

If and When Money Matters:  
Direct and Indirect Relationships between Expenditures and Student Learning

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## If and When Money Matters: Direct and Indirect Relationships between Expenditures and Student Learning

Calls for accountability in higher education have focused in part on whether colleges and universities spend revenue effectively to promote student learning. Unfortunately, little is known about whether money matters to the desired outcomes of college. Using data from the Spring 2004 administration of the National Survey of Student Engagement, this study examined the direct and indirect relationships between institutional expenditures and student learning. Results indicated that expenditures for undergraduate education had a weak albeit statistically significant association with gains in non-cognitive development. The indirect relationship between expenditures and outcomes, acting through engagement, appears to be as strong, or stronger, than the direct relationship.

Recent calls for accountability in American higher education focus, in part, on whether colleges and universities spend revenue effectively and efficiently to promote student learning (Leveille, 2006). For example, the Secretary of Education's Commission on the Future of Higher Education (2006, p. 4) recommended that colleges and universities "become more transparent about cost, price, and student success outcomes." Apparently, Howard Bowen's (1980) observation that colleges and universities raise all of the money they can and spend all of the money they raise does not resonate with policy makers and business leaders who want to know that funds are well spent. These leaders want institutions to demonstrate that expenditures are related to desired outcomes.

Although information about the relationships between college expenditures and student learning is essential to answer questions related to accountability and transparency, surprisingly little is known about whether and how "money matters" to desired outcomes of college. The present research addresses this gap in the literature by examining the direct and indirect relationships between institutional expenditures and student learning. In this study, student engagement is presumed to be the mediating factor in relationships between education expenditures and learning outcomes.

### Background

The connections between expenditures for education and student learning have been extensively studied in K–12 education since publication of the Coleman Report, *Equality of Educational Opportunity* (Coleman et al., 1966), but relatively few studies have examined the relationships between higher education expenditures and student outcomes. Many studies produced contradictory results. In the 1970s, for example, researchers failed to find statistically significant relationships between expenditures and students' exiting test scores (Rock, Baird, & Linn, 1972; Rock, Centra, & Linn, 1970). Likewise, researchers have not found significant relationships between expenditures for education and earnings after graduation (James & Alsalam, 1993; James, Alsalam, Conaty, & To, 1989). More recent studies have found statistically significant relationships between expenditures and college outcomes, even after controlling for a variety of student and institutional characteristics (Astin, 1993; Gansemer-Topf & Schuh, 2006; Hayek, 2001; Ryan, 2004; Smart, Ethington, Riggs, & Thompson, 2002; Toutkoushian & Smart, 2001).

Unfortunately, from an accountability standpoint, relationships between higher education expenditures and college outcomes have not been consistent, either between or within studies. For example, Astin (1993) found that expenditures for student services were positively related to retention, but Ryan (2004) did not find a significant relationship between retention and

expenditures for student services. Instead, Ryan (2004) found that expenditures for instruction and academic support were positively related to retention. Hayek (2001) also found a significant positive relationship between retention and expenditures for instruction and academic support; however, expenditures for research and institutional support were negatively related to retention and graduation. Most recently, and in contrast to previous studies, Gansemer-Topf and Schuh (2006) found that retention at private baccalaureate colleges was positively related to expenditures for academic support, unrelated to expenditures for instruction, and negatively related to expenditures for student services and institutional support.

Smart and his colleagues conducted two studies of the relationships between expenditures and students' self-reports of their learning and development using data from the Cooperative Institutional Research Program (CIRP). Toutkoushian and Smart (2001) found that expenditures for instruction were positively related to self-reported gains in interpersonal development. In contrast, Smart, Ethington, Riggs, and Thompson (2002) reported that expenditures for instruction were negatively related to leadership development. Toutkoushian and Smart (2001) also found that expenditures for academic support were positively related to students' self-reports of their preparation for graduate school, but negatively related to knowledge gains and the development of communication skills.

At least three factors help explain the weak and inconsistent findings regarding relationships between institutional expenditures and educational outcomes. First, any links between expenditures and outcomes are likely to be attenuated because only a small proportion of the variance in student outcomes is due to differences among institutions. Pascarella and Terenzini (1991, 2005) reported that differences in educational outcomes across institutions are substantially less than differences among students within institutions. Similar findings have been reported by Kuh (2007). Pascarella and Terenzini (1991) concluded that the lack of variance among institutions makes it difficult to identify institutional characteristics that are consistently related to educational outcomes.

A second factor that may contribute to weak and inconsistent relationships between institutional expenditures and learning outcomes is that while many studies focused on different types of expenditures such as instruction, academic support, or student services, institutions sometimes account for these expenditures in the same ways. Public and private institutions, for example, are required to report expenditures differently (National Center for Education Statistics, 2000). Moreover, the definitions of expenditure categories are somewhat vague and allow room for institutional interpretation. As a result, reported expenditures within categories vary substantially across institutions. Inconsistencies in reporting expenditures could attenuate the strength of associations and contribute to the failure of researchers to find consistent relationships between expenditures and educational outcomes.

A third factor contributing to the weak and inconsistent findings in studies of the relationships between expenditures and outcomes is that expenditures are indirectly, not directly, related to learning outcomes (Pike, Smart, Kuh, & Hayek, 2006). This claim is certainly consistent with the results of studies on the indirect effects of expenditures in K-12 education (Elliott, 1998; Wenglinsky, 1997) where expenditure effects on student learning were mediated by factors such as teacher-student ratios. In the case of higher education, the relationship between expenditures and outcomes is likely to be mediated by levels of student engagement.

### *The Role of Student Engagement*

Student engagement theory has its origin in the work of Pace (1980, 1984), Astin (1984, 1985), and Kuh et al. (1991). Although these writers used different terminology to describe their concepts of student engagement, their views were all based on the premise that what students learn in college is a function of how they spend their time and energy (Kuh, 2003). Research has provided strong, consistent support for this premise, finding that engagement is positively related to learning outcomes (Gellin, 2003; Kuh, Hu, & Vesper, 2000; Pascarella et al., 1996; Pike, 1999; Pike & Kuh, 2005; Pike, Kuh, & Gonyea, 2003). Although the theories focus on *student* engagement, a basic assumption underlying these studies is that *institutional* characteristics and actions influence levels of engagement on campus (Astin, 1985; Kuh et al., 1991; Pace, 1984). Among the institutional factors associated with student engagement are institutional size and mission, selectivity, and emphasis on undergraduate education (Kinzie, Schuh, & Kuh, 2004; Kuh et al., 2005; Kuh et al., 2007; Pike et al., 2006).

Colleges and universities' educational expenditures can also influence student engagement on campus. Hayek (2001) used quality of effort indicators from the *College Student Experiences Questionnaire (CSEQ)* along with IPEDS and *U. S. News and World Report* variables to determine whether expenditures mattered to student engagement. He found that quality of student effort was significantly related to expenditures for student services and institutional support, but not expenditures for instruction and academic support. In contrast, Ryan (2005) found a negative relationship between engagement and institutional support. Most recently, Pike et al. (2006) examined the relationships between institutions' NSSE benchmark scores and expenditures. Although relationships differed depending on institutional control and student level, expenditures for instruction, academic support, student services, and institutional support were significantly, and positively, related to benchmark scores. Thus, it seems reasonable to expect that combined expenditures for instruction, academic support, student services, and institutional support would be positively related to engagement and indirectly related to student learning outcomes.

In order to better understand the reasons underlying weak and inconsistent findings regarding the expenditures-outcomes relationship, three questions guided the present research:

1. To what extent do student learning outcomes vary across institutions?
2. What effects do the combined expenditures of instruction, academic support, student services, and institutional support have on student learning after accounting for differences within and among universities?
3. To what extent does student engagement mediate the relationship between combined expenditures and student learning?

Answering the first research question allows us to determine whether there are sufficient between-college differences to discern whether meaningful relationships exist between institutional expenditures and institution-level measures of learning and development. The second research question focuses on combined education expenditures which allows us to sidestep concerns about inaccurate reporting of expenditures within categories and examine the direct relationships between education expenditures overall and measures of student learning. Finally, by answering the third research question, we can find out if the relationships between expenditures and outcomes are direct or indirect.

## Research Methods

### *Conceptual Model*

The conceptual model underlying the present research presumes that the relationships between expenditures and outcomes are influenced by both student-level and institution-level factors. At the student level, educational outcomes are presumed to be related to such student background characteristics as gender, ethnicity, enrollment status, and field of study, their levels of engagement in educational activities such as active and collaborative learning and interaction with faculty, and a measure representing a unique effect for institutions. Student-level effects are represented by the equation

$$Y_{ij} = \beta_{0j} + \beta_{1j}X_{1ij} + \beta_{2j}X_{2ij} + \dots + \beta_{Qj}X_{Qij} + r_{ij} \quad [1]$$

Where  $Y_{ij}$  is the outcome for a given student ( $i$ ) at a particular institution ( $j$ ),  $\beta_{0j}$  is a unique level-1 coefficient represent the unique effect of the institution,  $\beta_{qj}$  is the level-1 coefficient for student-level variables (either background characteristic or student engagement measure)  $X_{qij}$ , and  $r_{ij}$  is a level-1 random effect of a given student within a particular institution.

At the institution level, the unique effect for the institution ( $\beta_{0j}$ ) is presumed to be related to a variety of factors, including an institution's expenditures for undergraduate education. The institution-level model is represented by the equation

$$\beta_{0j} = \gamma_{00} + \gamma_{01}W_{10} + \gamma_{02}W_{20} + \dots + \gamma_{0s}W_{sj} + u_{0j} \quad [2]$$

Where  $\beta_{0j}$  represents the unique effect for the institution,  $\gamma_{0s}$  are level-2 coefficients,  $W_{sj}$  are institutional characteristics, and  $u_{0j}$  is a level-2 random effect.

### *Participants*

The participants in this study were students who completed the National Survey of Student Engagement (NSSE) in Spring 2004. . The institutions that participated in the survey are very similar to the national profile of universities in terms of geographic region and urban-rural locale. Master's colleges and universities were overrepresented, whereas baccalaureate-general colleges were underrepresented among participating institutions (National Survey of Student Engagement, 2004). Students at 200 colleges and universities had the option of responding via a paper-and-pencil questionnaire or via the web, and 175 schools opted for web-only administration. In 2004, NSSE introduced Web+ administration which included multiple electronic contacts and mailing a paper-and-pencil survey to selected nonrespondents. A total of 98 institutions selected this method of administration. Approximately 13% of the respondents completed the paper version of the survey, and 87% used the web (National Survey of Student Engagement, 2004). Generally, administration mode does not affect NSSE results, except that Web respondents tend to report greater use of electronic technology (Carini et al., 2003).

Because the college experiences and educational outcomes of first-year students and seniors differ markedly (Kuh et al., 2001), and because it was believed that institutional characteristics would be more strongly related to the educational outcomes of students who had enrolled at the institution for a greater period of time, only seniors were included in the analyses. In addition, differences in accounting and reporting requirements for public and private sectors

required that only one type of institution be included in the study. Public institutions were selected for the present research.

Complete data were available for 35,895 seniors from 175 public colleges and universities. As was the case with all NSSE respondents, females (63%) and full-time students (84%) tended to be overrepresented. Participants were generally typical of their classmates in terms of race/ethnicity, transfer status, campus residency, and academic major. In addition, the public institutions included in the study were similar to all public institutions participating in NSSE 2004 and public institutions nationally. Approximately one-third (32%) of the 175 institutions were doctoral/research universities, 54% were Master's colleges and universities, and 14% were baccalaureate colleges. Average FTE enrollment was slightly less than 11,000, and 12.2% of FTE enrollment consisted of graduate or first-professional students. Average expenditures per FTE undergraduate were \$7,815.

### *Measures*

The engagement measures used in this study were student responses to *The College Student Report*. Information about institutional characteristics was drawn from IPEDS data, institutional common data sets, and College Board data. Student learning outcomes were measured using two NSSE scales. The first was a nine-item scale based on students' self-reports of their gains in cognitive development, and the second was a seven-item scale based on students' self-reports of their non-cognitive development.<sup>1</sup> Alpha reliability for the cognitive development scale was 0.86, and alpha reliability for the scale representing non-cognitive development was 0.85.

Self-report data are widely used in research on college outcomes, and the reliability and validity of these data have been studied extensively (Baird, 1976; Berdie, 1971; Pace, 1985; Pike, 1995; Pohlmann & Beggs, 1974). Research shows that self-report measures are likely to be valid under five conditions:

1. the information is known to respondents;
2. the questions are phrased clearly and unambiguously;
3. the questions refer to recent activities;
4. the respondents think the questions merit a serious and thoughtful response; and
5. answering the question does not threaten, embarrass, or violate the privacy of the respondent or encourage the respondent to respond in socially desirable ways (Kuh, 2001, p. 4).

Studies indicate that *The College Student Report* meets these five criteria and yields accurate, meaningful information about students' college experiences and educational outcomes (Kuh, 2001; Kuh et al., 2001; Ouimet et al., 2004).

Student engagement was represented by their scores on the five NSSE benchmarks which are based on 42 items on *The College Student Report*. The benchmarks represent clusters of activities that research shows are linked to positive educational outcomes. The Academic Challenge benchmark focuses on activities that demonstrate an institution emphasizes the importance of academic effort and sets high expectations for student performance, particularly in the areas of writing and higher-order thinking. Active and Collaborative Learning benchmark

questions ask students to report on the extent to which they are required to think about and apply what they are learning and to work with other students to solve problems and master difficult material. Student-Faculty Interaction items ask students to report on how often they interact with faculty inside and outside the classroom. The Enriching Educational Experiences benchmark covers a wide range of educationally purposeful learning activities. It also includes students' reports of their diversity experiences and experiences with technology. The final benchmark, Supportive Campus Environment, focuses on students' perceptions of institutional commitment to student success and the quality of students' interactions with peers, faculty, and administration (Kuh et al., 2001). Alpha reliability estimates for the NSSE benchmark scores range from 0.62 for Enriching Educational Experiences to 0.79 for Supportive Campus Environment (National Survey of Student Engagement, 2000). Appendix A presents the items comprising the learning outcome and student engagement measures used in this study.

Other student-level variables that were included in the study were gender (being female), ethnicity (being white), transfer status (being a transfer student), enrollment status (being enrolled full-time), on-campus residency (living on campus), and academic major (majoring in liberal arts). All of these variables, except gender and ethnicity, were taken from student responses to *The College Student Report*. Data on gender and ethnicity were provided to NSSE by the institutions.

Three institution-level variables were included in the study as controls because previous research indicated they are related to student learning and engagement (Pike et al., 2006). Institution size (measured by FTE enrollment in thousands), emphasis on graduate education (represented by the percent of student FTE that were graduate or first-professional students), and institutional selectivity (represented by the average ACT score, or converted SAT score, of students at the 25<sup>th</sup> percentile of the entering class) were derived from information in institution's common data sets and College Board data.

The final variable included in the study was an institution's combined undergraduate expenditures for instruction, academic support, student services, and institutional support. These expenditure categories were selected because they have been found to be related to both learning outcomes and student engagement. Expenditure data were taken from 2003-2004 IPEDS finance reports. Total expenditures were adjusted to reflect the proportion of funds spent on undergraduate education using procedures developed by the National Center on Higher Education Management Systems (NCHEMS) (Ewell, personal communication, November 15, 2004).<sup>2</sup> Table 1 displays summary information for all of the measures included in the study.

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Insert Table 1 about here

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### *Data Analysis*

Because students were nested within institutions, a series of hierarchical linear models were specified and tested using the HLM6 computer program (Raudenbush et al., 2004). The sequence in which models were specified and tested was based on procedures recommended by Bryk and Raudenbush (1992) and Ethington (1997) and corresponded to the study's three research questions. Answering the first research question involved determining whether there was sufficient between-institution variance in the cognitive and non-cognitive outcome measures

to warrant further analyses. At this stage of the analysis, the models for cognitive and non-cognitive outcomes included an intercept for the student-level model but no other independent or explanatory variables. The intercepts represented mean outcomes scores for each college or university, and chi-square tests of the between-institution variance components provided tests of whether there were statistically significant differences in cognitive and non-cognitive learning outcomes across institutions. In addition, dividing the between-institution variance component for a particular outcome by itself plus the corresponding pooled within-institution variance component provided an estimate of the proportion of the variance in student learning scores that was attributable to institutions. These models also served as baselines for evaluating subsequent models used to answer the second research question.

Answering the second research question involved building on the baseline models used to answer the first research question. Analyses began with the within-institution regression of the outcome measures on intercepts and student characteristics. Changes in the variance components from the baseline model provided estimates of the proportions of between- and within-institution variance explained by background characteristics. During the next step in the analysis, engagement measures were added to the models as within-institution student-level independent variables. The change in between- and within-institution variance components from previous models, divided by the appropriate variance components for the baseline models, provided indications of the explanatory power of the engagement measures.

The final step in this sequence involved specifying and testing a two-level model containing all of the student level variables plus the four institution-level variables.<sup>3</sup> The reduction in the between-institution variance component, divided by the between-institution variance component for the baseline model, provided an indication of the proportion of the variance in institutional means accounted for by institutional characteristics. Significance tests of the effect parameters for the student- and institution-level variables provided an indication of whether these variables were related to learning outcomes. Of particular interest were the effect coefficients for expenditures because the coefficients represented a test of whether expenditures were directly related to cognitive and non-cognitive development at the institutional level, after first accounting for student-level variables. Because of the large number of students in the analyses, a very conservative probability level ( $p < 0.001$ ) was used to evaluate the statistical significance of relationships at the student level. Given that only 175 institutions were included in the analyses, a traditional probability level ( $p < 0.05$ ) was used to evaluate the significance of relationships at the institution level. To improve the interpretability of the effect coefficients for the engagement and institution-level variables, these measures were centered around their grand means (Bryk & Raudenbush, 1992).

In order to answer the third research question, the NSSE engagement scales were individually analyzed in a series of hierarchical models. In the first model, engagement measures were regressed on a student-level intercept, and in the second model student characteristics were added to the equation. The final model included student level variables plus the four institution-level variables. Statistically significant relationships between expenditures and the intercepts for the engagement measures, coupled with the statistically significant relationships between engagement and outcomes identified in the previous research question, provided evidence of a mediating role for student engagement. Once again, institution-level measures were centered about their grand means, and changes in variance components from one model to the next were used to assess the explanatory power of student and institutional characteristics. A conservative

probability level ( $p < 0.001$ ) was used to evaluate student-level coefficients, whereas a more traditional probability level ( $p < 0.05$ ) was used to evaluate institution-level coefficients.

## Results

### *Variance among Institutions*

Chi-square results for the between-institution variance component revealed that there was statistically significant variation in students' cognitive outcomes across colleges and universities ( $\chi^2 = 856.82$ ;  $df = 174$ ;  $p < 0.05$ ). The ratio of between-institution variance to total variance further indicated that approximately 2% of the variance in cognitive outcomes could be attributed to differences among institutions. Chi-square results for non-cognitive outcomes also revealed that there was statistically significant variation at the institutional level ( $\chi^2 = 1529.36$ ;  $df = 174$ ;  $p < 0.05$ ). The ratio of the between-institution variance component to itself plus the total within-institution variance component indicated that 4.3% of the total variance in non-cognitive outcomes was attributable to institutional differences.

### *Relationships between Expenditures and Outcomes*

As previously noted, assessing the unique relationships between expenditures and outcomes involved specifying and testing student-level models, followed by models that included both student and institution measures. Initial tests revealed that students' background characteristics were significantly related to their self-reports of cognitive development. The student-level variance component was 364.34, and the institution-level variance component was 7.05. Comparing these values to the corresponding variance components for the baseline model revealed that student backgrounds accounted for approximately 1% of the variance in students' cognitive outcomes. Differences in the profiles of student characteristics across institutions accounted for 4.9% of the variance at the institution level.

Student engagement measures also were related to self-report cognitive outcomes. This model produced a student-level variance component of 213.67 and an institution-level variance component of 3.22. Comparing these results to the variance components for previous models revealed that the five NSSE engagement scores accounted for 40.9% of the variance in students' cognitive outcomes and 71.7% of the variance at the institution level. Adding institutional characteristics to the model produced an institution-level variance component of 2.97, indicating that institutional characteristics accounted for 3.4% of the variance in institution-level cognitive outcomes.

Similar results were obtained for self-reports of non-cognitive outcomes. The model that included student characteristics produced student- and institution-level variance components of 500.57 and 16.80, respectively. Thus, student characteristics accounted for 1.6% of the variance in student-level non-cognitive outcomes and 26.0% of the variance in institution-level outcomes. Including engagement measures in the model produced a student-level variance component of 313.00 and an institution-level variance component of 7.16. The NSSE engagement measures accounted for 36.9% of the student-level variance in non-cognitive outcomes and 42.5% of the variance in institutional non-cognitive outcomes. Adding institutional characteristics to the model produced an institution-level variance component of 6.89 and accounted for 1.2% of the variance in non-cognitive outcomes at the institution level.

The regression coefficients for the final models for cognitive and non-cognitive outcomes in Table 2 provided indications of which student characteristics, engagement measures, and

institutional characteristics were related to the outcomes. Asterisks (\*) are used to identify statistically significant ( $p < 0.001$ ) relationships at the student level, and daggers (†) are used to identify statistically significant ( $p < 0.05$ ) relationships at the institution level. In interpreting the coefficients in the table, all of the student characteristics are dichotomous variables, whereas the student engagement measures and institutional characteristics are centered around their grand means. Thus, the coefficient for being a female student represents the change in outcomes measures associated with being female, as opposed to male. The coefficient for academic challenge, on the other hand, represents the change in outcome measures associated with a one-point increase in academic challenge scores. The coefficient for the FTE enrollment variable represents the change in an institution's mean outcome measure that is associated with an increase of 1000 in FTE enrollment.

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Insert Table 2 about here

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The coefficients in Table 2 show that, after controlling for levels of engagement, all of the student characteristics, except being white, were significantly related to students' reports of their cognitive gains during college. Moreover, the direction of all of the significant relationships, except first-generation status, was negative. Thus, being female was associated with lower cognitive outcomes after accounting for the other-student-level variables in the model. Being a first-generation student was associated with greater cognitive gains, net the effects of the other variables in the model. All of the student engagement measures were significantly and positively related to cognitive gains. Increases in academic challenge and the campus environment were associated with the largest increases in cognitive gains. A one-unit increase in academic challenge scores was associated with an increase of 0.448 of cognitive gains, and a one-unit increase in supportive campus environment scores was associated with a 0.453 increase in cognitive gains.

Of the four institution-level measures, only FTE enrollment was significantly related to institutional intercepts (i.e., adjusted institutional means) for cognitive gains. The direction of the relationship was positive, indicating that—net the effects of the other institutional characteristics—increases in enrollment were associated with higher institutional cognitive-gain scores after the institutional means were adjusted for differences in student characteristics and levels of engagement.

The results for non-cognitive gains were somewhat different. All of the student-level variables, except living on campus, were significantly related to students' non-cognitive gains during college. Being a white student, a transfer student, or a full-time student was negatively related to reports of non-cognitive gains, whereas being female, a first-generation student, or a liberal arts major was positively associated with non-cognitive gains. All five student-engagement measures were positively related to non-cognitive gains, with the campus environment measure being associated with the largest change in non-cognitive gains. A one-unit change in the campus environment measure was associated with a 0.592 increase in non-cognitive gains. The variation in intercepts or adjusted means was negatively related to an institution's mean ACT score for students at the 25<sup>th</sup> percentile of the entering class.

Undergraduate expenditures per FTE were significantly and positively related to adjusted institutional means for non-cognitive gains.

### *Relationships between Expenditures and Engagement*

Specification and testing of a baseline model for the academic challenge benchmark produced a student-level variance component of 191.63 and an institution-level variance component of 4.37. Thus, 2.2% of the variance in students' academic challenge scores was attributable to institutions. Adding student characteristics to the model produced variance components of 185.77 for the student-level model and 3.99 for institutions, meaning that student characteristics accounted for 3.1% of the variance at the student level and 8.7% of the variance among institutions. Adding institutional characteristics to the model produced an institution-level variance component of 3.46, indicating that approximately 12.1% of the variance at the institutional level was attributable to differences in institutional characteristics.

Table 3 presents the coefficients for the final models for the five engagement measures. Examination of the results for the academic challenge benchmark revealed that being female, a transfer student, or a full-time student was positively related to students' academic challenge scores. Being white or living on campus was negatively related to academic challenge scores. Three institutional characteristics were related to variation in institutional intercepts. FTE enrollment was negatively related to academic challenge at the institutional level, whereas mean ACT scores at the 25<sup>th</sup> percentile of the entering class and undergraduate expenditures per FTE were positively related to variation in institutions' adjusted academic challenge scores.

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Insert Table 3 about here

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Analysis of active and collaborative learning measures using the baseline model produced student- and institution-level variance components of 265.22 and 9.85, respectively. These results indicated that 3.6% of the variance in active and collaborative learning scores was attributable to institutions. Adding student characteristics to the model produced variance components of 256.35 for the student level and 8.19 for the institution level. Thus, 3.3% of the variance at the student level and 16.9% of the variance at the institution level was attributable to differences in student characteristics. Adding institutional characteristics to the model produced an institution-level variance component of 5.32. This finding indicated that 29.1% of the variance in institution-level active and collaborative learning scores was related to institutional characteristics.

Examination of the coefficients in Table 3 revealed that being female or being enrolled full time was positively related to students' active and collaborative learning scores. Conversely, being white, a transfer student, a first-generation student, or majoring in an arts and sciences field was negatively related to reported levels of active and collaborative learning. At the institution level, both FTE enrollment and percent graduate enrollment were negatively related to variation in intercepts.

The baseline model for student-faculty interaction produced a student-level variance component of 397.22 and an institution-level variance component of 20.26. Approximately 4.9% of the variance in student-faculty interaction scores can be attributed to institutions. Including

student characteristics in the model produced variance components of 387.29 and 14.11 at the student and institution levels. Estimates of the variance accounted for by student characteristics were 3.3% at the student level and 30.3% at the institution level. Including institutional characteristics in the model produced an institution-level variance component of 9.66 and accounted for 22.0% of the variance in intercepts.

The results in Table 3 show that being a full-time student, living on campus, or being a liberal arts major was negatively related to students' reported levels of interaction with faculty members. Being white, a transfer student, or a first-generation student was negatively related to student-faculty interaction. Two institutional characteristics were significantly related to institutional intercepts (i.e., adjusted means) for student-faculty interaction. Both FTE enrollment and percent graduate enrollment were negatively related to institutional means for student-faculty interaction.

The enriching educational experiences baseline model produced variance components of 261.42 and 17.52 for students and institutions, indicating that institutional differences accounted for about 6.3% of the variance in this benchmark. Including student characteristics in the model produced variance components of 247.72 and 9.86 for the student and institution levels, respectively. Thus, student characteristics accounted for 5.2% of the variance at the student level and 43.7% of the variance at the institution level. Adding institutional characteristics to the model produced a variance component of 8.13, indicating that 9.9% of the variance in institutional intercepts was associated with those institutional characteristics.

Being female, a full-time student, living on campus, or majoring in the liberal arts were positively related to students' enriching educational experiences scores, whereas being white, a transfer student, or a first-generation student was negatively related to this engagement measure. Two institution characteristics were associated with the variation among intercepts. Both mean ACT score at the 25<sup>th</sup> percentile and undergraduate expenditures per FTE were positively related to adjusted institutional means for enriching educational experiences.

The baseline model for supportive campus environment scores produced variance components of 296.11 and 11.64 for the student and institution levels, respectively. Approximately 3.8% of the variance in supportive campus environment scores was attributable to institutional differences. Adding student characteristics to the model produced student- and institution-level variance components of 294.56 and 11.05, respectively. The corresponding estimates of explained variance were 0.5% for the student level and 5.1% for the institution level. Adding institutional characteristics to the model produced a variance component of 7.10 and accounted for 33.9% of the variance in institution-level scores.

The coefficients presented in Table 3 revealed that being female, enrolled full time, or living on campus was positively related to perceptions of a supportive campus environment. Being white, a transfer student, or a liberal arts major was negatively related to supportive campus environment scores. FTE enrollment and percent graduate enrollment were negatively related to adjusted campus environment means.

### *Limitations*

Care should be taken not to over generalize the results of this research. The findings of this study are limited to public institutions. Given that standards for reporting expenditures are different for public and private colleges and universities, it is unlikely that the results of this

research could be replicated exactly in a study of private institutions. The findings are further limited to public institutions that participated in NSSE. Although the public colleges and universities participating in the 2004 administration of *The College Student Report* were typical of public institutions generally, studies using different samples of institutions might produce different results. These results also represent a snapshot in time. In general, the findings from the 2004 NSSE survey are consistent with the results from other years; however, it is possible that using data from different years would produce different results.

In addition, *The College Student Report* is a relatively short survey, and it does not measure all aspects of student engagement or all dimensions of student learning. If additional items were included, or a different survey used, results might have differed in unknown ways. Likewise, a limited range of student and institutional control variables was used in the analyses. Using different control variables in the study could have led to different results. It is also not clear what expenditures were spent on. Expenditures could have been spent on instruction or academic support, or they could have been expenditures for institutional support. Furthermore, expenditures within the same category can be used for substantially different purposes. Given the lack of detail inherent in studies of higher-education expenditures, it is perhaps not surprising that the relationships between expenditures and student engagement and learning outcomes are quite modest. Finally, the relationships identified in this study are correlational and should not be taken as evidence of the causal effects of institutional characteristics, including expenditures, on student engagement and learning outcomes.

### Discussion

Despite the study's limitations, the findings from this study have important implications for theory, research, and practice. Specifically, the results indicate that there are statistically significant differences in mean learning outcomes across institutions. However, these between-institution differences are extremely small when compared to the differences among students within institutions. Institutions accounted for approximately 2% of the variance in students' self-reported gains in cognitive development and slightly more than 4% of the variance in non-cognitive gains. As Pascarella and Terenzini (1991, 2005) noted, similar findings have been reported in many studies of college students. The lack of variance among colleges and universities makes it extremely difficult to identify institutional characteristics that are related to differences in learning outcomes across institutions. However, the lack of variance alone is not sufficient to explain weak relationships between what institutions do and what students learn. Institutional differences do not explain substantially more of the variance in engagement measures than in outcome measures. Despite that fact, the relationships between institutional characteristics and institution-level measures of student engagement are substantially stronger than the relationships between institutional characteristics and learning outcomes.

The lack of variance in self-reported student learning outcomes and engagement measures at the institution level also sounds a cautionary note about placing too much weight on these measures in accountability reporting. Institutional scores can and do vary from administration to administration of the NSSE survey due to chance. This variation is attributable both to measurement error and sampling error. If differences among institutions are small, even modest changes in an institution's score can have substantial effects on that institution's standing relative to other institutions. Because of the dangers of over interpreting small changes in institution-level means, Kuh (2007) has strongly cautioned against using these measures to rank or compare institutions.

Combining institutional expenditures for instruction, academic support, student services, and institutional support did not produce a more robust measure of educational expenditures that could be used to explain institutional differences in student learning outcomes. Although expenditures were significantly related to non-cognitive outcomes, the expenditures measure, coupled with the measure of institutional selectivity, only accounted for about 1% of the variance in non-cognitive gains at the institution level. Does this mean that expenditures are unrelated to student learning? Not necessarily. Pike et al. (2006) observed that one problem with the IPEDS expenditure categories is that they are very gross measures of how institutions allocate their resources. What this study demonstrates is that it is not possible to overcome the limitations of the IPEDS categories by using an even more general measure of expenditures. Researchers interested in studying the relationships between expenditures and student learning outcomes would be well advised to examine the effects of very specific types of expenditures on student learning. The results of these highly focused studies may provide a framework that can guide college and university administrators in the effective allocation of resources to improve student success.

Although the effect sizes of the relationships were small, expenditures were more strongly associated with institutional levels of student engagement than learning outcomes. Expenditures were significantly related to benchmark scores for two of the five engagement measures—academic challenge and enriching educational experiences. For both of these engagement measures, expenditures and other institutional characteristics accounted for approximately 10% of the variance across institutions. This finding supports the observation made by Pascarella and Terenzini (1991) that many of the effects of college are indirect. Researchers interested in studying the effects of educational expenditures would be well advised to focus on mediating variables, such as student engagement. Similarly, institutions interested in improving the quality of students' educational experiences should focus on those aspects of the student experience that the institutions can affect directly. Rather than spending money to improve student learning, retention, or graduation rates, institutional leaders should put their resources into those aspects of college that experience, theory, and research tell them are related to learning and success in college.

Although it was not a focus of this study, the results of the present research provide important information about the relationships between student engagement in educationally purposeful activities and student-level learning outcomes. Specifically, all five measures of engagement were significantly and positively related to students' cognitive and non-cognitive gains in learning and development. From a statistical standpoint, this finding is somewhat surprising. When an outcome measure is regressed on a set of highly correlated variables, such as the engagement measures used in this study, suppressor effects, in which the directions of relationships are reversed, frequently occur (Ethington, Thomas, & Pike, 2002). Consequently, it would not be unusual for one or more of the engagement measures to appear to be negatively related to student learning outcomes when all five engagement measures are included in a model. That did not occur. It appears that the five types of engagement represented by the NSSE benchmarks make unique, positive contributions to student learning and development. To be sure some relationships are stronger than others, but all of the relationships are positive. From a practical standpoint, these results suggest that the greatest gains in student learning are likely to flow from institutional policies and practices that improve student engagement across multiple dimensions.

The results of this study are also helpful in that they reveal patterns in the characteristics of highly engaged and disengaged students. Based on these results, women, students of color, students who began at the institution, full-time students, students living on campus, and students whose parents attended college tended to be most highly engaged. Conversely, men, white students, transfers, students attending part-time, first-generation students, and students living off campus tend to be less engaged. Although institutions should identify the patterns of relationships that are specific to their own students, targeting programs at groups of students who are likely to be at risk of being underengaged seems to hold promise for improving the student experience on campus.

For some types of public institutions, achieving high levels of engagement will likely be more difficult than for others. The negative relationships between both FTE enrollment and percent of FTE enrollment at the graduate and professional level and engagement across most of the engagement measures suggests that large institutions and institutions with large graduate and professional programs are likely to have lower levels of engagement overall than are institutions with smaller, primarily baccalaureate enrollments. Selective institutions with relatively high mean ACT scores for students at the 25<sup>th</sup> percentile of the entering class are likely to have somewhat higher levels of engagement than less-selective institutions. Offsetting these disadvantages somewhat, larger institutions appear to have greater gains in cognitive development than smaller institutions, and less-selective institutions appear to have higher net gains in non-cognitive development than their more selective counterparts.

### Conclusions

In response to the question if and when does money matter, the findings from this study suggest that money seldom matters to student learning in meaningful ways. However, to close the book on researching the relationships between educational expenditures and students' college experiences would be premature. Even after 40 years, research on expenditures and achievement in K–12 education has begun to yield important insights, but few definite answers. Much more research is needed to untangle the relationships among expenditures, experiences, and the outcomes of college. In order to understand these relationships, better measures of expenditures and greater attention to the indirect and contingent effects of educational expenditures are needed. Like Thomas Edison's early attempts to invent the light bulb, the major contribution of the present research may be to show what does not work. Gross measures of expenditures do not appear to be helpful in understanding how expenditures affect student engagement and student learning, nor do simplistic models of direct effects. Future research might more profitably focus on the effects of narrowly defined types of educational expenditures on those types of student behaviors over which the institution has the greatest control.

### Notes

<sup>1</sup> Scale scores were calculated using procedures identical to those used to calculate NSSE benchmark scores for individuals. First, item scores were scaled from 0 to 100. Then scale scores were calculated as the arithmetic mean of the item scores.

<sup>2</sup> Total expenditures were adjusted to remove expenditures for graduate education by first multiplying the proportion representing graduate and first-professional FTE enrollment at the institution by 1.5—the typical cost increment for graduate programs in most state resource allocation models and in most cost studies. Next, total expenditures for an institution were multiplied by the weighted proportion to produce an estimate of spending for graduate education. Finally, the estimate for graduate expenditures was subtracted from total expenditures to arrive at an estimate of expenditures for undergraduate education at each institution.

<sup>3</sup> In the two-level models, institutional characteristics were presumed to be related only to variation in institutional intercepts represented by adjusted outcome and engagement means. Preliminary analyses revealed that the variation in student-level regression parameters was not statistically significant.

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*Table 1*  
Descriptive Statistics for Variables Included in the Study

Variable	N	Mean	Standard Deviation
Cognitive Gains	35,895	67.60	19.36
Non-Cognitive Gains	35,895	46.65	22.97
Academic Challenge	35,895	54.95	13.97
Active & Collaborative Learning	35,895	49.54	16.55
Student-Faculty Interaction	35,895	40.29	20.34
Enriching Educational Experiences	35,895	37.11	16.61
Supportive Campus Environment	35,895	56.35	17.54
Female Student	35,895	0.63	0.48
White Student	35,895	0.77	0.42
Transfer Student	35,895	0.45	0.50
Full-Time Student	35,895	0.84	0.37
First-Generation Student	65,895	0.37	0.48
On-Campus Student	35,895	0.10	0.29
Liberal Arts Major	35,895	0.42	0.49
FTE Enrollment (1,000s)	175	10.84	8.93
Percent Graduate Enrollment	175	12.16	9.03
Mean ACT Score (25 <sup>th</sup> Percentile)	175	19.52	2.41
Expenditures per FTE (\$1,000s)	175	7.83	2.34

*Table 2*  
Effect Parameters for Cognitive and Non-Cognitive Gains

Parameter	Cognitive Gains	Non-Cognitive Gains
Female Student	-1.188†	1.234†
White Student	-0.375	-3.119†
Transfer Student	-1.169†	-1.537†
Full-Time Student	-1.533†	-0.647†
First-Generation Student	1.494†	1.387†
On-Campus Student	-1.839†	0.597
Liberal Arts Major	-1.671†	1.059†
Academic Challenge	0.448†	0.242†
Active & Collaborative Learning	0.058†	0.124†
Student-Faculty Interaction	0.043†	0.025†
Enriching Educational Experiences	0.022†	0.136†
Supportive Campus Environment	0.453†	0.592†
Intercept	70.694*	48.535*
FTE Enrollment (1,000s)	0.045*	0.035
Percent Graduate Enrollment	0.027	-0.025
Mean ACT Score (25 <sup>th</sup> Percentile)	-0.096	-0.305*
Expenditures per FTE (\$1,000s)	0.073	0.333*

\* $p < 0.05$ ; †  $p < 0.001$

*Table 3*  
Effect Parameters for Student Engagement Scores

Effect Parameter	Academic Challenge	Active& Collaborative Learning	Student-Faculty Interaction	Enriching Educational Experiences	Supportive Campus Environment
Female Student	2.297†	2.346†	0.170	2.784†	0.477†
White Student	-1.023†	-0.863†	-0.641†	-0.849†	-1.136†
Transfer Student	0.439†	-1.352†	-2.365†	-4.444†	-1.355†
Full-Time Student	6.126†	6.073†	6.084†	5.345†	2.245†
First-Generation	0.013	-0.519†	-1.447†	-2.135†	0.272
On-Campus Student	-0.777†	0.029	1.673†	2.281†	1.185†
Liberal Arts Major	-0.135	-3.429†	3.570†	2.157†	-0.808†
Intercept	49.226*	46.234*	35.936*	33.010*	56.201*
FTE Enrollment	-0.064*	-0.089*	-0.174*	-0.014	-0.143*
Percent Graduate	-0.028	-0.097*	-0.131*	-0.063	-0.117*
Mean ACT Score	0.246*	-0.209	0.221	0.481*	0.218
Expenditures	0.153*	-0.033	0.207	0.232*	-0.191

\*  $p < 0.05$ ; †  $p < 0.001$

## Appendix A

### *Gains in Cognitive Learning and Development*

- Acquiring a broad general education
- Acquiring job or work-related knowledge and skills
- Writing clearly and effectively
- Speaking clearly and effectively
- Thinking critically and analytically
- Analyzing quantitative problems
- Using computing and information technology
- Learning effectively on your own
- Solving complex real-world problems

### *Gains in Non-Cognitive Learning and Development*

- Working effectively with others
- Voting in local, state, or national elections
- Understanding yourself
- Understanding people of other racial and ethnic backgrounds
- Developing a personal code of values and ethics
- Contributing to the welfare of your community
- Developing a deepened sense of spirituality

### *Academic Challenge*

- Preparing for class (studying, reading, writing, rehearsing etc. related to academic program)
- Number of assigned textbooks, books, or book-length packs of course readings
- Number of written papers or reports of 20 pages or more; number of written papers or reports of between 5 and 19 pages; and number of written papers or reports of fewer than 5 pages
- Coursework emphasizing analysis of the basic elements of an idea experience or theory
- Coursework emphasizing synthesis and organizing of ideas, information, or experiences into new, more complex interpretations and relationships
- Coursework emphasizing the making of judgments about the value of information, arguments, or methods
- Coursework emphasizing application of theories or concepts to practical problems or in new situations
- Working harder than you thought you could to meet an instructor's standards or expectations
- Campus environment emphasizing time studying and on academic work

*Active and Collaborative Learning*

- Asked questions in class or contributed to class discussions
- Made a class presentation
- Worked with other students on projects during class
- Worked with classmates outside of class to prepare class assignments
- Tutored or taught other students
- Participated in a community-based project as part of a regular course
- Discussed ideas from your readings or classes with others outside of class (students, family members, co-workers, etc.)

*Student-Faculty Interaction*

- Discussed grades or assignments with an instructor
- Talked about career plans with a faculty member or advisor
- Discussed ideas from your readings or classes with faculty members outside of class
- Worked with faculty members on activities other than coursework (committees, orientation, student-life activities, etc.)
- Received prompt feedback from faculty on your academic performance (written or oral)
- Worked with a faculty member on a research project outside of course or program requirements

*Enriching Educational Experiences*

- Participating in co-curricular activities (organizations, publications, student government, sports, etc.)
- Practicum, internship, field experience, co-op experience, or clinical assignment
- Community service or volunteer work
- Foreign language coursework or study abroad
- Independent study or self-designed major
- Culminating senior experience (comprehensive exam, capstone course, thesis, project, etc.)
- Serious conversations with students of different religious beliefs, political opinions, or personal values
- Serious conversations with students of a different race or ethnicity
- Using electronic technology to discuss or complete an assignment
- Campus environment encouraging contact among students from different economic, social, and racial or ethnic backgrounds
- Participate in a learning community or some other formal program where groups of students take two or more classes together

*Supportive Campus Environment*

- Campus environment provides the support you need to help you succeed academically
- Campus environment helps you cope with your non-academic responsibilities (work, family, etc.)
- Campus environment provides the support you need to thrive socially
- Quality of relationships with other students
- Quality of relationships with faculty members
- Quality of relationships with administrative personnel and offices