How do academic departments impact student satisfaction?
Understanding the contextual effects of departments

Paper presented at the 41st Forum of the Association for Institutional Research,
June 2-6, 2000, Long Beach, California

Paul D. Umbach
Research Assistant, Department of Education, Policy and Leadership
University of Maryland, College Park
College Park, MD 20742
Email: umbach@wam.umd.edu
Phone: 301.405.1514

Stephen R. Porter, PhD
Director, Office of Institutional Research
Wesleyan University
Middletown, CT 06459
Email: sporter@wesleyan.edu
Phone: 860.685.2530

How do academic departments impact student satisfaction? Understanding the contextual effects of departments

Abstract

Using multilevel modeling to analyze survey data from over 1300 alumni from a large research university, this study proposes to examine the impact that departments have on student satisfaction. Controlling for individual characteristics, we found that characteristics of departments such as size, faculty contact with students, research emphasis, and proportion of female undergraduates had a significant impact on satisfaction with education in the major and the perceived impact that college had on skill development.

How do academic departments impact student satisfaction?
Understanding the contextual effects of departments

For decades, scholars and academic administrators have examined the impact that college has on students and student satisfaction. Seminal works by Feldman and Newcomb (1969) and Pascarella and Terenzini (1991) explore the relationship between students' college experiences and learning, development, and satisfaction. Scholars have long understood the impact of subunits within colleges and universities on students and have concluded that they often produce quite different influences on student development (Baird, 1988; Chickering, 1969). More specifically, several authors have noted the impact that departmental culture and climate have on student learning and satisfaction (Cameron & Ettington, 1988; Hartnett & Centra, 1977; Volkwein, 1994).

What do we know about the impact that different departments have on student outcomes? In fact we know very little. We do know that academic disciplines vary in their views of application of practical problems, cognitive processes, concern with life systems, beliefs about collaboration, time commitments and scholarly output (Becher, 1987; Biglan, 1973a; Biglan, 1973b). Others suggest marked differences between departmental goals (Smart & Elton, 1975). Still others indicate differences in course planning and delivery (Stark, Lowther, Bentley, & Martens, 1990). While we know a great deal about the differences between departments, very little research has been done to study the impact that different departments have on student outcomes.

For researchers, studying the effects of departments poses a dilemma known as the unit of analysis problem. In the 1980s, elementary and secondary level researchers began to address school effects when studying students (Burstein, 1980; Burstein & Miller, 1981). They recognized that in educational research they are faced with a unit of analysis problem that has plagued educational researchers for decades. In the past, researchers were faced with three when examining group effects. They could build statistical models that examined data at the group level or organizational level and neglect differences in individuals; they could examine data at the individual level and ignore the impact of group membership; or they build models that attach group-level characteristics to individuals. All three approaches can result in inaccurate parameter estimates and the incorrect number of degrees of freedom; therefore, the results may lead to poor or even misleading policy analyses. Only recently have higher education researchers begun to recognize the need to analyze data taking into account the nested structures of institutions of higher education (Ethington, 1997; Patrick, 2001; Porter & Umbach, 2001). Multilevel modeling techniques allow researchers to appropriately handle the complex organizational effects of colleges and universities and provide the tools necessary to arrive at more accurate results.

Using multilevel modeling to analyze survey data from over 1300 alumni from a large research university, this study proposes to examine the impact that departments have on student outcomes. Given that purpose, this study asks several questions:

1. What impact do individual characteristics such as race, gender, age, grade point average and transfer status have on satisfaction and the perceived impact that the college experience has on enhancing skill development?

2. What effect do academic departments have on student satisfaction and the perceived impact that the college experience has on skill development? And to what extent do departmental size, departmental research focus, departmental diversity, and faculty contact with students within a department relate to satisfaction and the perceived impact of college?

Review of the literature

Research suggests that alumni satisfaction is an excellent tool for assessing the effects of college on students (Pace, 1979; Pike, 1994). In an era where outcomes assessment is important, alumni surveys also play an important role in evaluating programs (Pike, 1994). While alumni gauging alumni satisfaction is important, little attention has been given to it since the 1970s and 1980s (Bean & Bradley, 1986).

Nevertheless, extensive research has been done on the various dimensions of college outcomes (Bowen, 1977; Feldman & Newcomb, 1969; Pascarella & Terenzini, 1991). In their review of the literature on student outcomes, Pascarella and Terenzini (1991) found that there are at least 10 dimensions of college outcomes. This study is informed in particular by research done Pascarella and Terenzini (1978) where they identified two particular dimensions of college outcomes – intellectual development and personal development.

Individual effects

While a great deal of literature focuses on using individual factors to predict student outcomes, very little work has been done on predicting student satisfaction. The literature suggests a complex relationship between grades and satisfaction with college. Some have suggested that grades a moderate relationship with satisfaction (Liu & Jung, 1980; Pike, 1991). Bean and Bradley (1986) found that grades had almost no relationship with student satisfaction. However, others have found that student performance (grade point average) significantly relates to satisfaction (Centra & Rock, 1983; Lavin, 1965); Likewise, given the models of student retention where satisfaction and academic performance are predictors of attrition (Tinto, 1993), one could conclude that college grades and satisfaction are closely related.

Several researchers have found significant gender differences in satisfaction with college (Adelman, 1991; Rienzi, Allen, Sarmiento, & McMillin, 1993). In most cases, women report lower satisfaction with college than do men.

Scant research has been done on using race/ethnicity as a predictor of satisfaction. One study did find significant differences between racial/ethnic groups on reported satisfaction (Helm & Sedlacek, 1998). However, given the vast literature on the differences between races and the college experience, one would expect differences in satisfaction. Similarly, very little research has been done on the differences in satisfaction between transfer and native students. At the institution in this study, almost none of the transfer students live on campus, so one would expect their satisfaction to be similar to commuter students. Research suggests that transfer students are more critical of their college experience than native students (Liu & Jung, 1980).

Departmental effects

Beyond individual effects, research on the impact of college on students suggests that sub environments within the same institution can produce very different influences on students (Baird, 1988; Biglan, 1973b; Chickering, 1969; Weidman, 1989). Ewell (1989) argued that overall institutional culture was not significantly associated with student outcomes, but that major departments are important in the study of the impact of college on students. The literature points to departmental characteristics such as student-faculty relationships, structural diversity, and research emphasis of the faculty as factors influencing student outcomes.

Faculty continue to be one of the greatest influences on students' experiences in college. A debate continues over the opposing roles of faculty work and how that impacts college students. Many have suggested that research and teaching are in conflict (Clark, 1987; Kerr, 1963). Other researchers argue that research and teaching are complementary endeavors, and that faculty who do research are more likely to produce satisfied, well-educated students (Teague, 1981; Volkwein & Carbone, 1994). Still others (Feldman & Newcomb, 1969) suggest that there is no relationship between teaching and research.

Whatever the relationship between research and teaching, faculty are under attack. Many inside and outside of higher education have become increasingly concerned about how faculty spend their time (Bok, 1992; Boyer, 1990). Some have argued that faculty are now spending their discretionary time on research and are neglecting undergraduates (Massy & Zemsky, 1994). They suggest that as scholars "ratchet" up their research, student contact decreases, class size increases, and the number of faculty not engaging in undergraduate teaching decreases. Therefore, academic departments grow in size but not in service to their students.

Peer influences also appear to relate to student outcomes. Milem (1998) concluded that peers significantly shape students attitudes and beliefs. What characteristics of peers within a department might shape students satisfaction? Perhaps departments with students with high academic ability shape student attitudes differently than those with students with low academic ability.

Taking peer influences a step further, many researchers have investigated structural components of colleges and universities that impact students, particularly students of color and women (Gurin, 1999; Hurtado, Milem, Clayton-Pedersen, & Allen, 1999; Milem, in press; Milem & Hakuta, 2000). Chang (1996, 1998) found that students' overall satisfaction with college is enhanced in diverse learning environments. In other words, students have learning environments with a high proportion of students of color experience greater satisfaction than those who come from homogeneous learning environments. This is true for both white students and students of color. Although we are beginning to recognize the impact that diversity of colleges and universities has on student satisfaction, little empirical work has been done to support these ideas.

Unit of analysis

Given that both individual and departmental factors impact students, how does one best predict student outcomes? Some researchers (Berger, 2000; Berger & Milem, 2000) suggests a complex relationship between universities and students that cause methodological issues when determining units of analysis. Much of the current research focuses on how individual characteristics influence students. Several other studies chose to aggregate individual level outcomes data. Unfortunately analyses of this type are prone to what is known as an "ecological fallacy" (King, 1999; Kreft & DeLeeuw, 1998; Robinson, 1950), in which aggregate-level results may substantially differ or even be the reverse of individual-level results. To understand individual-level behavior, we must use individual-level data.

In addition to aggregating individual-level data, researchers often attempt to address group level characteristics on a dependent variable by attaching group level variables to individual-level data. As Ethington (1997) notes, this solution is flawed for several reasons. First, it violates the fundamental assumption of OLS that observations are independent of one another. Second, it assumes that individuals within a group are affected identically by institutional characteristics. Finally, the attachment of group level variables to an individual does not fully capture the effect of group level characteristics, which results in a misestimation of standard errors.

We have long recognized that the impact of college is an interactive process between students and their environment (Astin, 1993; Weidman, 1989); yet prior to the recent availability of multilevel modeling techniques, all previous researchers have used simple cross-tabulations, correlations or regression analysis when studying college outcomes. Such techniques ignore these interactive processes the impact that institutions and their sub environments may have on outcomes. Clustering of the data can radically affect the substantive results of any analysis. Only by explicitly modeling this hierarchical structure of the data can we begin to truly understand why some how college impacts students.

Sample and design

This study uses data from a survey of alumnae at a large Research institution. The survey itself contained over eighty questions and was 4 pages long. The questions covered such topic areas as current employment status, satisfaction with various aspects of the institution, and self-assessed growth of skills and abilities.

All 4,952 bachelor's degree recipients for fiscal year 1999 were surveyed using the Dillman (1986, 2000) method of mail surveying in an effort to obtain high response rates. Dillman's method involves multiple contacts with respondents when doing large-scale mail surveys, using a pre-notification contact and two survey mailings and reminder postcards. Taking into account bad addresses, the final sample size was 4,524. Of that sample, 1532 surveys were returned yielding a response rate of 34 percent.

Data analysis

Based on the literature of student outcomes, we propose four multi-level models predicting student outcomes. We posit that satisfaction is related to individual attributes such as age, race, gender, transfer status and academic performance. In addition, we argue that departmental-level attributes such as research emphasis, size, student contact with faculty, academic ability of students, and diversity are related to satisfaction.

Independent variables

At the individual level (or in multilevel modeling terms, level-1), we included the alumnus' race/ethnicity, gender, age, cumulative grade point average (GPA), and transfer status. Means and standard deviations for all variables can be seen in Table 1. Race/ethnicity was included in the model using three dummy variables for African American, Asian Pacific American, and other students of color, with White as the reference category. We included gender and transfer status in the model as a dummy-coded variables as well. Grade point average at graduation and age at the time of the survey were two continuous variables included in the model at level-1. Together these variables measure individual attributes of each alumnus that should affect their satisfaction and perceived gains in skills and abilities.

We also included a second set of variables to ascertain the impact of departmental organization on student outcomes. These variables are all measured at the departmental level using department data collected in Fall 1997, approximately the junior or senior year of the individuals in our population. Henceforth we refer to these as group level, or level-2, variables.

Three variables describe the undergraduate student body in each department. The *proportion of female undergraduates* and *proportion of undergraduates of color* are two diversity measures. The *midpoint of the 25th and 75th percentiles of the SAT* for freshmen majors is used as a proxy for academic ability of students within a department. Because of the high correlation between SAT scores and college GPAs, we have not included SAT scores at the individual level.

Three additional variables proxy the alumnus' experience with faculty within a department. *Instructional FTE* is used to represent department size and is defined as the number of full-time equivalent instructional tenured or tenure-track faculty. We used *average class size* as a measure of student contact with faculty. It is the average size of lecture courses taught by a department not including specialized courses such as individual instruction or thesis courses. Labs and discussion sections are not included in this average. We calculate g*rant dollars per FTE* by dividing the total expenditures for research contracts and grants and dividing by the instructional FTE. Because of the non-normal distribution of grant dollars, we logged grant dollars per FTE to ensure normality (Tufte, 1974).

With such closely related variables in our level-2 model multicollinearity could be a major concern. An examination of the correlations shown in Table 2 reveals low correlations between the variables. These relatively low correlations confirm our assumption that the six group level variables included in our models measure different constructs.

Dependent variables

Before developing our models, we performed an exploratory factor analysis on questions related to general satisfaction and perceptions of the impact that the institution had in enhancing skills. The factor analyses yielded four factor structures similar to those found by Pascarella and Terenzini (1978). All four are used as dependent variables in our models:

- Satisfaction with the major
- Personal skill development
- Intellectual skill development
- General skill development.

Items comprising the four constructs, their loadings and reliability estimates are presented in Table 3.

For satisfaction we developed one scale, *satisfaction with the major* (alpha=.72), which includes two Likert scale items. These asked alumni to rank the degree to which they agreed that their major provided them with a solid background for their career, and the degree to which they were satisfied with their major.

We used a battery of 13 items that asked alumni to respond on a 3-point scale about the degree to which they believed their college experiences enhanced their skills to develop the other three constructs. The *personal skill development* scale (alpha=.76) included seven items that asked the extent to which college enhanced skills such as teamwork, leading others, professional ethics and understanding diverse cultural, political and intellectual views. *Intellectual skill development* (alpha=.71) is a 7-item scale that asked the extent to which their college experiences enhanced skill such as writing, solving problems, thinking critically, and processing and interpreting data. The final scale, *general skill development* (alpha=.82), included 10 items from the other skill development scales such as writing effectively, speaking effectively, clarifying values, solving problems, and thinking creatively.

Respondents were deleted from the final sample if they answered less than half of the questions related to development, if they answered none of the major satisfaction questions, or if their major was not located in one of the departments (e.g. general studies). Mean substitutions were performed for the remaining missing variables prior to building the constructs. The remaining 1,356 individuals from 54 departments were used as the final sample. The average department size was 24 respondents, ranging from one to 232. See Table 4 for department frequencies.

Modeling strategy

The first step in multilevel modeling is the calculation of the amount of variance in the dependent variable explained by group (department) membership, or the inter-class correlation (ICC). The ICC is calculated by building a fully unconditional model (often referred to as a one-way ANOVA) model) where no predictors are specified. The ICCs for the four dependent

variables ranged from .06 (satisfaction with major and general development) to .08 (personal development. In other words, 6 to 8 percent of the variance in each of our dependent measures is explained by group membership. While these ICCs are somewhat modest, they are large enough to suggest that group membership has an impact on our outcomes and that multilevel modeling is the appropriate statistical approach.

After calculating the ICCs, we added independent variables to the model. When adding independent variables we must consider how to center the variable and whether to enter it as random or fixed. Variables can have a fixed effect or a random effect. If theory guides one to assume that the impact of the independent variable will be the same for individuals in every group, the variable is said to have a fixed effect. If theory guides one to assume that the impact of the independent variable will be different for different groups, the variable is said to have a random effect, or is free to vary across groups. For variables that are said to have a random effect, their variance is partitioned into what is attributed to the group and what is attributed to the individual. However, because multilevel model requires massive amounts of data, the decision to include a random effect is often predicated by the number of groups in a data set and the number of observations within each group. For our models, theory would suggest that perhaps race and gender be entered in our models as random effects, but due to the limitations in our data set, these models would not converge.

As a result, we left only the intercept as random and could only model average group differences. Thus our models assume that the impact of the individual- and group-level variables is the same across departments; however, the average level of satisfaction within a department can vary across departments. For example, students in Department A could be much less satisfied than students in Department B, but if the average class size was reduced by the same amount in each department, satisfaction would increase by the same amount in each department.

Centering is generally used to facilitate interpretation of the intercepts in the model. Variables are centered when the mean value of a variable is subtracted from the value the variable takes for each observation. If the mean is calculated across all observations, then the variable is grand mean centered; if the mean is calculated across observations in each cluster, then the variable is group mean centered. A general convention used in multilevel modeling is to grand mean center all fixed level-1 variables and group mean center all random level-1 variables. At level-2, in most cases, all independent variables are grand mean centered. So for all of our models, we have grand mean centered all level-1 and level-2 variables.

Results

We estimated parallel models for each of our four independent variables. The full multi-level models can be seen in Table 5 with their variance estimates shown in Table 6.

Satisfaction with education in the major

At the individual level, cumulative grade point average appears to be positively related with satisfaction with the major. Those with higher GPAs are more satisfied with their major. Gender and race also appear to have a significant relationship with satisfaction. Women and Asian Pacific Americans were on average less satisfied with their education in their major.

At the group level, several contextual factors impact satisfaction with education in the major. The proportion of female undergraduates in a department is positively related to major satisfaction. Controlling for the other variables in the model, alumni in departments made up of a large proportion of women had greater satisfaction with the education in their major.

Two other group-level variables appear to be significantly related with satisfaction with education in the major. The larger a department (as proxied by instructional FTE), the more satisfied on average students were with their education in their major. Focus on research also appears to be positively related to satisfaction with the major. As grant dollars per instructional FTE increases, the satisfaction that alumni had with their major increases.

Personal skill development

The model predicting alumni assessments of the degree to which their college experience enhanced their personal skill development (model 2) revealed several individual and group effects. At the individual level, only transfer status had a significant negative relationship with personal skill development. In other words, transfer students believed that their college experience enhanced their personal skill development significantly less than native students.

At level-2, several group characteristics significantly predicted the mean score for personal development. Similar to satisfaction, the proportion of females had a significant positive relationship with assessment of the impact that college had on personal skill development. The higher the proportion of females within a discipline, the higher the rating of the impact of college experiences on personal skill development.

Likewise, both departmental size and departmental research emphasis were positively related to perceived college impact on personal skill development. The higher the instructional FTE in a department and the higher the grant dollars per FTE, the higher alumni rated the impact of college.

Student contact also had a significant relationship with the dependent variable. As average class size increased, the less they believed that college enhanced their personal skill development.

Intellectual skill development

The model predicting intellectual skill development (model 3) appears somewhat different than that of personal skill development. At the individual level, gender, race and transfer status all had a significant relationship with the dependent variable. Females assessed the impact of college on intellectual development significantly lower than males. Likewise, transfer students assessed the impact significantly lower than native students. However, African American students rated the impact of college on intellectual development higher than White students.

At the group-level, only one variable was found to be a significant predictor of the average perceived impact that college had on intellectual skill development. Departmental research focus, as proxied by grant dollars per FTE, was positively related with the dependant variable.

General skill development

As expected, the fourth model, which predicts overall skill development, has some similarities to models 2 and 3. At the individual level race and transfer status are statistically significant predictors of the dependent variable. African Americans rate the impact that college had on enhancing their skills higher than Whites; Asian Pacific Americans rated the impact of college lower than Whites. Again, transfer students on average rated the impact of college significantly lower than native students.

The model at level-2 would suggest a significant relationship between departmental size, student contact with faculty in the department, and gender make-up of the students in the department have a significant relationship with the average perceived impact of college on skill development. As the proportion of female undergraduates in a department increases, the perceived impact of college increases. When contact with faculty decreased (or average class size increased), average student ratings decreased; yet, as department size increased, average student ratings of the impact of college on skill development increased.

Limitations

While this study uses a powerful modeling technique, it is not without its limitations. First, we were limited to the number of variables we could use to adequately represent the culture of a department. Because of the size of the institution, a limited number of variables are collected and aggregated at the departmental level. We included the independent measures that we felt could best represent factors, as indicated in the literature, which may impact satisfaction.

Second, we were limited by the data collected on the alumni survey. Many of the survey items were either mandated by the state coordinating body or were part of a previous survey that could not be changed because of the administration's desire to have longitudinal data. Although we were guided by the literature in the building of our scales, many of them could have been better measured by questions used on surveys that had been tested more extensively.

Third, we had limited variability on many of the questions in the survey. Most of the survey responses were quite favorable, which may suggest some response bias. Whatever the reason, we were left with measures that had little variability.

Finally, multilevel model requires a very large sample size, which we did not have. Because tests of significance are run at the group level, multilevel modeling requires a large number of groups with many individuals within each group. Ideally, we would have well over fifty groups with at least ten individuals per group. For this study, just over fifty groups were analyzed with several of the groups having less than ten members. As a result, we were only able to model the random intercept and no other random slopes even though theory would suggest that we should do otherwise. We also offer a word of caution about the generalizability

of the study given our sample. The data used in the analysis were collected at only one institution, and any conclusions drawn from the results should be treated as such.

Discussion

Several important observations can be made about the analyses. First, the analyses provide a great deal of information about individual predictors of satisfaction. The relationship between GPA and our dependent measures appears to reflect the contradiction in the literature. GPA is a significant predictor of satisfaction with education in the major. Yet, there appears to be no relationship between GPA and the perceived impact of college on skill development. Furthering the complexity of the relationship between GPA and satisfaction is that some of the literature suggests that the two may have a recursive relationship (Bean & Bradley, 1986; Pike, 1991).

Student race and gender also appear to be salient predictors of the college outcomes measured in this study. As with previous studies (Adelman, 1991; Rienzi et al., 1993), females consistently rated satisfaction and the college impact on development lower than males. The findings of the impact of race on the outcomes parallel previous research as well.(Helm & Sedlacek, 1998). African Americans in the sample reported higher ratings of the impact of college than did Whites. Asians consistently reported lower satisfaction with the education in their major and the impact of college on general skill development.

These data suggest that transfer students have a different experience than native students. On all of the skill development scales, transfers rated the impact of college lower than native students. Few, if any, transfer students live on campus at any time during their academic career on campus. As a result, many do not become fully integrated into the campus and do not experience many of the co-curricular activities that have proven to impact students. In addition, transfer students spend fewer semesters at the institution compared with first-time students.

Most interesting are the relationships between department characteristics and satisfaction and impact of college ratings. Racial diversity of departments appears to have little relationship with the outcomes in this study. This may be a true non-finding, but it may be attributed to the non-normality of the proportion of undergraduates measure. We cannot say conclusively that diversity does not matter; however, we cannot provide evidence that it does.

Gender diversity of departments does appear to make a difference in impacting the outcomes we studied. The impact of the proportion of female undergraduates appears important, particularly in terms of satisfaction with the major and personal skill development. The data suggest that departments largely made up of female undergraduates have an impact on the college experience.

This provides further support that the role of faculty appears to be extremely important in predicting student outcomes. In departments where faculty focus on research (as proxied by research dollars per FTE faculty) the students appear more satisfied with their major and report a higher impact of college experiences on skill development. Perhaps this suggests that departments where faculty are likely to get more research money, such as the sciences and

engineering, that students are more satisfied. The prestige that comes with earning large grants may also have an impact on satisfaction. Nevertheless, these data may provide some support for the research that indicates that research and teaching are complementary rather than opposing activities.

The size of a department, or number of faculty within a department, is important. Students from larger departments report higher satisfaction and a greater impact of college on skill development. While the number of faculty is important, contact with faculty is necessary as well. Students in departments with smaller average class size reported that college had a greater impact on their skill development than those from departments with larger classes.

This evidence provides mixed support for the notion of the "academic ratchet" (Massy & Zemsky, 1994). The impact of class size does provide support for the ratchet, but the impact of research emphasis and department size seems to have an opposite effect than what the ratchet would suggest.

The findings from our multilevel analysis of alumni survey data inform policy and practice in two areas. First, we argue that individual attributes matter. Students of different races/ethnicities and genders experience higher education differently and therefore have different levels of satisfaction. One of the most apparent differences in satisfaction and perceptions of skill development is between transfer and native students. To increase overall satisfaction, institutions need to look at experiences of groups such as transfer students.

Second, this study provides evidence of impact of organizational attributes on student outcomes. As focus on student satisfaction and first year-experience continues to grow, we need to go beyond comparing differences between institutions and begin to look at differences within institutions. In particular, we need to examine how departments are structured. Student contact with faculty, department size, gender diversity of departments, and departmental research emphasis all appear to have a significant relationship with satisfaction.

References

Adelman, C. (1991). Women at thirtysomething: Pardoxes of attainment. Washington, DC: U.S. Government Printing Office.

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

Baird, L. L. (1988). The college environment revisited. In J. Smart (Ed.), Higher education handbook of theory and research (Vol. 5). Edison, NJ: Agathon.

Bean, J. P., & Bradley, R. K. (1986). Untangling the satisfaction-performance relationship for college students. Journal of Higher Education, 57(4), 393-412.

Becher, T. (1987). The disciplinary shaping of the profession. In B. R. Clark (Ed.), The academic profession: National, disciplinary, and institutional settings . Berkeley, CA: University of California Press.

Berger, J. B. (2000). Organizational behavior at colleges and student outcomes: A new perspective on college impact. The Review of higher Education, 23(2), 177-198.

Berger, J. B. & J. F. Milem (2000). Organizational behavior in higher education and student outcomes. In J. Smart (Ed.), Higher education handbook of theory and research (Vol. 15). Edison, NJ: Agathon.

Biglan, A. (1973a). The characteristics of subject matter in different academic areas. Journal of Applied Psychology, 57(3), 195-203.

Biglan, A. (1973b). Relationships between subject matter characteristics and the structure and output of university departments. Journal of Applied Psychology, 51, 204-213.

Bok, D. (1992). Reclaiming the public trust. Change, 24(4), 12-19.

Bowen, H. R. (1977). Investment in learning: The individual and social value of American higher education. San Francisco, CA: Jossey-Bass.

Boyer, E. L. (1990). Scholarship reconsidered: Priorities in the American professoriate. Princeton, NJ: The Carnegie Foundation for the Advancement of Teaching.

Burstein, L. (1980). The analysis of multilevel data in educational research and evaluation. In D. C. Berliner (Ed.), Review of Research in Education (Vol. 8, pp. 158-233). Washington, DC: American Educational Research Association.

Burstein, L., & Miller, M. D. (1981). Regression-based analyses of multilevel educational data. In R. F. Borusch, P. M. Wortman, & D. S. Corday (Eds.), Reanalyzing program evaluations . San Francisco: Jossey-Bass.

Cameron, K., & Ettington, D. (1988). The conceptual foundations of organizational culture. In J. Smart (Ed.), Higher education handbook of theory and research (Vol. 4,). Edison, NJ: Agathon.

Centra, J., & Rock, D. (1983). College environments and student achievement. American Educational Research Journal, 8(1971), 623-634.

Chang, M. J. (1996). Racial diversity in higher education: Does a racially mixed student population affect educational outcomes. Los Angeles: University of California, Los Angeles.

Chang, M. J. (1999). Does diversity matter? The educational impact of racially diverse undergraduate population. Journal of college student development, 40(4), 377-395.

Chickering, A. (1969). Education and identity. San Fransisco: Jossey-Bass.

Clark, B. R. (1987). Academic life: Small worlds, different worlds. Princeton, NJ: The Carnegie Foundation for the Advancement of Teaching.

Dillman, D. A. (1978). Mail and telephone surveys: The total design method. New York, NY: John Wiley & Sons.

Dillman, D. A. (2000). Mail and internet surveys: The tailored design method. New York, NY: John Wiley & Sons.

Ethington, C. A. (1997). A hierarchical linear modeling approach to studying college effects. In J. Smart (Ed.), Higher education handbook of theory and research (Vol. 12,). Edison, NJ: Agathon.

Ewell, P. T. (1989). Institutional characteristics and faculty/administrator perceptions of outcomes: An exploratory analysis. Research in Higher Education, 30, 113-136.

Feldman, K. A., & Newcomb, T. M. (1969). The impact of college on students. San Francisco: Jossey-Bass.

Gurin, P. (1999). Expert report of Patricia Gurin. In M. No. 97-75321 (Ed.), The compelling need for diversity in higher education. Gratz et al. v. Bollinger, et al. . Ann Arbor: University of Michigan.

Hartnett, R. T., & Centra, J. A. (1977). The effects of academic departments on student learning. The Journal of Higher Education, 48(5), 491-507.

Helm, E. G., & Sedlacek, W. E. (1998). The relationship between attitudes toward diversity and overall satisfaction of university students by race. Journal of College Counseling, 1(2), 111-120.

Hurtado, S., Milem, J., Clayton-Pedersen, A., & Allen, W. (1999). Enacting diverse learning environments: Improving the climate for racial/ethnic diversity in higher education.

Washington, DC: The George Washington University, Graduate School of Education and Human Development.

Kerr, C. (1963). The uses of the university. New York, NY: Harper and Row.

King, G. (1999). A solution to the ecological inference problem: Reconstruction individual behavior from aggregate data. Princeton, NJ: Princeton University Press.

Kreft, I., & DeLeeuw, J. (1998). Introducing multilevel modeling. Thousand Oaks, CA: Sage Publications.

Lavin, D. E. (1965). The prediction of academic performance. New York, NY: Russel Sage Foundation.

Liu, R., & Jung, L. (1980). The commuter student and student satisfaction. Research in Higher Education, 12(3), 215-226.

Massy, W. F., & Zemsky, R. (1994). Faculty discretionary time: Departments and the academic ratchet. Journal of Higher Education, 65(1), 1-22.

Milem, J. F. (1998). Attitude change in college students: Examining the effect of college peer groups and faculty normative groups. The Journal of Higher Education, 69(92), 117-140.

Milem, J. F. (in press). The educational benefits of diversity: Evidence from multiple sectors. In M. J. Chang, D. Witt-Sandis, J. Jones, & K. Hakuta (Eds.), Compelling interest: Examining the evidence on racial dynamics in higher education . Palo Alto: Stanford University Press.

Milem, J. F., & Hakuta, K. (2000). The benefits of racial and ethnic diversity in higher education. In D. J. Wilds (Ed.), Minorities in higher education 1999-2000 . Washington, DC: American Council on Education.

Pace, C. R. (1979). Measuring the outcomes of college. San Francisco: Jossey-Bass.

Pascarella, E. T., & Terenzini, P. T. (1978). Student -faculty informal relationships and freshman year educational outcomes. Journal of Educational Research, 71, 183-189.

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

Patrick, W. J. (2001). Estimating first year student attrition rates : An application of multilevel modeling using categorical variables. Research in Higher Education, 42(2), 151-170.

Pike, G. R. (1991). The effects of background, coursework, and involvement on students' grades and satisfaction. Research in Higher Education, 32(1), 15-31.

Pike, G. R. (1994). The relationship between alumni satisfaction and work experiences. Research in Higher Education, 35(1), 105-123.

Porter, S. R., & Umbach, P. D. (2001). Analyzing faculty workload using multilevel modeling. Research in Higher Education, 42(2), 171-196.

Rienzi, B. M., Allen, M. J., Sarmiento, Y. Q., & McMillin, J. D. (1993). Alumni perception of the impact of gender on their university experience. Journal of College Student Development, 34, 154-157.

Robinson, W. S. (1950). Ecological correlations and the behavior of individuals. Sociological Review, 15, 351-357.

Smart, J. C., & Elton, C. F. (1975). Goal orientations of academic departments. Journal of Applied psychology, 60(5), 580-588.

Stark, J. S., Lowther, M. A., Bentley, R. J., & Martens, G. G. (1990). Disciplinary differences in course planning. The Review of Higher Education, 13(2), 141-165.

Teague, G. (1981). Compatibility of teaching and research at large land-grant universities. Improving College and University Teaching, 29, 33-34.

Tinto, V. (1993). Leaving college: Rethinking the causes and cures of student attrition. Chicago, IL: University of Chicago Press.

Tufte, E. R. (1974). Data analysis for politics and policy. Englewood Cliffs, NJ: Prentice-Hall.

Volkwein, J. F., & Carbone, D. A. (1994). The impact of departmental research and teaching climates on undergraduate growth and satisfaction. Journal of Higher Education, 65(2), 147-167.

Weidman, J. (1989). Undergraduate socialization: A conceptual approach. In J. Smart (Ed.), Higher education handbook of theory and research (Vol. 5,). Edison, NJ: Agathon.

Table 1. Variable Means and Standard Deviations

Variables	Mean	SD
Dependent variables		
Satisfaction-major	7.797	1.683
Intellectual development	18.707	2.676
Personal development	22.306	2.639
General development	31.899	3.936
Individual-level independent variables		
GPA	3.127	0.496
Age	25.314	4.369
Female	0.588	0.492
African American	0.114	0.318
Asian	0.134	0.341
Other Minority	0.098	0.297
Transfer	0.379	0.485
Group-level independent variables		
Prop. Nonwhite ugs	0.271	0.162
Prop. Female Ugs	0.561	0.270
SAT midpoint	1,196.864	72.361
Average class size	38.295	18.880
Instructional FTE	19.049	17.348
Logged grants per instructional FTE	9.104	3.886

Table 2. Correlations of Level-2 Variables

	Instructional FTE	Average class size	Prop. Nonwhite Ugs	Prop. Female Ugs	SAT midpoint	Logged grants per Instructional FTE
Instructional FTE	-					
Mean class size	0.270	-				
Proportion ugs nonwhite	0.171	0.258	-			
Proportion ugs female	-0.372	-0.064	-0.186	-		
SAT midpoint	0.002	-0.161	0.074	-0.137	-	
Logged grants per instructional FTE	0.228	0.383	0.232	-0.258	-0.168	-

Table 3. Dependent Variable Scales

Scales	Factor loadings
Satisfaction with major*	
Major provided a solid background	0.89
Satisfied with the quality of education in major	0.89
Alpha=.73	
Enhanced personal development**	
Speaking effectively	0.65
Clarifying values	0.63
Teamwork	0.69
Leading others	0.75
Professional ethics	0.70
Understanding diverse cultural, pol., intell. views	0.61
Alpha=.76	
Enhanced intellectual development**	
Writing effectively	.47
Solving problems	.77
Thinking creatively	.70
Thinking critically	.77
Computer/IT	.47
Processing/interpreting data	.55
Science and experimentation	.51
Alpha=.71	
Enhanced general development**	
Writing effectively	0.52
Speaking effectively	0.62
Clarifying values	0.60
Solving problems	0.63
Thinking creatively	0.70
Thinking critically	0.69
Teamwork	0.61
Leading others	0.65
Professional ethics	0.64
Understanding diverse cultural, pol., intell. views	0.56
Alpha=.82	

*1=strongly disagree, 2=diagree, 3=neutral, 4=agree, 5=strongly agree

**1=not at all, 2=moderately, 3=extremely

Table 4. Departmental Frequencies

Department	N	% of overall
AFRO/AMER ST	4	0.3%
AGR&RES ECON	1	0.1%
AMER STUDIES	5	0.4%
ANIMAL SCI	14	1.0%
ANTHROPOLOGY	6	0.4%
ARCH (B.S.)	9	0.7%
ART	21	1.5%
ART HISTORY	12	0.9%
ASIAN EAST EUR	8	0.6%
ASTRONOMY	1	0.1%
BIO RES ENGR	12	0.9%
BIO SCI	116	8.6%
BIOCHEMISTRY	12	0.9%
BUSINESS	232	17.1%
CLASSICS	1	0.1%
COMM	29	2.1%
COMPUTER SCI	45	3.3%
CRIM JUSTICE	90	6.6%
DANCE	5	0.4%
ECONOMICS	23	1.7%
ED-CURRIC & INSTR	72	5.3%
ED-HUMAN DEV	18	1.3%
SPECIAL ED	7	0.5%
ENGLISH	66	4.9%
ENGR-AEROSP	10	0.7%
ENGR-CHEM	16	1.2%
ENGR-CIVIL	22	1.6%
ENGR-ELEC	40	2.9%
ENGR-FIRE	11	0.8%
ENGR-MECH	23	1.7%
FAMLY STUDIE	35	2.6%
FOOD SCIENCE	11	0.8%
FRN ITAL	4	0.3%
GEOGRAPHY	12	0.9%
GERMAN	3	0.2%
GOVT & POLIT	72	5.3%
HEALTH EDUC	23	1.7%
HEAR+SPCH SC	14	1.0%
HISTORY	24	1.8%
JEWISH STUDY	1	0.1%

JOURNALISM	35	2.6%
KINESIOL SCI	45	3.3%
LINGUISTICS	2	0.1%
MATHEMATICS	6	0.4%
MICROBIOLOGY	9	0.7%
MUSIC	5	0.4%
NAT RES SCI	10	0.7%
PHILOSOPHY	2	0.1%
PHYSICS	2	0.1%
PSYCHOLOGY	53	3.9%
SOCIOLOGY	32	2.4%
SPAN PORT	14	1.0%
THEATRE	7	0.5%
WOMENS STDYS	4	0.3%
Total N	1,356	
N of departments	54	
Average department size	25	

Table 5. Full HLM Model Estimates and Standard Errors

	Model 1	**Model 2**	**Model 3**	**Model 4**
Fixed Effects	Satisfaction-major	Personal dev.	Intellectual dev.	General dev.
Intercept	7.691 **	18.538**	22.31 **	31.789 **
	(0.084)	(0.126)	(0.131)	(0.176)
Prop. Nonwhite Ugs	0.494	0.131	-0.331	-0.467
	(0.693)	(0.692)	(1.058)	(1.113)
Prop. Female Ugs	0.606 +	1.646**	-0.433	2.126 *
	(0.353)	(0.584)	(0.580)	(0.826)
SAT midpoint	0.001	-0.003	0.000	-0.002
	(0.001)	(0.002)	(0.002)	(0.003)
Average class size	-0.006	-0.015*	-0.007	-0.022 *
	(0.004)	(0.007)	(0.007)	(0.010)
Instructional FTE	0.006 +	0.017*	0.010	0.025 *
	(0.003)	(0.007)	(0.008)	(0.009)
Grants per instructional FTE	0.106 **	0.079*	0.146 **	0.101
	(0.030)	(0.040)	(0.046)	(0.064)
Female	-0.197 *	0.072	-0.453 **	-0.112
	(0.083)	(0.142)	(0.155)	(0.207)
African American	0.198	0.286	0.657 **	0.683 *
	(0.137)	(0.190)	(0.198)	(0.281)
Asian	-0.321 **	-0.268	-0.346	-0.508 +
	(0.114)	(0.190)	(0.228)	(0.279)
Other Minority	0.170	0.342	0.223	0.371
	(0.163)	(0.270)	(0.253)	(0.408)
Age	0.015	-0.030+	0.009	-0.032
	(0.010)	(0.017)	(0.020)	(0.028)
Transfer	0.021	-0.613**	-0.464 **	-0.744 **
	(0.105)	(0.163)	(0.148)	(0.214)
GPA	0.389 **	0.154	0.165	0.270
	(0.100)	(0.131)	(0.147)	(0.190)

**p<.01, *p<.05, +p<.10

Table 6. Full HLM Model Chi Square Table

Random Effects		Parameter Estimate	DF	Chi-square
Model 1				
	Intercept	0.133	47	91.676 **
	Residual	2.670		
Model 2				
	Intercept	0.431	47	118.521 **
	Residual	6.513		
Model 3				
	Intercept	0.404	47	110.876 **
	Residual	6.502		
Model 4				
	Intercept	0.746	47	103.934 **
	Residual	14.499		

**p<.01, *p<.05, +p<.10