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ABSTRACT

An examination was made of the relationship between grades and satisfaction from three distinct research viewpoints: (1) how satisfaction influences grades (as opposed to other research studying the reciprocal of grades influencing satisfaction); (2) the satisfaction of graduating seniors (rather than focusing on freshmen and sophomores); and (3) the hypothesis that grades and satisfaction are latent constructs rather than as directly measured variables. Subjects were 1,267 seniors at the hypothesis that grades and University of Tennessee at Knoxville. Study results indicated that satisfaction exerted a stronger influence on grades than grades did on satisfaction. More research was determined to be needed on seniors to assess the effects of involvement and coursework on students' educational outcomes. The research also supported the use of latent variable and nonrecursive models and the analyses of covariance structures because it forced researchers to think theoretically rather than enter variables in a regression equation. Contains 38 references. (GLR)

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The Effects of Background, Coursework, and Involvement on Students' Grades and Satisfaction

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Jean Endo
Chair and Editor
Forum Publications Editorial
Advisory Committee

Abstract

Research during the 1970s and 80s identifies grades and satisfaction with college as important educational outcomes, both in their own right and because of their relationship to other outcomes such as persistence. Building on previous research, this article examines the relationship between grades and satisfaction using a latent variable model that includes a variety of factors found to influence grades and satisfaction. The covariance structure analyses indicate that the model provides an accurate representation of the data and explains a substantial proportion of the variance in satisfaction and grades. Results suggest that satisfaction exerts a stronger influence on grades than grades exert on satisfaction. These findings suggest that popular recursive models of educational outcomes should be reevaluated, and that nonrecursive models may provide a more accurate representation of educational effects.

The Effects of Background, Coursework, and Involvement on Students' Grades and Satisfaction

During the 1970s and 80s, academic achievement and student attitudes have been the object of extensive research, much of it focusing on the relationship of grades and satisfaction to student persistence (Bean & Bradley, 1986; Kuh, Bean, Bradley, Coomes, & Hunter, 1986). Not surprising is the finding that grades and satisfaction are strongly related to the decision to remain in college (Aitken, 1982; Bean, 1980; Munro, 1981; Pascarella & Chapman, 1983; Pascarella, Smart, & Ethington, 1986; Terenzini & Pascarella, 1977). Equally important, the models used in persistence research guide studies of achievement and satisfaction in other contexts.

While this paper draws on previous studies of the relationship between grades and satisfaction, it differs from these studies in three ways: First, this research evaluates the reciprocal relationship between grades and satisfaction, rather than assuming (as does much of the research) that grades influence satisfaction. Second, this study examines the grades and satisfaction of graduating seniors, unlike previous research which tends to focus on freshmen and sophomores. Finally, this paper describes grades and satisfaction as latent constructs, rather than as directly measured variables.

Importance of Grades and Satisfaction

This research and previous studies assume that grades and satisfaction with college are important educational outcomes. While some scholars question what they perceive to be an overemphasis on grades, few dispute the claim that grades are an important aspect of college (Milton, Pollio, & Eison, 1986). At most colleges and universities, grades determine if a student will graduate,

influence entry into high-level occupations, and influence admission to graduate/professional school (Baird, 1985).

The current interest in students' satisfaction with college has its origin in the campus unrest of the 1960s and 70s (Betz, Starr, & Menne, 1972). Increasing pressure for accountability and heightened consumerism has focused even greater attention on student satisfaction (Morstain, 1977). In a study of 41 colleges and universities, Cameron (1981) reports that virtually all of the administrators surveyed identify satisfaction as a key element in the assessment of institutional effectiveness. Hearn (1985) concludes that the growing interest in the assessment of higher education programs will be paralleled by increasing research on student satisfaction.

Grades and satisfaction are also important because of their relationship to student persistence. Tinto (1975) argues that grades are the most important factor in the decision to drop out of college, and research tends to support this claim. At least four studies report that grades (alone or in conjunction with other achievement measures) are a primary factor in retention (Aitken, 1982; Munro, 1981; Pascarella & Chapman, 1983; Pascarella, Smart, & Ethington, 1986).

Although Tinto's model does not include satisfaction, measures of institutional commitment frequently include questions about satisfaction or items that can serve as proxies for satisfaction. Research using satisfaction measures within the framework of Tinto's model reveals that satisfaction does influence the decision to leave school (Pascarella & Chapman, 1983; Pascarella, Smart, & Ethington, 1986; Terenzini & Pascarella, 1977). Likewise, studies based on alternative models of persistence report that satisfaction is directly related to retention (Aitken, 1982; Bean, 1980).

Contributions of this Research

The Achievement-Satisfaction Relationship

While research consistently reveals that grades and satisfaction are moderately correlated, judgements about the direction of the relationship depend on the model being used (Pike, 1989b). Tinto's model guides much of the current attrition research, and it is based on the assumption that academic integration (measured by grades and perceptions of learning) influences institutional commitment (frequently measured by satisfaction) (Gilbert & Gomme, 1986). Consequently, the conclusion that grades influence satisfaction rests on the theoretical proposition of Tinto's model, not on empirical research.

Since Tinto's model also guides much of the research on grades and satisfaction as end products of higher education, these studies generally assume that grades influence satisfaction. For example, Liu and Jung (1980) report that there is a moderate correlation between grades and satisfaction. Based on their model, they conclude that grades influence satisfaction without testing the alternative hypothesis that satisfaction influences grades.

Two studies have raised questions about the assumed relationship between grades and satisfaction. Bean and Bradley (1986) employed nonrecursive structural equation models to identify reciprocal relationships between grades and satisfaction. They report that satisfaction has a greater effect on grades than grades have on satisfaction.

Pike (1989b) analyzed the relationship between grades and satisfaction measured at two points in time. He concludes that a substantial proportion of the association between grades and satisfaction is an artifact of other vari-

ables. Of that part of the relationship that is unique to them, satisfaction has a greater effect on grades than grades have on satisfaction.

Because research on the relationship between grades and satisfaction has produced conflicting results, studies using these measures should test the relationship between them. These studies should also include other factors that are likely to influence grades and satisfaction in order to determine if the achievement-satisfaction relationship is an artifact of these other factors. Both issues are addressed in this paper.

The Selection of an Age Cohort

Because many of the studies dealing with grades and satisfaction focus on student persistence, first-year college students have been the subjects of this research. This interest in freshman-year experiences is understandable because attrition rates tend to be highest for the freshman and sophomore years (Beal & Noel, 1979; Gilbert & Gomme, 1985).

While studying the grades and satisfaction of freshmen and sophomores makes sense for attrition research, the use of underclassmen may dilute the effects of involvement variables (Gilbert & Gomme, 1986). As Bean and Kuh (1984) explain, the effects of faculty-student interaction and peer interaction may not be fully evident until the junior or senior years. Consistent with the recommendation of these authors, this paper focuses on a cohort of graduating seniors.

The Measurement of Variables

A review of the research cited in this paper reveals that previous studies have relied on directly measured variables. To be sure, virtually all of the studies reviewed use scale scores to represent variables, but the statistical procedures used reflect the assumption that scores are directly measured. In contrast, this paper describes grades and satisfaction as latent variables. That is, "hypothetical or theoretical construct[s] ... for which direct measurements are not available" (James, Mulaik, & Brett, 1982, p. 104). The existence of these latent variables must be inferred from measured variables.

At the outset, it seems appropriate to question whether concepts such as achievement, satisfaction, and involvement can be directly observed. Even if they can be directly measured, treating these variables as latent constructs provides practical advantages over traditional statistical methods. The use of latent constructs allows researchers to assume that measured variables contain error. When traditional regression methods are used with variables that are directly measured, researchers must assume that these variables do not contain error. As a result, true scores are confounded with measurement error (Alwin & Jackson, 1980).

The use of latent constructs also allows researchers to assume that the residuals of structural equations are intercorrelated. (An assumption that is not made in path analysis.) Because data analysis using latent constructs allows researchers to specify measurement errors and correlations among residuals, effects estimates tend to be relatively unbiased (Terenzini & Wright, 1987).

The Research Model

The model used in this research is presented in Figure 1. The diagram depicts the hypothesized relationships among the latent constructs representing background characteristics, coursework, involvement, performance and satisfaction. Detailed information about the measures contributing to the latent constructs is presented in Table 1 in the results section.

Insert Figure 1 about here

Three background characteristics have been found to influence grades: gender (Aitken, 1982; Endo & Harpel, 1982; Pascarella, Smart, & Ethington, 1986), high school grade point average (Bean & Bradley, 1986; Munro, 1981; Pascarella, Smart, & Ethington, 1986), and scores on college entrance examinations (Aitken, 1982; Endo & Harpel, 1982). Munro goes so far as to argue that high school grades are the best predictor of grades in college.

Pike (1989a) reports that gender, high school grades, and scores on entrance exams are significantly related to both course taking and involvement. Although Endo and Harpel (1982) and Pascarella, Smart and Ethington (1986) indicate that gender is related to satisfaction, this finding is not supported by other research (Pike, 1989a; Pike 1989b). Consequently, the research model includes effects for background on coursework and involvement, but does not include effects for background on satisfaction.

Research has failed to demonstrate a significant relationships between course content and either grades or satisfaction. However, course difficulty is negatively related to grades (Bean & Bradley, 1986; Bean & Kuh, 1984). Two latent constructs representing coursework are included in this study. The

first includes courses in calculus, engineering, and physics, and is typical of the program of study for engineering majors. The second latent variable includes business mathematics and economics and is typical of courses taken by business majors. Because the engineering and business programs are very demanding, it is expected that these latent variables will be negatively related to grades and unrelated to satisfaction.

Research on faculty-student interaction and peer interaction shows that both are positively related to satisfaction (Bean & Bradley, 1986; Endo & Harpel, 1982; Pascarella, 1980; Pascarella, Smart, & Ethington, 1986). Likewise, Pike (1989b) reports that attending extracurricular cultural events is related to satisfaction. Based on these results, all three involvement variables are related to satisfaction in the model.

Less clear is whether involvement is related to grades. Pike (1989a) finds no evidence that cultural involvement is related to grades. While Pascarella (1980) reports that several studies document a relationship between faculty-student interaction and grades, other studies do not support this conclusion (Bean & Kuh, 1984; Pike, 1989b). In addition, research on peer interaction and grades reports both positive and negative effects (Aitken, 1982; Bean & Bradley, 1986; Pike, 1989b; Terenzini & Pascarella, 1980). Given the inconsistency of these results, involvement and grades are assumed to be unrelated. Furthermore, involvement and coursework are assumed to be uncorrelated.

Methods

Subjects

The setting for this research is the University of Tennessee, Knoxville (UTK), the state's public research university. UTK has an enrollment of almost 20,000 undergraduate and 6000 graduate and professional students. The campus-wide assessment program at UTK gathers data from a variety of sources including opinion surveys, student records, and tests of learning in general education and the major fields (Banta & Fisher,1986).

During 1988-89, approximately 2000 seniors tested in general education completed a questionnaire designed to elicit information about their background characteristics, college experiences, and satisfaction with their academic programs. Because of the possibility that the research model does not apply to reentry students, only seniors between 20 and 25 years of age are included in the research. Complete data are available for 1267 of the students.

Approximately 52% of the seniors in the study are female and 94% are white. The mean cumulative grade point average for these students is 2.89, and their mean high school grade point average is 3.22. The mean ACT Assessment composite score for these students is 22.

Data Analysis

The data for this study were analyzed using covariance structure models (Jöreskog, 1978; Jöreskog & Sörbom, 1986). The analysis of covariance structures is a two-step process (Long, 1988). First, a measurement model is tested

using confirmatory factor analysis, and then a series of structural equations are specified and tested.

In order to test the measurement model, the variance-covariance matrix for the observed variables was calculated and analyzed using the LISREL VI computer program (Jöreskog & Sörbom, 1986). For this phase of the analysis, all variables were assumed to be exogenous. Two measurement models were analyzed. The first was a null model in which there were no latent variables. The second model reproduced the latent variable structure of the research model. All latent variables were assumed to be intercorrelated (i.e., a saturated model).

Evaluating the structural equations also involved specifying and testing multiple models. First, a null model containing unrelated latent variables was specified and tested for goodness-of-fit to the observed data. Second, the research model was specified and tested.

While covariance structure models provide advantages over traditional regression techniques, they also present three problems in this research. First, the use of survey responses created a problem because they represent ordinal rather than interval data. The net effect of using ordinal data is that there is an attenuation of covariances (i.e., the strength of the relationships is underestimated) (Alwin & Jackson, 1980). The usual procedure for overcoming this problem is to analyze polyserial correlations (Jöreskog & Sörbom, 1986). However, attempts to use this procedure produced a correlation matrix that was not positive definite.

While it is possible to analyze a correlation matrix that is not positive definite using unweighted least squares techniques, these techniques may not accurately recover relationships in nonrecursive models (Jöreskog & Sörbom, 1986). Faced with the trade-off of using an attenuated variance-covariance matrix and relying on unweighted least squares analysis, the former option is

deemed preferable because it provides a conservative, but accurate, method of analyzing nonrecursive models.

The second problem is related to sample size. The standard goodness-of-fit test for covariance structure models is the chi-squared statistic derived from a comparison of the actual variance-covariance matrix and the variance-covariance matrix implied by the measurement and structural equation models (Jöreskog, 1978). A nonsignificant chi-squared value represents a good fit between the model and the actual data, while a significant chi-squared value represents a poor fit between model and data.

Because the chi-squared statistic is strongly influenced by sample size, large numbers of observations make it likely that trivial discrepancies between the model and the actual data will require the rejection of an acceptable model (Hayduk, 1987). In addition, the other goodness-of-fit indices provided by the LISREL program are also subject to the negative effects of sample size (Marsh, Balla, & McDonald, 1988).

A third problem with the analysis of covariance structures is related to the specification of a parsimonious model. Mulaik, James, Van Alstine, Bennett, Lind, and Stidwell (1989) note that it is always possible to improve the goodness-of-fit of a model by freeing additional parameters. However, freeing a large number of parameters in a model runs counter to the goal of providing a parsimonious explanation and may bias effects estimates (MacCallum, 1986).

The problems of sample size and parsimony can be minimized by reliance on appropriate goodness-of-fit indices. The Tucker-Lewis Index (TLI) provides a measure of goodness-of-fit that is relatively immune to the effects of sample size and contains a penalty function for indiscriminately freeing parameters in a measurement model (Marsh, Balla, & McDonald, 1988; Tucker & Lewis, 1973).

The Type II Relative Normed-Fit Index (RNFI) described by Mulaik et al. (1989) provides a goodness-of-fit index that is appropriate for evaluating structural equation models. Both of these indices are used to evaluate the models in this research.

Results

Measurement Models

Chi-squared goodness-of-fit tests indicate that the null model provides a very poor explanation of the observed data (χ^2 = 10,384.72; df = 253; $p < .001$). In contrast, the latent variable model provides a much better representation of the data (χ^2 = 740.42; df = 185; $p < .001$). Although the latent variable model still produces a statistically significant chi-squared value, this poorness-of-fit is most likely an artifact of sample size because the .93 value for the Tucker-Lewis Index is above the .90 threshold used to indicate an acceptable model (Bentler & Bonett, 1980). Approximately 60% of the total variance in subjects responses is explained by the latent variable model.

An examination of the standardized maximum likelihood estimates and squared multiple correlations for the measured variables supports the validity of the hypothesized structure. These coefficients, along with means and standard deviations are presented in Table 1. All of the maximum likelihood estimates in the table are statistically significant ($p < .001$).

Insert Table 1 about here

The results in Table 1 reveal that sophomore calculus is most strongly related to the latent construct representing engineering coursework (MLE = .33; SMC = .81). Freshman calculus (MLE = .35; SMC = .67) and basic engineering (MLE = .28; SMC = .65) contribute equally to the construct. Somewhat less than 50% of the variance in physics coursework is explained by the construct.

Both business algebra and business calculus contribute equally to the construct representing business coursework (MLE = .42; SMC = .80; and MLE = .42; SMC = .81 respectively). Economics coursework makes a small contribution to this construct (MLE = .11; SMC = .06). One possible explanation for the poor performance of economics coursework is that students who do not major in business take courses in economics. This interpretation is supported by the fact that the mean for economics coursework (which represents the proportion of students reporting they have taken an economics class) is more than twice the means for business algebra and business calculus.

Attending campus plays makes the greatest contribution to cultural involvement (MLE = .65; SMC = .55). Attending campus films (MLE = .47; SMC = .22) and attending campus concerts (MLE = .38; SMC = .19) also make a significant contribution to the cultural involvement construct.

Faculty-student interaction is most strongly defined by its contribution to intellectual growth (MLE = .83; SMC = .83) and personal growth (MLE = .80; SMC = .77). The relationship between the construct and the number of faculty-student relationships is much smaller (MLE = .52; SMC = .25).

The contribution of the peer interaction construct is greatest for personal development (MLE = .74; SMC = .83). The peer involvement construct is also related to the number of peer relationships (MLE = .61; SMC = .55) and the effect on intellectual development (MLE = .50; SMC = .41).

Satisfaction with intellectual development (MLE = .62; SMC = .56) is most strongly related to the satisfaction construct, followed by satisfaction with the extent to which academic experiences contribute to intellectual development (MLE = .52; SMC = .51). The contribution of the construct to satisfaction with academic experiences in general is more modest (MLE = .37; SMC = .34).

The squared multiple correlations for the four measured variables that each represent a construct are the reliability estimates assigned to those measured variables during the specification process. These reliability estimates were assigned using procedures suggested by Hayduk (1987).

Structural Equation Models

Because the measurement model provided an accurate representation of the observed data, a series of structural equation models were specified and tested. The null model, consisting of unrelated latent variables, provides a poor explanation of the data (χ^2 = 2308.29; df = 230; $p < .001$). In contrast, the research model provides a much better description of the observed data (χ^2 = 775.06; df = 201; $p < .001$), and represents a significant improvement over the null model (χ^2 = 1533.23; df = 29; $p < .001$). The Type II Relative Normed-Fit Index is .99, indicating that the research model provides an excellent fit to the data.

Table 2 presents the standardized maximum-likelihood estimates for the relationships among latent variables, as well as the squared multiple correlations for the structural equations. Asterisks are used to indicate the significance of effects.

Insert Table 2 about here

Results presented in Table 2 support the contention that student satisfaction has a stronger effect on grades (.21) than grades have on satisfaction (.06). Consistent with expectations, the involvement variables are significantly related to satisfaction. The effects of both faculty-student interaction (.30) and peer interaction (.32) are positive, while cultural involvement is negatively related to satisfaction (-.17). The last result can be attributed to colinearity among the effects because the correlation between cultural involvement and satisfaction is weak and nonsignificant (.04).

The relationship between coursework and grades also conforms to expectations. Both engineering and business coursework are negatively related to grades (-.12 and -.11 respectively). Likewise, students' entering ability-achievement scores are related to grades (.40), as are high school grades (.23). Gender (being female) is not significantly related to grades.

Background variables are also related to coursework and involvement. Gender is negatively related to both coursework variables, indicating that females are less likely than males to take engineering (-.27) and business (-.13) courses. Females are more likely than males to attend cultural events (.18) and to interact with faculty (.09).

High school grades and entering ability levels are positively related to engineering coursework (.17 and .24 respectively), but negatively related to business coursework (-.03 and -.12 respectively). Entering ability levels are positively related to cultural involvement (.11).

Correlations among the latent variables also conform to expectations. All three background variables are significantly correlated. High school grades

and ability levels are positively correlated (.48), gender and ability are negatively correlated (-.13), and gender and high school grades are positively correlated (.17). In addition, the correlation between engineering and business coursework is negative (-.37) indicating that students tend to take either engineering or business courses, not both.

All three involvement variables are positively correlated. The correlation between cultural involvement and faculty-student interaction is .11, as is the correlation between cultural involvement and peer interaction. The correlation between faculty-student interaction and peer interaction is .19.

The assumed absence of significant relationships between coursework and involvement is generally supported by the results. Although business coursework is negatively related to faculty-student interaction (-.13), the inclusion of this parameter in the research model makes only a minor contribution to goodness-of-fit ($\chi^2 = 13.42$; $df = 1$; $p < .001$) and the Relative Normed Fit Index remains the same.

Discussion

The results of this study can best be understood as they relate to the findings of previous research. Earlier studies of grades and satisfaction report that these variables are moderately correlated. However, the direction of the relationship remains an open question. The results for this study support a growing body of evidence that satisfaction influences grades and is in opposition to the theory underlying Tinto's model.

Results also indicate that the constructs included in the research model are significantly related to grades and satisfaction and explain a substantial proportion of the variance in both outcomes. While explaining between one-

quarter and one-third of the variance in grades and satisfaction is impressive, it also indicates that a great many other influences remain to be identified.

Previous studies have shown that involvement is significantly related to satisfaction. Consistent with expectations, this research finds that faculty-student interaction and peer interaction are related to satisfaction. Contrary to expectations, attending cultural events is negatively related to satisfaction.

For some, the finding that faculty-student interaction is not directly related to grades may be troubling. However, this research does not indicate that faculty-student contact and grades are unrelated, only that they are not directly related. Indeed, the indirect effect of faculty-student interaction and peer interaction acting through satisfaction is significant.

As expected, the effect of engineering and business coursework on grades is negative. This supports previous findings that difficult courses lower students' grades and underscores the inappropriateness of using grades to evaluate curricula.

It is somewhat disappointing to find that coursework is generally not related to involvement, and that business coursework is negatively related to faculty-student interaction. Future research should examine whether particular types of courses (e.g., laboratory versus lecture courses) are related to measures of involvement.

Previous research has consistently shown that students' background characteristics influence academic performance, and the current research is no exception. Both high school grades and entering ability levels significantly influence subsequent academic performance. What is surprising is the finding that entering ability, not high school grades, is the best predictor of college achievement.

In considering the implications of these findings, it is important to remember that some of the relationships identified in this research may be understated due to the attenuation of covariances created by reliance on ordinal responses as measured variables. Accordingly, results should be interpreted as conservative estimates of the true relationships between latent constructs.

It is also important not to overgeneralize these results. This study, like much of the research that preceded it, is institution specific. It cannot be said with certainty that the results apply to other colleges and universities. However, these results do have important implications for research at UTK, and they may be relevant to other institutions, particularly public research institutions.

The most important contribution of this study concerns the modeling of the relationship between grades and satisfaction. In an earlier paper, Pike (1989b) concludes that the fact that satisfaction exerts a greater influence on grades than grades exert on satisfaction does not require a revision of the models used in persistence research. He suggests that what is needed is different operational definitions of constructs such as academic integration and institutional commitment.

The findings of the present research suggest that more is needed. Although performance did not significantly influence satisfaction in this study, viewing the relationship between grades and satisfaction as reciprocal provides researchers with the opportunity to empirically test the relationship between achievement and satisfaction. In the future, researchers should examine whether other relationships that have been viewed as unidirectional can be better described as reciprocal. The research of Bean and Kuh (1984) on the

reciprocal effects of informal faculty-student interaction and grades is an example of such research.

The present study also demonstrates that more research on college seniors is needed to assess the effects of involvement and coursework on students' educational outcomes. Studies of freshmen and sophomores may be useful in predicting/explaining the early college dropout, but they do not provide an adequate opportunity for faculty-student relationships and relationships with peers to mature and for the impacts of these variables to be felt on educational outcomes.

The results of this research also support the use of latent variable models and the analyses of covariance structures. The ability to specify measurement errors and identify correlations among residuals is important in this research and undoubtedly provided more accurate effects estimates than would have been available with ordinary least squares regression.

Perhaps the most important benefit of using latent variables to model covariance structures is that these techniques require that researchers think theoretically. Modern computer and statistical technology make it all too easy for researchers to indiscriminately enter variables in a regression equation. Experience has shown that these regression models seldom produce an accurate representation of the data. When researchers carefully review the literature and consider potential relationships among variables, including the relationships between constructs and measured variables, the models they develop are more likely to provide accurate explanations of the data and significantly advance theories of the outcomes of higher education.

Conclusion

Models are an important aspect of institutional research because they relate theories of higher education to observable phenomena. Models identify the important factors in a study and describe the interrelationships among these factors (Bean, 1982). However, models can obscure as well as illuminate by omitting important variables and/or relationships. For too long, recursive (unidirectional) models have dominated research in higher education, in part because specifying and testing models of reciprocal influence is very difficult. This paper indicates that what is needed are more complex models of institutional processes that can better represent the reciprocal effect of higher education.

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Table 1

Means, Standard Deviations, Maximum-Likelihood Estimates and Standard Errors for the Measured Variables

Measured Variables	Mean	SD	MLE	SMC
Engineering				
Basic Engineering	.14	.35	.28	.65
Physics	.21	.41	.27	.43
Freshman Calculus	.24	.43	.35	.67
Sophomore Calculus	.16	.36	.33	.81
Business				
Business Algebra	.34	.47	.42	.80
Business Calculus	.33	.47	.42	.81
Economics	.72	.45	.11	.06
Cultural Involvement				
Plays	1.02	.88	.65	.55
Films	1.01	1.02	.47	.22
Concerts	1.06	.86	.38	.19
Faculty-Student Interaction				
Number of Relationships	2.00	1.04	.52	.25
Effect - Personal Development	3.49	.91	.80	.77
Effect - Intellectual Development	3.62	.92	.83	.83

Table 1 (Continued)

Measured Variables	Mean	SD	MLE	SMC
Peer Interaction				
Number of Relationships	4.40	.82	.61	.55
Effect - Personal Development	4.32	.81	.74	.83
Effect - Intellectual Development	4.09	.78	.50	.41
Academic Satisfaction				
Rating of Academic Experience	3.04	.63	.37	.34
Satisfaction Intellectual Growth	3.68	.82	.62	.56
Satisfaction with Academic Experience	4.03	.73	.52	.51
Academic Achievement				
Cumulative Grade Point Average	2.89	.58	.57	.95
Gender				
Female	.52	.50	.50	.98
High School Grades				
High School GPA	3.22	.60	.58	.95
Entering Ability/Achievement				
ACT Assessment composite score	22.00	4.44	4.10	.85

All maximum-likelihood estimates (MLE) are statistically significant ($p < .001$).

Table 2

Maximum-Likelihood Estimates for the Latent Constructs in the Research Model

Latent Construct	Engineering	Business	Culture	Faculty	Peer	Satisfaction	Grades
Gender	-.27***	-.13***	.18***	.09***	.03	---	.04
H. S. Grades	.17***	-.03	-.04	.04	-.03	---	.23***
Entering Ability	.24***	-.12**	.11*	.02	.02	---	.40***
Engineering		-.37***				---	-.12***
Business						---	-.11***
Culture				.11**	.11**	-.17***	---
Faculty					.19***	.30***	---
Peer						.32***	---
Satisfaction							.21***
Grades						.06	
SMC	.20	.04	.04	.01	.00	.26	.34

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

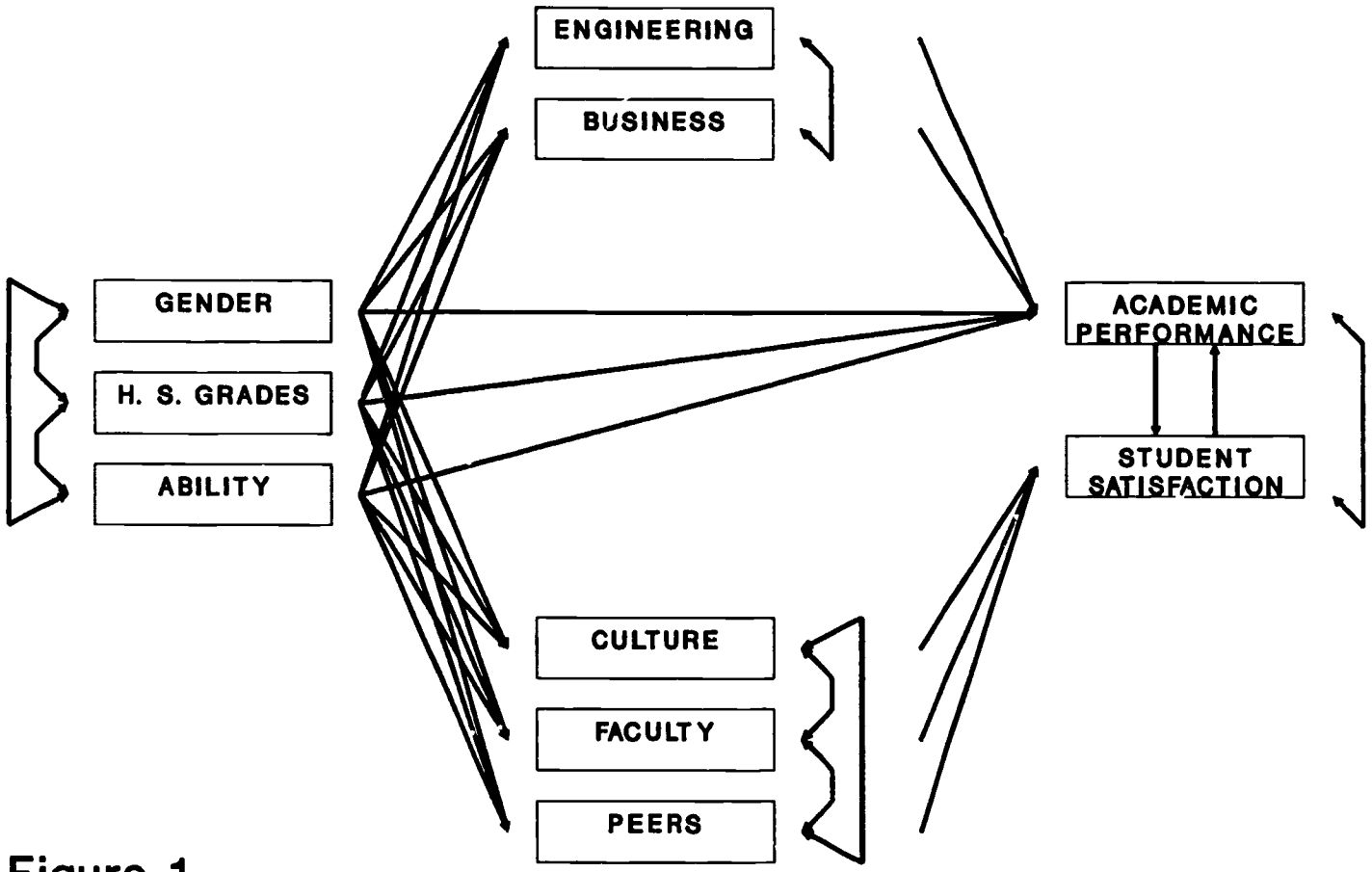

Figure 1
Research Model for the Reciprocal Effects of Grades and Satisfaction