DETERMINANTS OF RETENTION
AMONG CHICANO COLLEGE STUDENTS:
A STRUCTURAL MODEL

Monograph 86-8

Amaury Nora
Postdoctoral Research Fellow
Institute for Higher Education
Law and Governance
University of Houston - University Park
Houston, TX 77004

$5.00
University of Houston Law Center/Institute for Higher Education Law and Governance (IHELG)

The University of Houston Institute for Higher Education Law and Governance (IHELG) provides a unique service to colleges and universities worldwide. It has as its primary aim providing information and publications to colleges and universities related to the field of higher education law, and also has a broader mission to be a focal point for discussion and thoughtful analysis of higher education legal issues. IHELG provides information, research, and analysis for those involved in managing the higher education enterprise internationally through publications, conferences, and the maintenance of a database of individuals and institutions. IHELG is especially concerned with creating dialogue and cooperation among academic institutions in the United States, and also has interests in higher education in industrialized nations and those in the developing countries of the Third World.

The UHLC/IHELG works in a series of concentric circles. At the core of the enterprise is the analytic study of postsecondary institutions—with special emphasis on the legal issues that affect colleges and universities. The next ring of the circle is made up of affiliated scholars whose research is in law and higher education as a field of study. Many scholars from all over the world have either spent time in residence, or have participated in Institute activities. Finally, many others from governmental agencies and legislative staff concerned with higher education participate in the activities of the Center. All IHELG monographs are available to a wide audience, at low cost.

Programs and Resources

IHELG has as its purpose the stimulation of an international consciousness among higher education institutions concerning issues of higher education law and the provision of documentation and analysis relating to higher education development. The following activities form the core of the Institute’s activities:

Higher Education Law Library

Houston Roundtable on Higher Education Law

Houston Roundtable on Higher Education Finance

Publication series

Study opportunities

Conferences

Bibliographical and document service

Networking and commentary

Research projects funded internally or externally
DETERMINANTS OF RETENTION AMONG CHICANO COLLEGE STUDENTS: A STRUCTURAL MODEL

This study tested a modified version of Tinto's student attrition model on a Chicano two-year college student population. Structural equation modeling and LISREL VI were used to examine the parameter estimates of the structural and measurement models of the hypothesized causal model. Measures of goodness of fit were examined to provide indices for the overall fit of the causal model in the study. The measurement and structural models were found to represent a plausible causal model of student retention among Chicano students. Although the measures used in assessing the fit of the model reflected the overall strength of the hypothesized model, the present study was not entirely supportive of Tinto's model. The findings were only minimally supportive of the hypothesized relationship between measures of academic integration and retention; however, the results indicated that the hypothesized relationship between measures of social integration could not be substantiated. Moreover, measures of initial commitments were found to have a significantly large direct effect on the dependent variable, retention.

The issue of retention and attrition rates for minority students, particularly at two-year colleges, continues to be of significant concern to administrators and educational researchers. Administrators involved in initiating, designing, and implementing programs, policies and procedures in attempts to increase their holding power over minority students must consider the many factors which may have an influence on retention rates. Institutional responsibility incorporates an awareness of appropriate explanatory models that can account for these variables. Traditionally, public two-year institutions have been seen as providing equal educational opportunities to minorities by increasing minority access to postsecondary programs and services (Cohen and Brawer, 1982). Access for Mexican American
students to higher education has come primarily through the community college (CHML, 1982; Olivas, 1983). Duran (1983) reported that well over half of Hispanics who are enrolled in college attend two-year institutions. Based on a five year study (1972-1976), Garcia (1980) also found that more than half of all Mexican American postsecondary students are enrolled in community colleges, particularly in five Southwestern states (Texas, Arizona, New Mexico, Colorado, and California).

Although community colleges have assumed the responsibility of achieving equity in higher education for minorities through admissions, many have not been successful in retaining their students and advancing them toward fulfillment of educational and career goals (Astin, 1977; Rendon, 1982). In a review of selected literature, Haro (1983) found that the proportion of Chicanos diminishes at the highest levels of education. A report by the National Center for Education Statistics, The Condition of Education for Hispanic Americans, revealed that in two and four year institutions, Hispanics demonstrate significantly higher attrition rates than non-Hispanics.

In order to deal with problems of attrition, community colleges have implemented a wide variety of instructional and programmatic innovations in attempts to reduce the high attrition rates present in most institutions (Cohen and Brawer, 1982). However, the implementation or evaluation of these attrition reducing approaches has not been very systematic. Moreover, the relationships between these instructional techniques, programs,
or policies and retention are often not based on a theoretical framework. The rationale for the implementation of these well-intended programs of strategies should reflect a theoretical basis if retention rates are to be improved. The problem is confounded by the fact that although studies are needed on which to base administrative decisions, only recently have researchers examined variables which are believed to affect retention decisions among Chicanos (Rendon, 1982).

Research has found that retention rates, or students' persistence in college, are a function of the degree of the individual student's integration into academic and social systems in which both individual and institutional factors play a major role in the interaction (Alfred, 1972; Terenzini & Pascarella, 1979, 1980; Tinto, 1975). Student retention rates have also been found to be affected by: (1) the nature and extent to which students relate to faculty and staff outside the classroom and (2) the degree to which students interact with academic and social support systems accessible to them (Seale, 1984; Terenzini & Pascarella, 1980). Furthermore, research indicates that these institutional factors along with individual student factors influence the decisions of students to remain in college or drop out (Allen, 1979; Johnson, 1980; Pascarella & Terenzini, 1979; Tinto, 1975).

The theoretical model applied in this study is based on Tinto's (1975) student attrition model. His explanatory model specifies that students entering college bring with them a variety of attributes or pre-college experiences and background
characteristics which have an impact on determining educational expectations and commitments. These educational expectations and commitments represent initial institutional/goal commitments by students when first entering college. These initial commitments change during a student's stay in a college as a result of a student's normative and structural integration into the academic and social systems of the institution. Tinto includes grade performance and intellectual development in academic systems, and peer-group interactions and faculty interactions in social systems. The degree to which students can integrate into the academic and social systems on campus will determine the final commitments toward the institution and completing their objectives. These final commitments have an influence in dropout decisions made by the student.

Research relating to factors which affect retention rates has been conducted primarily on residential, four-year institutions (Allen, 1979; Johnson, 1980; Pascarella & Terenzini, 1979). Studies which examine the relationship between specific variables identified by researchers and retention rates at two-year institutions are few (Seale, 1984; Rendon, 1982). Moreover, research studies which examine the relations among variables affecting retention among Chicano populations are almost nonexistent.

Research studies by Kohlen (1978), Levin and Clowes (1982), Pascarella and Chapman (1983) have utilized Tinto's model to examine the effect of variables derived from the model on
attrition. While it is possible to explore the effects of background characteristics and subsequent college-related experiences on attrition, the adaptation of Tinto's model into a causal model that examines the interrelations among and within these variables enables the researcher to test more adequately the appropriateness of the model to differing student populations.

Research studies which have examined student attrition via Tinto's (1975) model have resulted in the field of retention research separating into two camps - one side having consistently found the academic integration component in Tinto's model to be more important in affecting retention decisions while the other side having found the social integration component to be more influential in determining student retention.

In "Synthesis of Issues and Directions for Research," Duran (1983) urges researchers: "By concentrating on a similar group of campuses, it would be possible to learn how Hispanic students are accommodating to similar environmental factors and how students' personal characteristics interact with institutional characteristics to affect college achievement." Olivas (1983) has noted, "Our understanding of Hispanic college students is not significantly increased by the available literature. A major summary of research on college students published in 1973 reported no studies on Hispanic students, and there is as yet no book on Hispanic college students. ...much work is needed on Hispanic student characteristics and achievement."
The present study specifies a causal model which examines the effect of six constructs on student retention rates. Figure 1 provides an overview of the structural model in this study. The model identifies four endogenous variables and three exogenous variables. The constructs represented by the model are: (a) grades, (b) parents' education, (c) encouragement, (d) academic integration, (e) social integration, (f) institutional/goal commitments, and (g) the dependent variable, retention. More specifically, this study tested a model of student attrition on a Chicano two-year college student population. Background characteristics were examined to determine the direct effects and indirect effects (through intervening variables) these factors had on minority retention rates and the direct and indirect effects of institutional/goal commitments, academic integration and social integration on minority retention rates.

LITERATURE REVIEW

Although many other studies on student retention are theoretical in nature, the techniques employed to test models of attrition have not examined causation among variables but have remained merely predictive. The regression of predictor variables on different measures of educational outcomes (retention/attrition) is important in identifying variables that can be used in future research; however, the regression offers no explanation in causality among the variables. Recently, path analytic techniques have been used successfully by several researchers to study retention. Pascarella, Terenzini and Wolfle (1985) tested the effect of college orientation sessions (prior
to the students attending their first academic semester) on student attrition, a model based on Tinto's theory. Path analysis was used to arrive at the direct, indirect, and total effects of the variables in the model. Munro (1981) tested Tinto's model on a sample drawn from the National Longitudinal Study. Aitken (1982) used path analytic techniques to test a modified version of Tinto's model in which he included a number of variables indicative of the physical environment and quality of services provided by an institution along with variables representative of Tinto's theory.

In a literature review by Lenning (1982), variables in six major categories (factors) were identified which appear in most retention research. Lenning's overview is based on research conducted by Cope and Hannah (1975), Lenning, Beal, and Sauer (1980), Lenning, Sauer, and Beal (1980), Pantages and Creedon (1978), and Ramist (1981). The six major factors include: (1) student demographic variables, (2) student academic factors, (3) initial student aspirations and motivational variables, (4) student personality and value variables, (5) institutional variables, and (6) interaction variables. Among the interaction variables are: (1) social integration /peer group relations, (2) informal contact with faculty, (3) institutionally generated student development, (4) commitment to the college and graduation, (5) extracurricular involvement, (6) student expectations and realities, (7) student participation in student services, (8) student ability and college demands, and (9)

**Background Variables**

The background variables used in the present study (structural model) include: high school grades; parents' education; and encouragement by significant others (high school teachers, counselors, relatives, and parents). Bean (1982) cites that high school grades and rank in high school class have been found to be intercorrelated with student attrition. Although this single predictor explained a larger proportion of the variance than other academic factors (Astin, 1975; Pascarella et al., 1981; Peng & Fetters, 1978), high school grades typically only account for 10% of the total variance in student attrition. Cope and Hannah (1975) and Pantages and Creedon (1978), however, found that academic ability and class rank do not directly affect attrition rates.

Mother's and father's education have been found to be related to variables in retention research (Bean, 1982) but not necessarily to measures of college persistence. Sewell and Shah (1968) found that parents' education influenced perceived encouragement by students and student attrition. However, Seale (1984) found that in testing Tinto's model on a community college population, parents' education did not affect any of the variables in the model.

Encouragement by significant others, a measure of the amount of interest and encouragement expressed by parents, high school teachers and counselors, and relatives, represents an attitudinal variable which has been found to have direct effects on dropout
(Bean, 1982).

The Intervening Variables

Institutional/goal commitments measured the initial institutional commitment that students had upon entering a community college for that particular institution. Secondly, it was a measure of the students' initial goal commitments when they first entered their community college. Two indicators were used to measure institutional/goal commitments. Each indicator was a single Likert-scaled item. Lenning (1982) included this construct under initial student aspirations and motivational variables in his review. Ramist (1981) concluded that "Student motivational factors may be considered the sine qua non of persistence, and therefore the most important target of persistence research."

Although Tinto (1975) specified that initial commitments are an integral component of his model, no direct path between initial commitments and student attrition was specified. Initial commitments indirectly affected dropout decisions within his theory.

Academic integration was a measure of the students' perceptions about their academic experiences with faculty, counselors, and administrators and perceptions about their career preparation at their institutions. Tinto (1975) referred to this integration into academic environment as the "individual's evaluation of the academic system." Academic integration is often called a measure of the intellectual development of the student (Seale, 1984). Fox (1985) found that the academic integration by
students affected attrition decisions directly, even more than social integration in Tinto's model. Academic integration, in the present research, represented students' perceptions about their academic experiences based on their interactions with faculty members, counselors, and college administrators. Although Spady (1971) and Seale (1984) reported that perceptions of faculty concern for student development and concern for teaching were highly related to students' intellectual development, in this research, students' perceptions of faculty members and of their career preparation represented "realized ideas" (Weick, 1977) that were based on "enacted environments" and not a measure of the students' true academic development at their institutions.

Social integration, a measure of students' informal contacts with faculty members, counselors, and peer groups, reflected student interaction with peers (e.g., extracurricular activities such as sports, clubs, organizations) and nonclassroom interactions with faculty members and counselors. Numerous studies (Astin, 1977; Beal, 1979; Gaff & Gaff, 1981; Johnson & Hartwein, 1980; Pascarella & Terenzini, 1979; Pascarella, 1980; Pascarella, Terenzini, & Wolfle, 1985; Wilson, et al., 1975) have all substantiated the impact that social integration has had on student persistence. Specifically, Seale (1984) cited one study in which "students who sought out faculty members for discussions of intellectual, social, and campus issues were more satisfied with their total college experience" and three studies by Astin (1975), Pascarella and Terenzini (1977), and Theophilides and Terenzini (1981) which confirmed that "informal interactions
focusing on intellectual or course-related matters as well as on students' future career concerns made a significant contribution to persistence in college, particularly at the freshman level" (Seale, p. 15).

**Student Outcomes (Retention)**

Tinto (1982), in "Defining Dropout: A Matter of Perspective", concluded: "the field of dropout research is in a state of disarray, in large measure because we have been unable to agree about what behaviors constitute an appropriate definition of dropout" (p. 3). Lenning, Beal, and Sauer (1980) concluded that there were four types of students in considering retention and attrition: (1) the persister, (2) the stop-out, (3) the attainer, and (4) the drop out. In defining the four student types, they provided a composite definition of retention/attrition. A persister was a student who continuously enrolled without any interruption. A stop-out was a student who left the institution for a period of time and then returned for additional study. The attainer was the student who dropped out prior to graduation, but after attaining a particular goal. The dropout was one who left the institution and did not return for additional study at any time. If measures of retention and attrition were to incorporate these four overlapping constructs, one variable could be used in retention research that would capture a more thorough meaning of attrition/retention. Lenning, Beal, and Sauer (1980) cited that retention and attrition should be measured by graduation rates, course completion, and goal
attainment. Rendon (1982) points out that because of the diverse nature of community college students (terms of age, attendance patterns; and choice of goals), it is necessary to examine dependent measures which permit the examination of student's outcomes based on, traditional and nontraditional measures of retention. Figure 2 represents the full causal model of the structural relationships among the variables and the indicators (observed variables) of each latent construct. The present research incorporated all three measures of retention by using each measure as a single indicator of the latent dependent variable, retention. The use of multiple indicators for a complex variable like retention permitted the inclusion of all aspects of attrition previously mentioned.

**Statistical Techniques in Retention Literature**

Two specific statistical procedures have been used almost exclusively in attempts at analyzing data collected from different student populations, multiple regression analysis and path analysis. Multiple regression (MR) is a method by which the variability of a dependent variable is analyzed by regressing the dependent variable on one or more independent (predictor) variables. Studies in attrition, however, employ variables which are intercorrelated. Moreover, the order of entry of the variables in the equation is critical and should be based on theoretical considerations. Variables which appear not to have any predictive validity would prove to be statistically significant had the order of entry for the variable in the equation been different. Finally, multiple regression, at most,
Figure 2
Full Causal Model

Institutional/Goal Commitments

Grades
High School Grades
Parents' Schooling
Father's/Mother's Education

Encouragement
Encouragement by Others

Institutional Commitment
Goal Commitment
Perceptions about Academic Experiences
Perceptions about Academic and Career Preparation

Academic Integration
Retention

Social Integration

Hours Enrolled
Satisfaction with present goal attainment
Graduation
Contact with Faculty, Counselors and Peers
makes implicit assumptions about the direct and causal relationships among the variables. Underlying structural equations (within a model of retention) among the variables cannot be examined.

Path analysis (PA) is a method for studying patterns of causation among a set of variables. It is used to study the direct and indirect effects of variables which have been hypothesized as causes of variables treated as effects (Pedhazur, 1982). Path analysis can provide the means by which institutions can test conceptual frameworks representing basic structural processes that may affect attrition. In a study of attrition, Munro (1981) used path analysis to arrive at a path analytic model of attrition similar to Tinto's model. Direct and indirect effects of the variables in the model were derived. Pascarella and Chapman (1983) explored the applicability of Tinto's model of attrition in four distinct student populations (two-year, four-year, residential, commuter) utilizing path analytic techniques.

Similar techniques were used by Bean (1980), Fox (1985), and Pascarella and Terenzini (1985) in which each researcher tested Tinto's theoretical framework on different student populations by examining the direct, indirect and total effects of the variables in their models. Although all made modifications by either adding or deleting variables to their respective models, each model reflected Tinto's conceptual framework on retention.

More recently, Seale (1984) tested Tinto's model of persistence among a two-year community college student population.
Table 1

Structural Equations for the Full Causal Model

Retention (RETENTION) = a GRADES + a PARENSCH + a ENCOUR +
                        1                                  2       3
                        a INST.GOAL + a ACADINT + a SOCINT    4       5       6

GRADES = High School Grades
PARENSCH = Education of Mother/Father
ENCOUR = Encouragement by Teachers, Counselors, Parents, Relatives
INST.GOAL = Institutional/Goal Commitments
ACADINT = Perceptions about Faculty, Counselors, Administrators and Academic Experiences and Career Preparation
SOCINT = Student/Environment Interactions

Social Integration (SOCINT) = b GRADES + b PARENSCH +
                             1                                  2
                             b ENCOUR + b INST.GOAL        3

GRADES = High School Grades
PARENSCH = Education of Mother/Father
ENCOUR = Encouragement by Teachers, Counselors, Parents, Relatives
INST.GOAL = Institutional/Goal Commitments

Academic Integration (ACADINT) = c INST.GOAL
                                        1

INST.GOAL = Institutional/Goal Commitments

Institutional/Goal Commitments (INST.GOAL) = d GRADES +
                                           1
                                           d PARENSCH + d ENCOUR
                                           2

GRADES = High School Grades
PARENSCH = Education of Mother/Father
ENCOUR = Encouragement by Teachers, Counselors, Parents, Relatives
in which he utilized a structural equation model, a statistical technique for analyzing the covariance matrices derived from the structural equations in the causal model. Seale examined a five equation theoretical causal model of student satisfaction, performance and retention. The model included exogenous variables which were believed to affect retention indirectly and five endogenous variables which are present once the student enters the college community. In addition, the model specified the causal relationships among the endogenous variables and the dependent variable, retention/attrition decisions.

The present research tested a structural equation model of retention for a Mexican American student population at three two-year institutions. The model includes the variables previously identified and represents a multiequation model with four endogenous variables. The four endogenous variables include the dependent variable retention, social integration, academic integration, and institutional/goal commitments. The structural model is represented by a system of four equations (see Table 1).

Each subscripted letter represents parameters which are estimated by an unweighted least square solution. Structural equation modeling (Bentler, 1980; Bentler & Speckart, 1981; Bentler & Woodward, 1978, 1979; Joreskog & Sorbom, 1981; Kenny, 1979; Long, 1976; Pedhazur, 1982) was used to examine the structural coefficients and measurement model of the hypothesized causal model.
METHOD

Subjects

The population was drawn from a total population of 3,544 first-time Chicano students who were enrolled full-time or part-time in 1977 or 1978 at one of three community colleges in South Texas. These three two-year institutions were Laredo Junior College (Laredo), Texas Southmost College (Brownsville), and Del Mar College (Corpus Christi). The selection of these three institutions was based on each community college situated in a community with the following characteristics: (1) a Hispanic population of at least 70,000, (2) a median family income of less than $5,000 and (3) a 45% Chicano enrollment at the respective institution (Hispanics in the Nation, 1982; Olivas, 1979; U.S. Bureau of the Census, 1977). The three community colleges selected for this study enroll the highest proportion of Chicano students in South Texas (Olivas, 1979; Rendon, 1982). Because of the similarities in geographical data and enrollment patterns, these three institutions were used for determining the retention rates of Chicano students.

Procedures

Four scales were used to measure two endogenous variables (Academic Integration and Social Integration) and one exogenous variable (Encouragement by teachers, counselors, parents, and relatives). Scale I (perceptions about faculty members, counselors, and administrators) and Scale II (perceptions about academic experiences and career preparation) were measures (indicators) of academic integration. Scale III (contact with
faculty, counselors, and peers) was used to provide a measure of social integration and Scale IV (encouragement from teachers, counselors, father, mother, and relatives) measured encouragement by family and others. All other indicators (observed variables) of latent (unobserved) variables were single item measures and, therefore, were not tested for their reliabilities. These single item indicators were examined for their factor loadings when a confirmatory factor analysis was conducted on the measurement model. Table 2 displays the Cronbach alpha reliability coefficients for the four scales previously mentioned.

A confirmatory factor analysis of the measurement model was performed utilizing LISREL VI (Joreskog & Sorbom, 1984). A polyserial correlation matrix was analyzed through an unweighted least square solution resulting in parameter estimates (loadings) for each indicator (observed variable) of the latent variable in the structural model. Figure 3 represents the measurement model in the confirmatory factor analysis. The model includes 11 observed variables and 7 latent variables. The latent variables are all treated like exogenous variables while the observed variables are free to load on all latent variables. Modification indices were examined to determine if any parameters should be freed in the LAMBDA X matrix that were not specified in the measurement model. The measures of goodness of fit for the whole model were:

| Goodness of fit index                      | 0.942* |
| Adjusted goodness of fit index            | 0.873  |
| Root mean square residual                 | 0.083**|

* >.9 significant
** <.1 significant
<table>
<thead>
<tr>
<th>Scale</th>
<th>Scale Descriptions</th>
<th>Number of Items</th>
<th>Cronbach's Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Perceptions about faculty, counselors, and administrators</td>
<td>3</td>
<td>.7076</td>
</tr>
<tr>
<td>II</td>
<td>Perceptions about academic experiences and career preparation</td>
<td>2</td>
<td>.7281</td>
</tr>
<tr>
<td>III</td>
<td>Contact with faculty, counselors, and peers</td>
<td>3</td>
<td>.5424</td>
</tr>
<tr>
<td>IV</td>
<td>Interest and encouragement by teachers, counselors, father, mother, and relatives</td>
<td>5</td>
<td>.7443</td>
</tr>
</tbody>
</table>
Figure 3: Measurement Model
Because a polyserial correlation matrix was analyzed and an unweighted least square solution sought, a measure of the goodness of fit for the measurement model utilizing Chi-squared was not possible, but a goodness of fit index and a root mean square residual index provided goodness of fit measures. The results, however, confirmed the good fit for the indicators of each latent (unobserved) variable in the measurement and structural models.

**Operational Definitions of Endogenous Variables**

The construct academic integration represents student perceptions about their academic experiences in the institution (Scale I) and perceptions about their career preparation experiences (development of job skills, selection of appropriate career, etc.) (Scale II). Three items form Scale I and two items form Scale II. These two scales are multiple indicators of the endogenous variable academic integration.

The construct social integration includes measures of the student/environment interactions. These interactions between the student and their environment included peer group relations, nonclassroom involvement with faculty, and noncounseling (or at least informal) involvement with counselors. Three items formed Scale III which served as a single indicator for the construct social integration. Although Pascarella and Terenzini (1980) and Seale (1984) indicate that informal classroom contacts with faculty and peer group relations are separate measures of social integration, the results from the confirmatory factor analysis
where these two measures are combined as one indicator verify the use of these measures as one indicator of social integration.

Multiple indicators are used to provide a measure of the construct institutional/goal commitments. Two items include the students' initial institutional commitments upon entering the community college and the students' educational goal commitments. Each item represents a single indicator which was to be used as a separate measure of the construct.

Three indicators are used to measure the retention construct: the total number of hours enrolled by the end of Spring 1981, the extent and satisfaction with present educational attainment, and a dichotomous variable, graduation (credentials earned). Students who attained some form of credential at the end of the four year period were placed in one category (1=yes) and students who had not received any were placed in a second category (2=no) (credentials could include AA, etc).

**Operational Definitions of Exogenous Variables**

The construct grades is a measure of the students' academic performance in high school. One item provided the single measure for the construct. The variable represents student self-reported data. One indicator was used to measure the parents' education construct. The variable is a measure of the father's and mother's educational attainment in terms of years. Two items were combined into one composite score and used a single indicator; the variable is a continuous variable. The encouragement construct represents the interest and encouragement the student's received about going to college from high school teachers, high school
counselors, mother, father, and other close relatives. Five responses were combined to form Scale IV, a single measure (indicator).

Data Analysis

All but one of the studies previously mentioned (Seale, 1984) used path analysis to examine the causal relationships among the variables in order to determine the direct, indirect, and total effects. Although this analytical technique is appropriate for retention research, it is predicated on several restrictive assumptions. Pedhazur (1982) includes in these restrictions that: (1) the variables are measured without error, (2) the residuals are not intercorrelated, and (3) the causal flow is unidirectional (recursive). However, Pedhazur cites that these assumptions are rarely, if ever, met in nonexperimental research. Many sources of error are nonrandom or systematic and "measures used in social behavioral research have at best moderate reliabilities" (Pedhazur, 1982, p. 636).

Bentler and Speckart (1981, p. 227) point out that in many studies problems are "investigated by an analysis of manifest variables that contain substantial measurement error. Since the question of cause and effect is fundamentally a theoretical one, an appropriate analysis must use a methodology that eliminates the biasing effects of errors of measurement." Even when specification error is not a concern, they note "it does not suffice to provide an appropriate basis for theory evaluation in the absence of a measurement in the variables" (p. 228).
Moreover, even when variables are measured with minimal error, another constraint on path analysis is that only one indicator can be used to measure each construct. In many instances, multiple indicators of complex constructs (e.g., retention) can provide a better measure of an unobserved latent variable (construct) than can a single indicator which may bring with it measurement error.

Bentler and Speckart (1981) conclude: "It is therefore necessary that analysis on latent variables be performed to direct regression estimates from the effects of unreliabilities of measured variables." The use of unmeasured latent variables (factors) with multiple indicators in causal models is referred to as structural equation modeling. The present research utilizes analysis of linear structural relationships by Joreskog and Sorbom (1984), a structural equation model labelled LISREL.

Structural equation modeling, utilizing unmeasured variables with multiple indicators, has decided advantages over path analysis (Bentler, 1978, 1980; Bentler & Huba, 1979; Joreskog, 1977; Sorbom, 1978). The inclusion of error or unique variances in the model as separate parameters makes it possible to estimate the causal regression parameters (LISREL estimates) without the influence of measurement error in the observed variables. This is particularly true when items are combined into averaged composite scores "for the purpose of increasing breadth of generality in conjunction with reliability" (Bentler & Speckart, 1981). Using latent variables with appropriately selected multiple indicators accomplishes the same purpose of averaging across
items, but composite scores cannot provide a basis for inference unless they were based on an infinite number of observational occasions or situations. However, an appropriate latent variable causal model can be used to provide a basis for correct inference even when only a few indicators per construct are employed. This is true because a measurement model is contained within the complete structural model. Bentler and Speckart conclude: "The measurement model provides information on the factor loadings that relate the indicators and the latent constructs as well as on the variances and covariances of measurement errors and of the constructs. The causal model relating the latent variables yields the causal regression parameters and the residual variances and covariances of the dependent factors" (p. 228).

Covariance structure models combine a measurement model and structural (causal) model into a complete model and are analogous to a combination of factor analysis and path analysis. The measurement model is similar to factor analysis; however, it is confirmatory in nature, unlike traditional factor analysis. Confirmatory factor analysis does not have the rotation problems found in exploratory factor analysis and unique variables (residuals) can be correlated (Long, 1983). The structural model is similar to path analysis (simultaneous regression equations) except that these regression equations are based on latent (unobserved) variables and there is the possibility of correlated residuals.
The most powerful aspect of LISREL (covariance structure models) is that the parameters for the measurement and causal model can be estimated simultaneously, standard errors can be obtained, and the goodness of fit evaluated (Bentler & Speckart, 1981; Bentler & Weeks, 1980; Joreskog, 1977; Pedhazur, 1982; Long, 1983). In assessing the goodness of fit of the model several indices (tests of significance) must be examined (Joreskog & Sorbom, 1984; Long, 1983; Pedhazur, 1982). Included in these tests are Chi-squared goodness of fit, goodness of fit index (GFI), adjusted goodness of fit index, and the root mean square residual (RMR). Because a polyserial correlation matrix was used to analyze the data, a Chi-squared goodness of fit was not possible due to the use of an unweighted least square solution. All other indices for assessing the fit of the model were used, including the total coefficient of determination for the Y variables and the structural equations. The coefficient of determination is similar to the percentage of the variation in the dependent variable that is explained by the regression (Long, 1983).

The data collected through the survey instrument included one variable which was measured at the ordinal level. This variable represented a dichotomy and was used as one indicator of the retention dependent variable. Most treatments of ordinal variables are based on two assumptions, equal intervals between categories and a standard normal distribution. However, when observed variables are of mixed scale types (ordinal and interval), the use of ordinary product moment correlations is not
recommended (Joreskog & Sorbom, 1984). Rather, it is suggested that estimates of polyserial correlations (one discrete and one continuous variable) among the observed variables be computed and that a matrix of such correlations be analyzed by the unweighted least square (ULS) method (Joreskog & Sorbom, 1984).

If the observed variables to be analyzed by the LISREL VI computer program are continuous variables (interval scales) and normally distributed, the use of maximum likelihood estimates (ML), their associated standard errors, and Chi-squared goodness of fit measure may be used. However, if observed variables are non-symmetric (highly non-normally distributed), it is suggested that initial estimates and ULS estimates be used instead of ML estimates. In the present research, one variable (credentials earned) was not normally distributed and, therefore, the ULS method was used in the data analysis. This procedure is recommended by Joreskog and Sorbom (1984) for using discrete data. The ULS parameter estimates are derived by means of an iterative procedure that minimizes a definite fitting function by improving the initial parameter estimates. The fitting function for ULS is:

\[ F = 1/2 \text{tr} [(S - \hat{S})] \]

where "tr" is the trace operator indicating the sum of the diagonal elements of a matrix, \( \hat{S} \) is the fitted covariance matrix implied by the model, and \( S \) is the sample covariance matrix. All these measures were examined to assess the overall fit of the model in the present research. No one single measure (test of significance) was used exclusively
### Table 3

<table>
<thead>
<tr>
<th>Factor-Standardized Structural Models</th>
<th>Parameter Estimates: Measurement and Unique Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factors and variables</td>
<td>Factor loading</td>
</tr>
<tr>
<td>Measurement model parameters</td>
<td></td>
</tr>
<tr>
<td>Grades</td>
<td></td>
</tr>
<tr>
<td>High school grades</td>
<td>1.000</td>
</tr>
<tr>
<td>Parents' education</td>
<td></td>
</tr>
<tr>
<td>Mother's/Father's education</td>
<td>1.000</td>
</tr>
<tr>
<td>Encouragement</td>
<td></td>
</tr>
<tr>
<td>Encouragement by others</td>
<td>1.000</td>
</tr>
<tr>
<td>Institutional/goal Commitments</td>
<td></td>
</tr>
<tr>
<td>Institutional Commitments</td>
<td>.463</td>
</tr>
<tr>
<td>Goal Commitments</td>
<td>.583</td>
</tr>
<tr>
<td>Academic Integration</td>
<td></td>
</tr>
<tr>
<td>Perceptions about staff</td>
<td>.620</td>
</tr>
<tr>
<td>Perceptions about academic and career preparation experiences</td>
<td>.676</td>
</tr>
<tr>
<td>Social Integration</td>
<td></td>
</tr>
<tr>
<td>Student/environment interactions</td>
<td>.702</td>
</tr>
<tr>
<td>Retention</td>
<td></td>
</tr>
<tr>
<td>Total number of hours enrolled</td>
<td>.703</td>
</tr>
<tr>
<td>Satisfaction with present educational goal attainment</td>
<td>.526</td>
</tr>
<tr>
<td>Graduation (credentials earned)</td>
<td>.603</td>
</tr>
</tbody>
</table>
(Cont.)

Causal model parameters

<table>
<thead>
<tr>
<th>Standardized parameters</th>
<th>Standard weight</th>
</tr>
</thead>
</table>

**Regression weights**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>beta(AI)</td>
<td>0.650</td>
</tr>
<tr>
<td>beta(SI)</td>
<td>0.450</td>
</tr>
<tr>
<td>beta(RA)</td>
<td>0.193</td>
</tr>
<tr>
<td>beta(RS)</td>
<td>0.091</td>
</tr>
<tr>
<td>beta(RI)</td>
<td>0.428</td>
</tr>
<tr>
<td>gamma(IG)</td>
<td>0.299</td>
</tr>
<tr>
<td>gamma(IP)</td>
<td>0.042</td>
</tr>
<tr>
<td>gamma(IE)</td>
<td>0.339</td>
</tr>
<tr>
<td>gamma(SG)</td>
<td>-0.219</td>
</tr>
<tr>
<td>gamma(SP)</td>
<td>-0.203</td>
</tr>
<tr>
<td>gamma(SE)</td>
<td>0.042</td>
</tr>
<tr>
<td>gamma(RG)</td>
<td>0.084</td>
</tr>
<tr>
<td>gamma(RP)</td>
<td>0.191</td>
</tr>
<tr>
<td>gamma(RE)</td>
<td>-0.075</td>
</tr>
</tbody>
</table>

**Residual variances**

<table>
<thead>
<tr>
<th>Category</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institutional/goal commitments</td>
<td>0.794</td>
</tr>
<tr>
<td>Academic integration</td>
<td>0.578</td>
</tr>
<tr>
<td>Social integration</td>
<td>0.758</td>
</tr>
<tr>
<td>Retention</td>
<td>0.577</td>
</tr>
</tbody>
</table>
but, rather, all indices collectively provided the measures of goodness of fit.

RESULTS

Table 3 includes the measurement and structural model parameter estimates of the causal model in the present research and provides information (parameter estimates) relating the observed or manifest variables to their underlying constructs. Moreover, the unique variances (residuals) are included to report the amount of each indicator's variance that is not accounted for by the latent variable. The parameter estimates (factor loadings) consist of standardized regression coefficients indicating the regression of the observed variables (indicators) on the latent variable (construct). All the factors are scaled to unit variance, therefore, the single indicators for the latent exogenous variables are assumed to be measured without error and no LISREL estimates are reported in Table 3.

Figure 4 represents the structural model in the present research. Labelled circles represent error or unique factors (residuals). The structural model can be considered a series of simultaneous regression equations. Each variable in the structural model that has one or more unidirectional arrows going to it represents a dependent variable with a given equation. Each unidirectional arrow is a regression weight in the equation.

Included in Table 3 are the relationships (standard weights) between the latent endogenous variables and the magnitudes of and covariances between factor residuals. The parameter estimates in Table 3 are each subscripted designating the relationship between
Figure 4

Full Statistical Model
latent variables. The two letters in each subscript represent two factors (latent variables). The following letters were used to designate factors in the structural model: (1) G=highschool grades, (2) P=parents' education, (3) E=precollege encouragement, (4) I=institutional/goal commitments, (5) A=academic integration, (6) S=social integration, and (7) R=retention. In each subscript for the regression weights, the first letter references the dependent variable in a particular equation and the second letter references the predictor variable with the predictor variable having temporal priority for any two latent variables in the structural model.

Standardized weights were used because of the differences in scales among the observed variables. Nonequivalent factor variances in unstandardized regression coefficients would make it difficult to compare the differences in parameter estimates for the measurement and structural models. Moreover, Bentler and Speckart (1981) specify: "Standardization has no effect on any statistical tests made. It has the advantage of increased ease in comparing parameter estimates; in particular, dependent or endogenous factor residuals become interpretable as the proportion of unexplained variance not accounted for by the predictor or exogenous factors" (p. 233).

**Institutional/Goal Commitment**

The first equation in the structural model examined the effects of three precollege variables on institutional/goal commitments, a measure of a student's initial commitment to
their institution and their initial educational goals upon entering a community college. Table 4 displays the parameter estimates, the factor loadings for the observed variables and the squared multiple correlations (R-SQ) for the latent dependent (endogenous) variables. The R-SQ represents the variance accounted for by the exogenous variables. Because the exogenous variables were scaled to unit variance and single indicators were used for each construct, the factor loadings were all 1.000. The unique variance for the indicator variables were all 0.000. The factor loadings for institutional commitment (.463) and goal commitment (.583) supported the use of these two variables in their measurement of institutional/goal commitments. The R-SQ or proportion of variance explained by the exogenous variable in the equation was 20%.

A comparison of the standardized coefficients revealed that only two of the three predictor variables, grades and encouragement, accounted for the variance in institutional/goal commitment. However, students who made better grades had higher initial institutional and goal commitments as did students who received more encouragement from their teachers, counselors, parents and relatives. Although it was hypothesized within the structural model that parents' education would affect the latent variable, the standard weight of parents' education on institutional/goal commitment was only .042.

**Academic Integration**

The second structural equation in the model examined the effects that institutional/goal commitments had on academic
integration, a measure of students' perceptions about the faculty, counselors, and administrators relating to academic experiences and a measure of students' perceptions of their academic and career preparation experiences at their respective institutions. The parameter estimates, factor loadings of multiple indicators, and the squared multiple correlation for academic integration are displayed in Table 5. The squared multiple correlation (R-SQ) for academic integration was .422. Therefore, institutional/goal commitments accounted for 42% of the variance in academic integration. The two indicators of academic integration in the measurement model, students' perceptions about institutional personnel (.620) and students' perceptions about their institutional experiences (.676), were accurate in their measurement of the latent construct academic integration. Students who had higher levels of institutional and goal commitments had more positive perceptions about their institutions or a higher level of academic integration (beta=.650).

Social Integration

The third structural equation examined the effects of three precollege factors, (1) high school grades, (2) parents' education, and (3) encouragement by parents and high school teachers and counselors and one endogenous variable, institutional/goal commitment on social integration, a measure of the contact or interactions students had with faculty, counselors, and other students (see Table 6). The squared
Table 4

Parameter Estimates for Institutional/Goal Commitments

<table>
<thead>
<tr>
<th>Variable</th>
<th>Unstandardized coefficients (LISREL estimates)</th>
<th>Standardized coefficients (Factor loadings)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement Model for Institutional/Goal Commitment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High school grades</td>
<td>1.000*</td>
<td>1.000*</td>
</tr>
<tr>
<td>Mother's/Father's education</td>
<td>1.000*</td>
<td>1.000*</td>
</tr>
<tr>
<td>Encouragement by others</td>
<td>1.000*</td>
<td>1.000*</td>
</tr>
<tr>
<td>Institutional Commitment</td>
<td>1.000</td>
<td>.463</td>
</tr>
<tr>
<td>Goal Commitment</td>
<td>1.260</td>
<td>.583</td>
</tr>
</tbody>
</table>

Structural Equation for Institutional/Goal Commitment

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Grades</td>
<td>.138</td>
<td>.299</td>
</tr>
<tr>
<td>Parents' education</td>
<td>.019</td>
<td>.042</td>
</tr>
<tr>
<td>Encouragement</td>
<td>.157</td>
<td>.339</td>
</tr>
</tbody>
</table>

Squared Multiple Correlations for Institutional/Goal Commitment

\[
R^2 = .206 \quad N = 225
\]

*Indicators scaled to unit variance.
Table 5

Parameter Estimates for Academic Integration

<table>
<thead>
<tr>
<th>Variable</th>
<th>Unstandardized coefficient</th>
<th>Standardized coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicators of Academic Integration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceptions about faculty, counselors, and administrators</td>
<td>1.000</td>
<td>.620</td>
</tr>
<tr>
<td>Perceptions about academic and career preparation experiences</td>
<td>1.090</td>
<td>.676</td>
</tr>
<tr>
<td>Structural Equation for Academic Integration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Institutional/goal commitments</td>
<td>.871</td>
<td>-.650</td>
</tr>
<tr>
<td>Squared Multiple Correlations for Academic Integration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$R^2$</td>
<td>= .422</td>
<td></td>
</tr>
</tbody>
</table>
### Table 6

**Parameter Estimates for Social Integration**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Unstandardized coefficients</th>
<th>Standardized coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Indicators of Social Integration</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student/environment interactions</td>
<td>1.000</td>
<td>.702</td>
</tr>
<tr>
<td><strong>Structural Equation for Social Integration</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High school grades</td>
<td>-.154</td>
<td>-.219</td>
</tr>
<tr>
<td>Parents' education</td>
<td>-.146</td>
<td>-.208</td>
</tr>
<tr>
<td>Encouragement</td>
<td>.029</td>
<td>.042</td>
</tr>
<tr>
<td>Institutional/goal commitments</td>
<td>.683</td>
<td>.450</td>
</tr>
</tbody>
</table>

**Squared Multiple Correlation for Social Integration**

\[ R^2 = .242 \]
multiple correlation for this structural equation was .242 indicating that the proportion of variance explained by all the variables in the equation was 24%. The factor loading for student/environment interactions, the single indicator for social integration, was .702. The use of the single indicator to measure the latent variable was highly supported.

Although it was hypothesized that institutional/goal commitments would contribute to the variance explained in social integration, the extent to which it accounted for the proportion of variance (beta=.450) over the other variables in the equation was not expected. Moreover, the direct effects of grades and parents' education on social integration were not in the hypothesized directions (beta=-.219 and beta=-.208, respectively). Students who received higher grades were less socially integrated (interacted less frequently with faculty, counselors, and peers). Students whose parents had more years of education were similarly less socially integrated within the institution. The effect of encouragement was extremely small which indicated that the path could conceivably be omitted from the model without affecting the proportion of explained variance.

Retention

The final structural equation examined the effects of three exogenous latent variables (grades, parents' education, and encouragement) and three endogenous variables (institutional/goal commitments, academic integration, and social integration) on the dependent variable, retention, a measure of the total number of hours enrolled over a four-year period, the extent to which
students were satisfied with their present educational goal attainment, and whether the student graduated (earned some form of credential) or not during the four years. The squared multiple correlation for the structural equation was .423 (see Table 7). Therefore, the variables accounted for 42% of the explained variance in retention. The use of the three indicators to measure the dependent variable was highly supported (λ = .703, .603, and .526).

The regression weights for the three exogenous variables hypothesized to have an effect on retention were minimal. The omission of these paths would not affect the total variance explained in retention. The regression coefficients for academic integration (.193) and social integration (.091), hypothesized to have large effects on retention, were surprisingly different from what was expected. Moreover, the regression coefficient for institutional/goal commitment (β = .428) was much larger than all the other variables in the equation. Students with higher levels of institutional and goal commitments had higher levels of retention (enrolled in more total semester hours, were more satisfied with their educational goal attainment, and earned some form of credential).

**Measures of Goodness of Fit**

The parameter estimates were examined for unreasonable values. These values included: (1) negative variances, (2) correlations greater than one, and (3) unreasonably large parameter estimates. None of these values were found in the present research. Table 8 displays the measures used in assessing
<table>
<thead>
<tr>
<th>Variables</th>
<th>Unstandardized coefficients</th>
<th>Standardized coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicators of Retention</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total number of semester hours enrolled</td>
<td>1.000</td>
<td>.703</td>
</tr>
<tr>
<td>Satisfaction with present goal attainment</td>
<td>.749</td>
<td>.603</td>
</tr>
<tr>
<td>Graduation</td>
<td>.858</td>
<td>.526</td>
</tr>
<tr>
<td>Structural Equation for Retention</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High school grades</td>
<td>.059</td>
<td>.084</td>
</tr>
<tr>
<td>Parents' education</td>
<td>.134</td>
<td>.191</td>
</tr>
<tr>
<td>Encouragement</td>
<td>-.052</td>
<td>-.075</td>
</tr>
<tr>
<td>Institutional/goal commitments</td>
<td>.651</td>
<td>.428</td>
</tr>
<tr>
<td>Academic integration</td>
<td>.218</td>
<td>.193</td>
</tr>
<tr>
<td>Social integration</td>
<td>.092</td>
<td>.091</td>
</tr>
</tbody>
</table>

Squared Multiple Correlation for Retention

\[ R^2 = .423 \]
### Measures of Goodness of Fit for the Whole Model

<table>
<thead>
<tr>
<th>Measures</th>
<th>Test of Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goodness of Fit Index</td>
<td>.920</td>
</tr>
<tr>
<td>Adjusted Goodness of Fit Index</td>
<td>.840</td>
</tr>
<tr>
<td>Root Mean Square Residual</td>
<td>.098</td>
</tr>
<tr>
<td>Total Coefficient of Determination for</td>
<td>.341</td>
</tr>
<tr>
<td>Structural Equations</td>
<td></td>
</tr>
</tbody>
</table>
the fit of the causal model. The Goodness of Fit Index, a measure of the relative amount of variances and covariances jointly accounted for by the model, was .920 (values were found between zero and one, larger values signifying a good fit). The root mean square residual (RMR) is a measure of the average of the residual variances and covariances. The values for the RMR should be between zero and one. However, for the RMR a good fit is signified by smaller values (RMR=.098). Finally, the Total Coefficient of Determination for the structural equation was .341. This value represents a squared multiple correlation coefficient (R-SQ) of all structural equations in the model. The coefficient is a measure of the proportion of generalized variance accounted for by the causal model (structural equations). All measures (tests of significance) indicated that the overall fit of the model was acceptable in the present research.

In sum, the measurement model and the structural model were found to represent a plausible causal model of student retention. Figure 5 displays the factor loadings and parameter estimates for the full causal model. The findings were supportive of the hypothesized relationship between measures of academic integration and the dependent variable, retention; however, the results indicated that the hypothesized relationship between measures of social integration could not be substantiated. Moreover, measures of initial commitments were found to have a significantly large direct effect on retention.
DIRECT, INDIRECT, AND TOTAL EFFECTS

Although the measures used in assessing the fit of the model reflected the overall strength of the hypothesized model, the present research was not entirely supportive of Tinto's model. Academic and social integration did not have significant direct effects on retention as was reported by other researchers (Fox, 1985; Pascarella, Terenzini, & Wolfle, 1985) testing Tinto's model. Tinto's model emphasizes the importance of initial institutional/goal commitments on retention but only when they are mediated through academic and social integration. Students entering an institution with higher levels of institutional/goal commitments will have higher levels of academic and social integration at their respective institutions and consequently higher levels of retention. However, in the present study, institutional/goal commitments not only have a significant direct effect on retention rates but are considerably more important (see Table 4) in determining retention. The total effect for academic integration was only .218 while the total effect of social integration (.092) on retention signified that there was no causal path between these two variables. The effect coefficient for institutional/goal commitments, on the other hand, was .904, significantly higher than the two integration variables. There were no significant direct effects of any of the exogenous variables (grades, parents' education, and encouragement) on retention rates, but two of the three variables, grades and encouragement, directly affected initial institutional/goal commitments.
Institutional/Goal Commitments

Table 9 includes the total effects of the three exogenous variables on institutional/goal commitments in the structural equation. Although the effect of parents' education on institutional/goal commitments was in the hypothesized direction, the strength of the structural coefficient (gamma = .415) was not what had been expected. Students' initial commitments to the institution and to their educational goals were not affected significantly by their parents' education. It is believed that for most Mexican Americans education is highly valued, whether it is because parents who have not themselves earned a college degree provide strong incentives for their children to "succeed" where they did not (Sewell & Shab, 1968) or merely because it is expected by parents who have "succeeded" in earning a college degree. If this was the case for most Chicano students, then, regardless of their parents' education, initial institutional/goal commitments would not be a factor.

Social Integration

None of the hypothesized direct effects of the background characteristics on social integration were supported in the findings. Students' high school grades or their parents' education did not directly affect the level of social integration within their institutions in the hypothesized directions. The amount of encouragement received from parents, teachers, counselors, and relatives affected social integration, but only indirectly through institutional/goal commitments. It was
Table 9

**Effect Coefficients of Exogenous and Endogenous Variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Direct effect</th>
<th>Total effect</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Retention</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grades</td>
<td>.059</td>
<td>.170</td>
</tr>
<tr>
<td>Parent's education</td>
<td>.134</td>
<td>.138</td>
</tr>
<tr>
<td>Encouragement</td>
<td>-.052</td>
<td>.092</td>
</tr>
<tr>
<td>Institutional/goal commitments</td>
<td>.651</td>
<td>.904</td>
</tr>
<tr>
<td>Academic integration</td>
<td>.218</td>
<td>.218</td>
</tr>
<tr>
<td>Social integration</td>
<td>.092</td>
<td>.092</td>
</tr>
<tr>
<td><strong>Institutional/Goal Commitments</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grades</td>
<td>.138</td>
<td>.138</td>
</tr>
<tr>
<td>Parents' education</td>
<td>.019</td>
<td>.019</td>
</tr>
<tr>
<td>Encouragement</td>
<td>.157</td>
<td>.157</td>
</tr>
<tr>
<td><strong>Social Integration</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grades</td>
<td>-.154</td>
<td>-.059</td>
</tr>
<tr>
<td>Parents' education</td>
<td>-.146</td>
<td>-.133</td>
</tr>
<tr>
<td>Encouragement</td>
<td>.029</td>
<td>.137</td>
</tr>
<tr>
<td>Institutional/goal commitments</td>
<td>.683</td>
<td>.683</td>
</tr>
<tr>
<td><strong>Academic Integration</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Institutional/goal commitments</td>
<td>.871</td>
<td>.871</td>
</tr>
</tbody>
</table>
expected that students, whose parents had higher levels of education, should not require the assistance of college instructors, particularly counselors. This attitude was evident in that the total effect (−.133) of parents' education on social integration was smaller than the direct effect (−.146). The negative effect of high school grades (−.154) on social integration, however, was almost totally negated by the indirect effects (total effects = −.059).

More importantly, though, was the positive direct effect (.683) which initial institutional/goal commitments had on social integration. Students who entered college with higher levels of commitment to the institution and to their educational goals had more informal interactions with faculty members, met more often with counselors, and attended and participated more in peer-related activities.

**Academic Integration**

The third equation examined the direct effects of one endogenous variable, students' initial institutional/goal commitments, on students' academic perceptions about the faculty, counselors, and administrators and about their academic experiences (including career preparation). The direct effect of institutional/goal commitments on academic integration were supported by research conducted by Fox (1985) and by Pascarella, Terenzini, and Wolfle (1985).

**Retention**

The last structural equation examined the direct and indirect effects of three exogenous variables (grades, parents'
education, encouragement) and three endogenous variables (institutional/goal commitments, academic integration, social integration) on the dependent variable, retention. Students whose parents had higher levels of education were more likely to enroll in more semester hours, to be more satisfied with their present goal attainment, and had earned some form of credential. Although this direct effect was hypothesized, and the findings supportive (\(\gamma = .134\)), it was expected to have a smaller impact or importance in determining retention. The direct effect of academic integration on retention was the second largest structural coefficient in the equation (\(\beta = .218\)).

One precollege variable, high school grades, and one endogenous variable, social integration, had direct effects on retention as hypothesized; however, even with total effects taken into account, the strength of the relationship was minimal (see Table 9). Although it was hypothesized in the causal model, the degree (strength) of the direct effect of institutional/goal commitments on retention was unexpected, the direct effect on the latent variable was .651, the effect coefficient .904. Students with higher levels of commitments to the institution and to educational goals enrolled in more semester hours, were more satisfied with their present educational goal attainment, and graduated with some form of credentials.

Fox (1980, 1985) has consistently found that higher levels of academic integration have more of an impact on persistence than any other variable in Tinto's model. The findings in the
present research, however, revealed that, for a community college Chicano student population, neither academic integration nor social integration affected retention rates significantly. Instead, institutional/goal commitments affected student retention measures significantly more than academic and social integration measures.
DISCUSSION

Practical implications

With increasing concern for accountability, reductions in state and federal appropriations to postsecondary institutions, and large numbers of potential students not readily available to institutions, community college administrators have begun to focus on students presently enrolled at their institutions. Attention is now being given to retaining students at two-year institutions not only because recruitment of new students is difficult but, in addition, because federal and state representatives are requiring answers to questions of accountability prior to the allocation of funds, particularly when attrition rates are exceedingly high at these very institutions. Community colleges have begun to study retention/attrition on their campuses and have designed, initiated, and implemented programs and support services to increase student retention. However, implementation of programs (or support services) at institutions with large minority student populations have not appreciably affected student persistence, even when these programs are based on empirical studies. Often, it is not the programs themselves nor the faculty and administrative concern that makes these programs ineffective. Two-year institutions, where a disproportionate number of Chicano students are found, may be culturally different from four-year residential institutions where many studies are conducted. Moreover, Chicano student populations may have different response patterns to programs or support services than does the majority
population.

At community colleges where evaluative measures are included in institutional efforts to increase retention, attempts have not been effective primarily because institutions are overly concerned with increasing student numbers rather than implementing evaluations which are data based. Those involved in evaluating retention efforts (programs) may be identifying solutions which are temporary or inappropriate for certain student populations.

In the present study two precollege factors were found to be significant in the retention process reflected in the causal model. High school grades and encouragement by others prior to entering a community college were determinants of institutional/goal commitments. While it is not possible for college faculty and administrators to control these two factors, particularly high school grades, it is possible for colleges to recognize that a large portion of their student clientele is not academically prepared and have received little, if any, support to attend college; therefore, initial institutional and educational goal commitments, which were found to be extremely significant determinants of educational outcomes, are not present for most of their student populations.

It is important for two-year colleges with large numbers of Chicano students to identify institutional goals in terms of the total student clientele. Institutional awareness of differing educational levels must be present to offset the
two precollege factors previously mentioned. One method would be to involve the entire college staff in a campus-wide retention program. Noel (1976) cites the use of a campus-wide committee in charge of identifying and promoting activities (e.g., determining the campus dropout rate, increasing institutional awareness of variables related to retention, and initiating and implementing orientation and counseling and career programs) that affect student retention. Another method would involve faculty and counselors in training sessions or conferences directed at increasing faculty awareness of factors related to student persistence. These two methods would offset lower levels of encouragement and high school grades that students bring with them upon entering college by providing programs and activities which would increase the student's commitment to the institution. A campus-wide effort at affecting retention rates would be felt by students and, subsequently, result in higher levels of institutional and goal commitments.

Another important aspect to consider, related to educational outcomes, is the significance of the institutional/goal commitment variable itself. Although it is mentioned in the previous section, the importance of this variable becomes more significant with diverse student populations. Not only must colleges increase institutional commitments by offering remedial programs to students who need them, but, by offering honors programs, an accelerated curriculum, courses for independent study, and special courses within majors to transfer students to those students who are academically prepared. By providing
something for everyone, students would be more committed to their institutions and to their educational goals.

In addition to the above, the availability of extension courses offered by institutions at off-campus sites would not only make it possible for students to enroll in course work without having to travel to the college campus but would relate to the community (and students) the concern that the institution has for its students. It would be hoped that the student's commitment to the college would increase even if the student was not attending classes on the college campus. The presence of counselors at these sites would add to these efforts, and career programs (or courses) taught by counselors would ensure that educational goals be addressed.

Faculty and counselor involvement in orientation programs (courses), which reflects institutional concern, is another tactic that could increase initial institutional and educational goal commitments. Pascarella et al. (1985) found that participation in orientation sessions would increase the levels of commitment in students. If students perceive that counselors and faculty members are genuinely interested in their academic and career goals, students should be more committed to their institutions.

Finally, commitment to educational goals must be addressed specifically. Courses relating directly to career and academic goals could be offered by counselors and would be required in the curriculum for all students. Moreover, a student would be
assigned to a course in their first semester of their freshman year. Initial commitments by students are formed during their first academic semester (Seale, 1984) and, therefore, it becomes extremely important that institutions focus their efforts during this time, particularly because of the impact that initial commitments have on retention.

**Future Research**

Because of the differences between the findings reported by Fox (1985), Pascarella et al. (1985), and others and the present research, it is recommended that future research in retention should examine the invariance that may be found among different student populations. Regional differences among Mexican American student populations should be tested and sex differences examined. In testing differences between groups, research should assess the equality of the variance covariance matrices. If it is found that the different groups can generate similar measures of goodness of fit, further testing should be made to examine the underlying factor patterns between the groups. The difference between student populations may not be determined by testing the invariance of the groups at these two levels. Parameter estimates or even unique variances may have to be examined prior to identifying where the differences between the groups are to be found.

Using a confirmatory maximum likelihood estimation of linear structural equation models with latent variables, Bentler and Speckart (1981) examined the causal predominance of attitudes over behaviors. Two wave, two variable (2W2V) crosslagged
structural models were tested to determine if attitudes cause behavior, or if behavior determines attitudes. Dentler and Speckart concluded that their "main empirical results do confirm... that attitudes cause behavior" (p. 237). It is recommended that future research examine retention rates from an attitudinal/behavioral view. Another possible study would be to determine if data collected several years after the behavior are a measure of past reality, or if the outcome (behavior) influences students' perceptions of past experiences or attitudes. A structural model could be used to test the effect that retention decisions have on perceptions of past institutional/goal commitments, perceptions about their social integration at their institutions, and perceptions about their academic experiences. Finally, a reduced model could be tested with another Chicano student population to determine if deletion of paths in the structural model do not significantly affect the variance accounted for by the present model.

Concluding Comments

While it is believed that access to higher education for Hispanics has been fulfilled at all levels of postsecondary education, "Hispanic students are extraordinarily disproportionately concentrated in fewer than 2 percent of the more than 3,100 colleges and universities in the country" (Olivas, 1983, p.116). Moreover, 42% of all Hispanic students are found enrolled in two-year institutions (Olivas, 1983). At the same time, these two-year institutions report high attrition
rates which disproportionately have affected Chicano students. If these institutions have taken on the responsibility to provide equal educational opportunities to minorities, problems inherent in two-year institutions must be resolved in order that Hispanic students enjoy full access into higher education. Identification of factors affecting Hispanic students and a full understanding of underlying structural patterns must be achieved if community colleges are to be effective in their educational efforts. Institutional attempts, whether they be programs or recruitment efforts, must be based on theoretical research. Olivas (1983, p.136) notes: "The fertile void in the literature on Hispanic students is a handicap in our understanding of the condition of Hispanic education, and this persists despite the abundance of research on students generally." It is hoped that the present study provides information essential to understanding the factors affecting Chicano student retention.


living at college on attainment of the baccalaureate degree. *Journal of College Student Personnel*, 23, 99-104.


The California State University and Colleges. (1979). Those who stay - Phase II: Student continuance in the California State University and Colleges. Technical memorandum No. 8 from the Office of the Chancellor, California State University and Colleges.


