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ABSTRACT

This paper estimates the relative importance of three, theoretically interrelated sets of variables on changes in students' intellectual curiosity and interest in learning for its own sake. Variables being analyzed are: (1) students' curricular experiences; (2) students' formal instructional experiences and classroom-related contacts with faculty members; and (3) students' out-of-class experiences with faculty, peers, and the formal co-curriculum. The major purpose was to assess the extent to which student interest in learning is shaped by both formal academic activities and by their out-of-class experiences. Data from a group of 210 students who participated in a Spring 1992 survey and followup surveys show that what happens to students after they matriculate has a substantially greater influence on what and how much they learn than their precollege personal and academic development. Study analysis also revealed that both students' class-related experiences and their out-of-class experiences made statistically significant and unique contributions to the explanation of variations in intellectual orientations above and beyond students' precollege traits and their experiences in other areas of college life. (Contains 44 references.) (GLR)

IN- AND OUT-OF-CLASS INFLUENCES AFFECTING THE DEVELOPMENT OF STUDENTS' INTELLECTUAL ORIENTATIONS

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IN- AND OUT-OF-CLASS INFLUENCES AFFECTING THE DEVELOPMENT OF STUDENTS' INTELLECTUAL ORIENTATIONS

Students' academic and cognitive development have attracted substantial interest as researchers have, appropriately, tried to identify those dimensions of students' collegiate experiences that influence learning and cognitive development and are within an institution's power to shape to educational advantage. Pascarella and Terenzini (1991), in their review of the past twenty years of research on the effects of college on students, use two over-arching categories to summarize and synthesize the available research on within-college influences on students learning. The first deals with "the acquisition of subject matter knowledge and academic (usually verbal and quantitative) skills" (p. 114). Within this category, studies have focused on five general sources of influence: 1) course-taking patterns; 2) the teaching/learning context; 3) instructional approaches; 4) teacher behaviors, and 5) the extent of student involvement or engagement in academic and related experiences (pp. 84-102).

According to Pascarella and Terenzini (1991), the second large subdivision of the research on student learning contains studies on the development of students' higher-order cognitive skills (e.g., communication, formal reasoning, critical thinking, postformal reasoning) and intellectual growth. By and large, the within-college sources of influence on these educational outcomes tend to fall into the same general categories as listed above (pp. 138-152).

Most educators would agree that these areas of academic and cognitive development constitute a central portion of the mission of undergraduate education. Most would probably also agree that colleges and universities (as well as supermarket tabloids) are

also interested in "inquiring minds." Indeed, fostering "intellectual curiosity" is an important educational goal and implicitly or explicitly part of most institutional missions. According to Whitehead (1939), "Every belief is to be approached with respectful inquiry" (p. 478), while more recently, Greeley (1978) asserted that "it is with curiosity . . . that education begins" (p. 197). The concept of intellectual curiosity, as used here, refers to a general disposition to inquire, to ask questions, to want to know why things happen or are the way they are, not for any explicit reason, but because one is curious and enjoys learning. In this paper, "Intellectual curiosity" and "intellectual orientation" are used interchangeably.

Interestingly, Pascarella and Terenzini's (1991, chap. 6) review indicates that despite the centrality of the development of intellectual curiosity to the undergraduate mission of most institutions, scholars have virtually ignored this cognitive trait over the past 10 to 15 years. The development of the Omnibus Personality Inventory (OPI) (Heist & Yonge, 1968) facilitated a spate of studies of students' intellectual orientations during the 1970s, and most of the studies that examine students' "intellectual curiosity, inclination to be skeptical and critical of information, analytical orientation, and intellectual flexibility and complexity" (Pascarella & Terenzini, 1991, p. 221) were undertaken using the OPI, particularly the Thinking Introversion, Theoretical Orientation, and Complexity scales.

With a few exceptions (e.g., Brawer, 1973; Snyder, 1968), the OPI-based evidence indicates consistent (if modest) increases in students' intellectual orientations during the college years (Chickering, 1974; Chickering & Kuper, 1971; Chickering & McCormick,

1973; Chickering, McDowell, & Campagna, 1969; Clark, Heist, McConnell, Trow, & Yonge, 1972; McConnell, 1972; Wilson, Gaff, Dienst, Wood, & Bavry, 1975; Trent & Medsker, 1968; Trent & Craise, 1967; Trent & Golds, 1967).

Studies of various within-college sources of influence on students' intellectual orientations indicate little or no impact related to academic major field (Brown, 1968; Feldman & Weiler, 1976; Burton & Polmantier, 1973; Yonge & Regan, 1975). Students living in residence halls, however, enjoy greater gains in intellectual orientation than do commuting students (Chickering & Kuper, 1971; Welty, 1976), and students participating in experimental courses or curricula, or living in living-learning centers consistently experience significantly larger gains in intellectual orientation than do their peers in traditional courses and curricula (Bennett & Hunter, 1985; Lacy, 1978; Newcomb, Brown, Kulik, Reimer, & Revelle, 1971; Tomlinson-Keasy, Williams, & Eisert, 1978). Pascarella and Terenzini (1991) conclude, however, that "The degree of change in intellectual orientation appears more clearly to be related to the socializing influences within various college settings that involve the interaction of people -- students and faculty members" (p. 246).

Examination of the publication dates of these references quickly reveals that this literature is dated. Pascarella and Terenzini (1991) identified only two studies done on students' intellectual orientations in the 1980s (Friedlander & Pace, 1981; Bennett & Hunter, 1985), the most recent in 1985. An ERIC literature search failed to uncover additional studies done since that time.

Not only is the literature on changes in students' intellectual orientations dated, it is also highly atomistic in its conception. The role of the curriculum or course-taking patterns, for example, is analyzed separately from the influences of instructional approaches and classroom climate, and these academic sources of influence on learning are examined as if they were unrelated to students' out-of-class experiences. In short, while each of these areas of influence has a modest-to-large research base, we have studied influences on cognitive development and intellectual orientation to learning as if they were independent of one another. Theoreticians (e.g., Sanford, 1962; Chickering, 1969; Heath, 1968) have suggested for years that students learn and change in holistic ways. Pascarella and Terenzini (1991) speculated that both the in- and out-of-class experiences of students contributed simultaneously to changes in various educationally-desirable outcomes. They noted, however, that no empirical evidence existed to support that belief.

This study sought to estimate the relative importance of three, theoretically interrelated sets of variables on changes in students' intellectual curiosity and interest in learning for its own sake: students' curricular experiences, their formal instructional experiences and classroom-related contacts with faculty members, and their out-of-class experiences with faculty, peers, and the formal co-curriculum. The major purpose of the study was to assess the extent to which students' interest in learning is shaped by both formal academic activities and by their out-of-class experiences.

METHODS

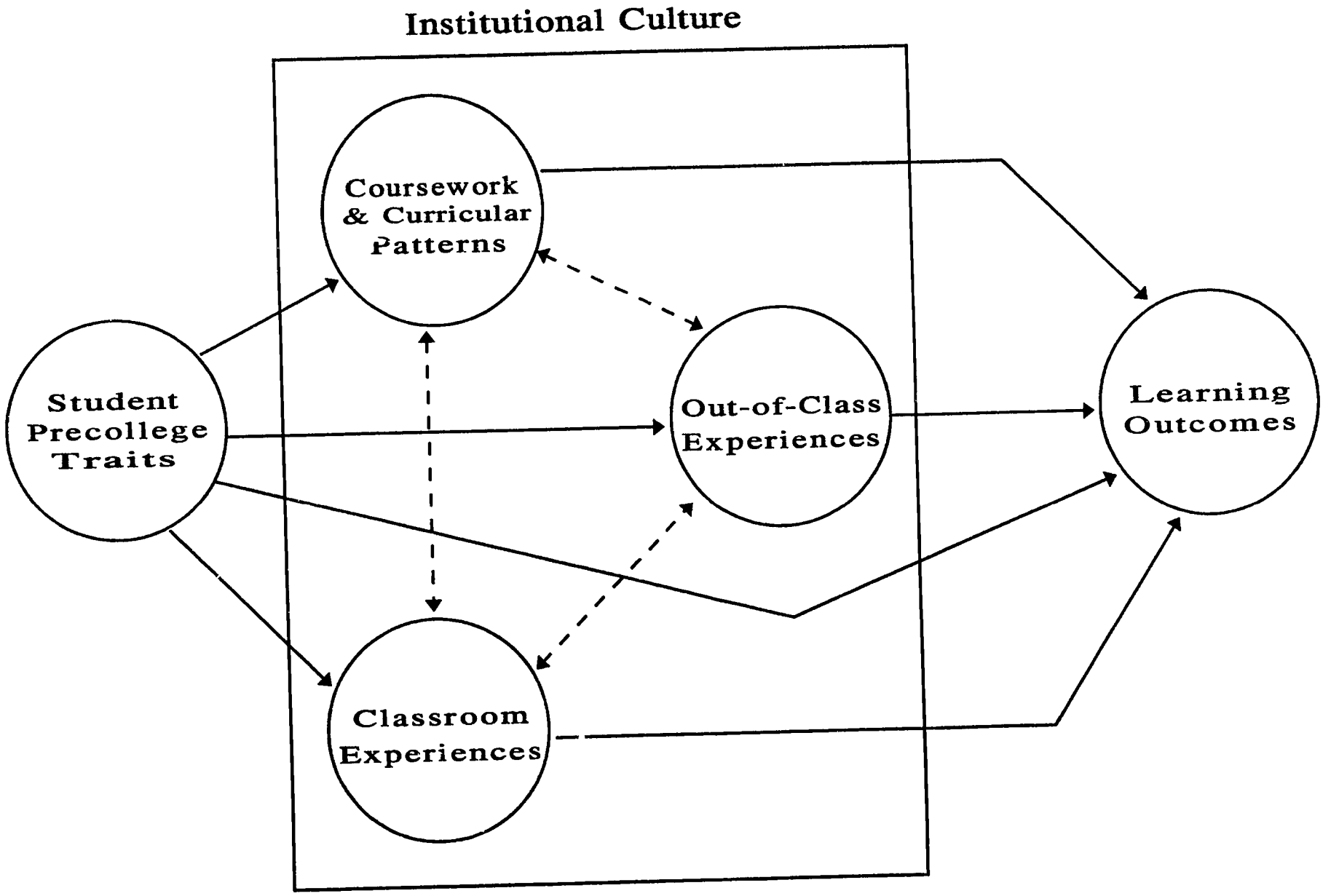
Conceptual Framework

The basic conceptual model for this study (see Figure 1) is longitudinal and draws upon many of the elements of recent conceptualizations of college impact (e.g., Astin, 1984; Pascarella, 1985; Tinto, 1975, 1987; Weidman, 1989). The model hypothesizes six sets of constructs defining a causal sequence that begins when students come to college with a constellation of educationally-relevant background characteristics. These precollege characteristics influence not only the outcomes of college directly, but also students' course-taking patterns, formal classroom experiences, and out-of-class experiences during college, which, in turn, shape educational outcomes. The interplay between and among these sets of influences on learning takes place within a particular institutional context (e.g., organizational characteristics, structures, and policies). This study seeks to estimate the relative importance of students' curricular, classroom, and out-of-class experiences on learning-related attitudes and values after taking into account certain of the precollege characteristics of new students, including initial levels of interest in learning for its own sake. (Because this is a single-institution study, the institutional context is constant for all students and, thus, cannot be a factor in differential change in students' intellectual orientations.)

Design, Sample, and Data Collection

The study employed a one-year, longitudinal, panel study design. Data were collected as part of a pilot study for a large, national, longitudinal investigation of the factors that influence learning, cognitive development, and orientations toward learning in

Figure 1. A General Conceptual Model of College Influence on Student Learning



college. The population for the study was the approximately 4,500 students enrolled for six or more academic credit hours during their first semester (Fall, 1991) at a large, urban, Research I university in the midwest serving an undergraduate population composed primarily of commuters. Students were recruited by mail and from the population of students attending precollege orientation. They were advised they would be participating in a national longitudinal study and would receive a stipend for their participation. Students were also assured that the information they provided would be kept confidential and would never become part of their institutional record.
The Fall, 1991 data collection required approximately four hours, and students were paid $35 for their participation. Students who participated in the Spring follow-up received a second stipend of $35 for their three and one-half hours of testing.

Of those who volunteered for the initial, precollege data collection, 600 were randomly selected to participate (the small initial sample size relative to the population reflects budgetary constraints on the pilot study). Of the 600 students selected to participate, 327 (54.5%) actually did so, with 210 (64.2%) of those also participating in the subsequent Spring, 1992 (the end of the students' first year) follow-up data collection. This sample of 210 students was reasonably representative of the institution's population of new students. However, there was some bias. Although the trends were not statistically significant, students in the sample had somewhat higher academic aptitudes and were somewhat more likely to be non-minority students than the population from which they were drawn.

Variables

Fall, 1991 data were collected using two instruments. The first was Form 88B of the Collegiate Assessment of Academic Proficiency (CAAP), a five-module instrument designed by the American College Testing Program to measure student skills in reading comprehension, mathematics, writing, science reasoning, and critical thinking. The second instrument was specifically designed for this study and gathered information on student demographic and background characteristics. Incorporated in this survey were a series of Likert-type items designed to tap students' orientations toward learning.

The Spring, 1992 follow-up instruments included Form 88A of the CAAP, measures of students' first-year experiences in college, and a specially-designed follow-up survey form. This latter measure contained a second series of Likert-type items tapping students' orientations to learning that were an exact parallel of those completed by students in the fall of 1991.

Following the conceptual framework for this study, one set of dependent variables and four sets of independent variables were developed. The dependent measures were two scales designed to measure students' orientation toward learning. Development of the scale items was guided by such sources as the intellectual orientation/disposition scales of the Omnibus Personality Inventory (Heist & Yonge, 1968), intellectual autonomy or internal attribution for academic success (e.g., Phares, 1973, 1976; Rotter, 1966, 1975; Wolfle & Robertshaw, 1982), and various taxonomies of educational objectives (e.g., Bloom 1956; Braxton & Nordvall, 1985). Initially, 50 items were developed using a Likert-type (5 = strongly agree to 1 = strongly disagree) format.

These items were then subjected to a series of principal component factor analyses with both varimax and oblique rotations. The analyses yielded five meaningful factors from which factor scale scores (the sum of each student's scores on the component items divided by the number of items) were developed using those items loading .40 or higher on a factor. Any items loading at or above .40 on two or more factors were excluded.

Two of these five factors were judged to most closely reflect the construct of "intellectual orientation" or "intellectual curiosity," and they constitute the two dependent measures in this study. Table 1 reports the component items, factor loadings, and internal consistency reliability (Cronbach's Alpha) for each scale. As can be seen there, the first factor (with an internal consistency reliability coefficient of .67) contains items dealing with students' enjoyment of their academic collegiate experiences, the willingness to work hard to master material, and their enjoyment of learning complicated material. The factor was labeled "Interest in Academic Learning" to reflect what appears to be the underlying construct being tapped. The second factor was dubbed "Intrinsic Value of Learning" (alpha = .56) because of the negative components dealing with the importance of preparing for a career and the importance of getting the best grades possible (both items were reverse-scored for scaling), and the positive loadings associated with the valuing of learning in a course above the grade received and the relatively greater value attached to learning about self compared with preparing for a career. Inasmuch as scores on these scales correlate .27, it appears that they tap two relatively independent dimensions of students' orientations to learning.

Table 1

Item Factor Loadings and Alpha Reliabilities

Scale/Item	Loading[a]
Interest in Academic Learning (Scale Alpha = .67)	
My academic experiences (i.e. courses, labs, studying, discussions with faculty) are the most enjoyable part of college.	.63
I am willing to work very hard for a course in order to learn the material, even if it won't lead to a higher grade.	.62
When I do well in a test, it is usually because I was well prepared, not because the test was easy.	.58
I enjoy the challenge of learning complicated new material.	.49
When I don't understand something in a college course, I work at it until I do.	.47
Intrinsic Value of Learning (Scale Alpha = .56)	
My major purpose for being in college is to prepare myself for a career.	-.61[b]
Getting the best grades I can is very important to me.	-.54[b]
What I learn in a course is more important than the grade I receive.	.49
In college, I frequently question or challenge professors' statements and ideas before I accept them as "right."	.43
Learning about myself during college is probably more important than preparing for a career.	.40

[a]No item loaded above .40 on any other scale.
[b]Item was reverse-coded prior to scaling.

The first set of independent variables consisted of students' precollege characteristics, which were controlled in this study. That set included parents' combined formal education and total family income, and students' race/ethnicity, gender, degree aspirations, and precollege scores on the CAAP mathematics and reading comprehension modules (adopted to reflect students' precollege basic academic aptitudes and achievement levels). The internal consistency reliability (KR-20) coefficients for these two CAAP modules are .81 and .84, respectively (American College Testing Program, 1989). The operational forms of all these control variables are given in Table 2.

As explained in greater detail below, the results of this study are based on two, "reduced model" multiple regressions containing only those independent variables which preliminary analyses indicated were related to either or both of the dependent measures. Thus, not all variables used in these preliminary analyses were retained for the final analyses. Tables 2 and 3 list the variables (including item/scale content and metrics) in each of the three areas of institutional influence (the curriculum, students' classroom experiences and instruction-related contacts with faculty members, and their out-of-class experiences) that were retained for the "reduced model" regressions on the "Interest in Academic Learning" (Table 2) and "Intrinsic Value of Learning" (Table 3) scales. Table 4 lists those variables (within each college influence category) that were included in the preliminary analyses for both dependent variables but which were not retained for the final analyses.

Table 2

Independent Variables in Interest in Academic Learning Model

Category/Variable
Precollege
Parents' Education: Sum of mother's and father's education on a 9-point scale, where 1 = grammar school or less and 9 = professional degree.
Total Family Income: 14-point scale, where 1 = less than $6,000 and 14 = $150,000 or more.
Race: 0 = nonwhite, 1 = white.
Sex: 0 = female, 1 = male.
Highest Degree Planned: 4-point scale, where 1 = associate's degree (A.A. or equivalent) and 4 = doctoral degree (Ph.D., Ed.D., M.D., D.O., D.D.S., or D.V.M.).
CAAP Mathematics Score: From ACT's CAAP Mathematics module; mean = 60, SD = 5. Internal consistency reliability (KR-20) for Form B = .81 (American College Testing Program, 1989).
CAAP Reading Score: From ACT's CAAP Reading module; mean = 60, SD = 5. Internal consistency reliability (KR-20) for Form B = .81 (American College Testing Program, 1989).
Courses
Technical or Preprofessional: Number of college courses taken in drawing, drafting, architectural design, criminology, education, study skills, agriculture, business, physical therapy, pharmacy, physical education, nursing, computer programming, or other technical or preprofessional areas.
Sciences: Number of college courses taken in astronomy, biology, botany, chemistry, engineering, geology, microbiology, physics, zoology, or other sciences.

Table 2 (Continued)

Independent Variables in Interest in Academic Learning Model

Category/Variable

Class-Related Experiences

Hrs./Wk. Studying: Single-item rating on a 7-point scale, where 1 = 0 hrs./wk. and 7 = more than 20 hrs./wk.

Instructor Effectiveness in Math: Single-item rating on a 5-point scale reflecting instructor's overall teaching effectiveness in the first course in mathematics taken at this college, where 1 = very poor and 5 = excellent.

Course Learning: 10-item CSEQ "Course Learning" scale reflecting students' experiences in courses (e.g., "Took detailed notes in class" and "Participated in class discussions"). Scored on a 4-point scale, where 1 = never and 4 = very often. Alpha = .78.

Science: 10-item CSEQ "Science" scale reflecting students' experiences with science (e.g., "Memorized formulas, definitions, technical terms" and "Tried to express a set of relationships in mathematical terms"). Scored on a 4-point scale, where 1 = never and 4 = very often. Alpha = .90.

Out-of-Class Experiences

Relationship with Students: CSEQ single-item rating of "Relationship with other students, student groups, and activities" on a 7- point scale, where 1 = "competitive, uninvolved, sense of alienation" and 7 = "friendly, supportive, sense of belonging."

Campus Residence: 10-item CSEQ "Campus Residence" scale reflecting students' experiences in their residence hall (e.g., "Had lively conversations about various topics during dinner in the dining room or cafeteria" and "Studied with other students in the residence unit"). Scored on a 4-point scale, where 1 = never and 4 = very often. For students not living in a residence halls, all responses coded "never." Alpha = .96.

Hrs./Wk. Socializing with Friends: Single-item rating on a 7-point scale, where 1 = 0 hrs./wk. and 7 = more than 20 hrs./wk.

Table 2 (Continued)

Independent Variables in Interest in Academic Learning Model

Category/Variable
Out-of-Class Experiences (Continued)
Hrs./Wk. Talking with Teachers Outside Class: Single-item rating on a 7-point scale, where 1 = 0 hrs./wk. and 7 = more than 20 hrs./wk.
Topics of Conversation: 10-item CSEQ "Topics of Conversation" scale reflecting frequency of conversations with other students on selected "substantive" topics (e.g., "Current events in the news" and "Different life syles and customs"). Scored on a 4-point scale, where 1 = never and 4 = very often. Alpha = .84.

Note. All Alphas are for this sample of students.

Table 3

Independent Variables in Intrinsic Value of Learning Model

Category/Variable
Precollege
Same as Table 1
Courses
None
Class-Related Experiences
Hrs./Wk. Studying: Single-item rating on a 7-point scale where 1 = 0 hrs./wk. and 7 = more than 20 hrs./wk.
Instructor Effectiveness in Social Science: Single-item rating on a 5-point scale reflecting instructor's overall teaching effectiveness in the first course in social science taken at this college, where 1 = very poor and 5 = excellent.
Library Experiences: 10-item CSEQ "Library Experiences" scale reflecting students' experiences in libraries (e.g., "Used the library as a quiet place to read or study materials you brought with you" and "Used the card catalogue or computer to find what materials there were on some topic"). Scored on a 4-point scale, where 1 = never and 4 = very often. Alpha = .81.
Experiences with Faculty: 10-item CSEQ "Experiences with Faculty" scale reflecting students' experiences with faculty (e.g., "Talked with a faculty member" and "Asked your instructor for comments and criticisms about your work"). Scored on a 4-point scale, where 1 = never and 4 = very often. Alpha = .82.

Table 3 (Continued)

Independent Variables in Intrinsic Value of Learning Model

Category/Variable
Out-of-Class Experiences
No. of Non-Assigned Books Read: CSEQ single-item rating on a 5-point scale of the number of non-assigned books read during the current school year, where 1 = none and 5 = more than 20.
Art, Music, Theater: 12-item CSEQ "Art, Music, Theater" scale reflecting students' experiences in the arts (e.g., "Talked about art [painting, sculpture, architecture, artists, etc.] with other students at the college" and "Talked about music [classical, popular, musicians, etc.] with other students at the college"). Scored on a 4-point scale, where 1 = never and 4 = very often. Alpha = .84.

Note. All Alphas are for this sample of students.

Table 4

Independent Variables Dropped from Both Reduced Models

Category/Variable
Courses
Number of college courses taken in:
composition or writing
social science
mathematics
arts and humanities
Class-Related Experiences
Number of textbooks or assigned books read
Number of essay exams taken
Number of term papers or other written reports
Instructor effectiveness in science
Instructor effectiveness in arts and humanities
CSEQ Experiences in Writing scale
Out-of-Class Experiences
Hours worked on-campus
Hours worked off-campus
Hours in student clubs or organizations
Living with parents (dichotomous item)

Table 4 (Continued)

Independent Variables Dropped from Both Reduced Models

Category/Variable
Out-of-Class Experiences (Continued)
CSEQ scales:
Athletic and Recreation Facilities
Student Union
Personal Experiences
Clubs and Organizations
Student Acquaintances

Analytical Procedures

Data analysis proceeded in two stages. In order to avoid inflated estimates of the proportion of the variance explained due to the large number of independent variables relative to the sample size, the first stage consisted of a series of ordinary least-squares (OLS) regressions to identify those variables within each college influence set (curriculum, class-related, and out-of-class experiences) that were statistically significant predictors of each outcome measure net of students' precollege characteristics, but not controlling for students' precollege intellectual orientations or other college experience variables. These variables were left uncontrolled to avoid masking (through collinearity among the predictor variables) the possible influence of college experience variables that might be of theoretical or practical interest in their own right. Only those college influence variables related ($p < .10$) to the dependent variable being modeled were retained. Thus, the variable selection process was an inherently lenient one.

The second stage of analysis used OLS regressions to estimate, for each dependent measure, the unique and joint proportion of the variance explained by each of the three (now reduced) college experience variable sets. To estimate the unique variance attributable to each category of variables, each of the three sets of college influence measures was entered into the regression after precollege characteristics and the other two college experience sets had been entered. The change in the value of the R^2 accompanying the entry of the last set reflects the magnitude of that variable set's influence on intellectual orientations above and beyond that attributable to students' precollege characteristics and all other college experience variables. Estimates of the

proportion of the total variance shared by the three college experience variable sets were derived by subtracting from the overall R^2 the sum of the variance due to the precollege characteristics plus the unique variance associated with each of the three college experience variable sets. Such an analytical approach produces conservative estimates of the influence of each set of experience variables in that any variance these experience variables share with students' background characteristics are attributed to the precollege characteristics set.

Students' precollege level of intellectual curiosity could be expected to be the single-most powerful predictor of intellectual orientation at the end of the first year. Under such conditions, the probability was strong that the influence of other predictor variables of inherent theoretical or practical interest might be masked due to collinearity among the independent variables. Consequently, two "reduced model" regressions (i.e., containing only those variables identified in the first stage analyses) were run for each intellectual orientation measure, the first with precollege level on that measure controlled (included in the set of precollege characteristics, labeled the "In" model), the second with precollege level left uncontrolled (the "Out" model). The two reduced models for each dependent variable produce upper- and lower-bound estimates of the influence of each variable set. Inclusion of students' precollege level of intellectual orientation (the "In" model) probably underestimates college's influence on that dependent variable, while exclusion or precollege intellectual orientation (the "Out" model) probably overestimates college's effects.

RESULTS

Table 5 summarizes the results of the four reduced-model regressions to estimate the unique and shared variance for each of the two intellectual orientation criterion variables. Overall, the models explained 43.2% and 51.2% of the total variance in students' interests in academic learning (depending on whether precollege orientation level was excluded or included) and 25.6% and 45.4% of the total variance in the measure of the intrinsic value students' find in learning. When precollege intellectual orientation levels were excluded from the models (the "Out" models), background traits accounted for less than 6 percent (statistically non-significant amounts) of the variance in year-end orientations. With precollege intellectual orientation status included (the "In" models), the variance attributable to precollege characteristics jumped to 32-34 percent.

The number of courses taken in any of six general categories during the first year was unrelated to changes in intellectual orientations (a possible explanation for this finding is offered below). Even with precollege and other college experience variables controlled, however, variables reflecting students' class-related and out-of-class experiences both made statistically significant and unique contributions to changes in both measures of students' intellectual orientations, whether or not (with one exception) precollege intellectual orientations were controlled.

For changes in students' interest in academic learning, Table 5 indicates that, of the total variance explained by the "Out" model (43.2%), students' class-related experiences uniquely account for about half (22.1%), about 7 times as much as that explained by students' out-of-class experiences (3.5%). The unique variance attributable to out-of-

Table 5

Partitioning of Variance Results for Reduced-Model Regressions on Interest in Academic Learning and Intrinsic Value of Learning Scales

	Interest in Academic Learning		Intrinsic Value of Learning	
Variable Set	Out[a]	In[b]	Out	In
Variance due to Precollege Characteristics	.048	.318***	.057	.343***
Unique[c] Variance due to:				
Courses Taken	.011	.009		
Class-Related Experiences	.221***	.141***	.077***	.052***
Out-of-Class Experiences	.035*	.023	.086***	.041***
Total Shared Variance[d]	.117	.021	.036	.018
Total Variance Explained	.432***	.512***	.256***	.454***

[a]Precollege score on dependent variable excluded from model.
[b]Precollege score on dependent variable included in model.
[c]Controlling for precollege variables and other college experience variable sets.
[d]Shared among the three college experience variable sets. The statistical significance of these estimates cannot be determined.

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

class variables, while relatively small, was nonetheless statistically significant. When students' precollege level of interest in academic learning is taken into account (the "In" model), the approximately 7-1 ratio in the importance of class-related experiences compared to out-of-class experiences is maintained, although (as expected) the amount of variance each set explains is reduced (by about a third in both instances: from 22.1% to 14.1% for class-related experiences, and from 3.5% to 2.3% for out-of-class experiences).

Particularly noteworthy is the fact that, for the "Out" model of the Interest in Academic Learning scale, 11.7% of the total variance explained (i.e., a little more than one quarter of the explained variance) is shared among the three college experience variables sets. The shared variance is an estimate of the joint, simultaneous influence of all college experience variables above and beyond the variance attributable to students' precollege characteristics and the unique contributions of each college experience set. When precollege scores on this dependent measure are controlled, the shared variance drops to 2.1%.

For the "Intrinsic Value of Learning Scale," Table 5 indicates, again, that the courses the students took were not related to this outcome, but also that students' class-related and out-of-class experiences both contribute significantly and about equally to the explanation of variance (8 to 9% in the "Out" model and 4 to 5% in the "In" model) above and beyond students' precollege characteristics. Not only are the contributions of these two variable sets more balanced than was the case with students' interest in academic learning, but the drop in the contributions with the addition of students'

precollege scores on this outcome measure was less here than in the other regression. The proportion of the variance shared among the college experience variables is also smaller than was the case in the regression on students' interests in learning.

These shared variance estimates may reflect "reality," that is, the extent to which students' college experiences in fact jointly influence learning, or they may be a statistical artifact, reflecting multicollinearity (the intercorrelations) among the independent variables. To shed light on this issue, several analyses were undertaken. Independent of sign, the median correlation among the independent variables in both models was .078. For the "Interest in Academic Learning Scale," the 95% confidence interval for the mean correlation of .110 was between .094 and .126. No correlation coefficient exceeded .553 for this model. For the "Intrinsic Value of Learning Scale," the 95% confidence interval for the mean (.107) was .097 to .127. The highest correlation among independent variables in this model was .39. A formal analysis of the degree of collinearity in the two models was also carried out using the collinearity diagnostics available in SAS (SAS Institute, 1989). The results of this analysis were consistent with those reported above in indicating little or no collinearity among the predictor variables in any of the four reduced model regressions. Thus, the evidence rather clearly suggests that the shared variance reflects magnitude of the joint effects of the college experience and not multicollinearity among the predictor variables.

Table 6 reports the standardized multiple regression coefficients (beta weights) reflecting the relative contributions of each component variable to the explanation of variance in the dependent measure. For students' interest in academic learning, as can be

Table 6

Beta Weights at Final Step[a] for Reduced-Model Regressions on Interest in Academic Learning and Intrinsic Value of Learning Scales

	Interest in Academic Learning		Intrinsic Value of Learning	
Variable	Out[b]	In[c]	Out	In
Precollege				
Parents' Education (Sum)	-.05	-.02	-.04	.04
Total Family Income	-.00	.01	.04	.05
Race	-.06	-.02	-.03	.04
Sex	-.01	-.01	.14	.05
Highest Degree Planned	.04	.05	.02	-.01
CAAP Mathematics Score	.05	.06	.04	-.01
CAAP Reading Score	.01	-.01	.09	-.01
Dependent Measure		.33***		.49***
Courses				
No. in Tech./Preprofessional	.09	.10		
No. in Sciences	.08	.02		
Class-Related Experiences				
CSEQ Scales:				
Course Learning	.43***	.36***		
Science	.09	.08		
Library Experiences			-.14*	-.15*
Experiences with Faculty			.24**	.21***
Hrs./Wk. Studying	.17**	.14*	-.12	-.07

Table 6 (Continued)

Beta Weights at Final Step[a] for Reduced-Model Regressions on Interest in Academic Learning and Intrinsic Value of Learning Scales

Variable	Interest in Academic Learning		Intrinsic Value of Learning	
	Out[b]	In[c]	Out	In
Class-Related Experiences (Continued)				
Instructor Effectiveness in Math	.11	.05		
Instructor Effectiveness in Soc. Science			.16*	.11*
Out-of-Class Experiences				
CSEQ Scales:				
Campus Residence	.04	.01		
Topics of Conversation	-.05	-.10		
Art, Music, Theater			.24***	.16*
No. Non-Assigned Books Read			.15*	.12*
Relationship with Students	.10	.06		
Hrs./Wk. Socializing with Friends	-.16**	-.12*		
Hrs./Wk. Talking with Teachers Outside Class	.07	.05		

Note. The absence of a beta weight for a variable indicates that the measure was not included in the model.

[a]All variables with a beta weight reported were included in model.
[b]Precollege score on dependent variable excluded from model.
[c]Precollege score on dependent variable included in model.

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

seen in that table, two class-related experience and one out-of-class experience variables had statistically significant beta weights in both the "In" and "Out" regressions. Among students' class-related experiences, the number of hours spent studying and students' course learning experiences were both positively related to students' year-end level of interest in academic learning (both with and without controls for precollege level). Students' course learning experiences had by far the largest influence, contributing more than two and one-half times as much as the time spent studying. This scale reflects the extent to which students took detailed class notes, participated in class discussions, tried to see how different ideas and facts fit together, thought about practical applications of course material, worked on a paper or project that required integrating ideas from various sources, tried to explain course material to another student or friend, and did additional reading on topics introduced and discussed in class.

Among students' out-of-class experiences, only the number of hours per week students spent socializing with friends made a statistically significant contribution (in both models), and that effect was negative. The more time students spent socializing, the smaller the gains they were likely to experience in the level of their interest in academic learning. Examination of the variables' means indicates that, on average, students spent slightly more time studying than they did socializing (both between 6 and 10 hours per week). The beta weights indicate that these two variables made approximately equal contributions to the explanation of changes in students' interest in academic learning.

Interestingly, none of the variables that contributed to changes in students' interests in academic learning were involved in the prediction of the intrinsic value students find in

learning. In both the "In" and "Out" models for that dependent measure, three class-related experience variables and two out-of-class variables had statistically significant beta weights. In the academic domain, students' experiences with faculty members made the largest contribution, followed by students' library experiences (negative), and their evaluations of the effectiveness of the instruction they had received in the social sciences. The CSEQ's "Faculty Experiences" scale reflects the extent to which students did such things as talk with a faculty member, ask for course-related information, visit informally with a faculty member after class, discuss ideas for a term paper or class project with an instructor, ask an instructor for comments and criticisms of their work, meet a faculty member for coffee or a soft drink, or work with a faculty member on a research project. The Library Experiences scale describes the extent of such activities as students' use of the library as a quite place to read or study materials the student brought, use of the card catalogue or computer to find materials, reading in the reserve or reference section, developing a bibliography or set of references for a paper or report, finding interesting reading material through browsing, reading a basic reference or document to which other authors referred, or checking out non-textbooks to read. No explanation for the negative relation between these activities and students' scores on the intrinsic value of learning scale is readily apparent, nor is it obvious why students' evaluations of the instruction they had received in the social sciences (but not in other disciplines) was positively related to the intrinsic value students find in learning.

Among students' out-of-class experiences, students' involvement with art, theater, and music made the largest contribution. This CSEQ scale reflects the extent of student

involvement in talking about art, theater, or music with other students; going to art galleries or exhibits, plays, or concerts; reading or discussing art, theater, or music critics' opinions, and participating in some art, theater, or music activity. Reading non-assigned books was also positively and uniquely (although somewhat less strongly) related to the intrinsic value students find in learning.

Limitations

This study is limited in several respects. First, it is based on data from a relatively small sample of students at a single institution who are probably not representative of any national population. While these students may well be representative of first-year students at similar commuter institutions, only a small number lived in university-controlled housing and, thus, the nature and impact of their college experiences may not be representative of those of students at residential institutions. Second, the study examines change over only one year. It seems quite possible, even probable, that greater, cumulative changes may occur later in students' college careers. This study, however, cannot address the magnitude of change over a longer period nor whether the same college influences may be consistently salient in subsequent college years. Third, "intellectual curiosity" or "orientation toward learning" are complex constructs. It is entirely possible that the dependent measures in this study only begin to reflect that complexity. Fourth, the measures of students' curricular experiences (the number of courses taken in each of six general disciplinary categories) probably does not adequately reflect the effects of those courses (or the patterns among them) on changes in students' orientations to learning.

DISCUSSION AND CONCLUSIONS

The findings of this study are consistent with a number of other studies indicating that what happens to students after they matriculate has a substantially greater influence on what and how much they learn than does the precollege personal and academic baggage students bring with them to college (see Pascarella & Terenzini, 1991). Measures of a variety of students' college experiences variables explained an additional 20 to 38 percent of the total variance above and beyond that attributable to students' precollege characteristics. Even when students' initial intellectual orientations were taken into account, students' college experiences still explained an additional 11 to 19 percent of the variance, all statistically significant and unique increments in the variance explained. The number of courses students had taken in each of six general disciplinary categories (used as a measure of curricular effects), however, appeared to be unrelated to intellectual orientations net of students' precollege characteristics and other college experiences. This finding may be artifactual, however, due more to the relatively imprecise measurement of curricular effects (i.e., number of courses taken instead of, say, patterns of coursework). It may also be that curricular effects are cumulative over time and not manifest until later in students' college careers.

More interesting and important is the finding that both students' class-related experiences and their out-of-class experiences made statistically significant and unique (if sometimes modest) contributions to the explanation of variations in intellectual orientations above and beyond students' precollege traits and their experiences in other areas of college life. Students' class-related experiences uniquely explained from 5 to 22

percent of the total variance, while students' out-of-class experiences uniquely explained 2 to 8 percent of the total. Moreover, not only do students' class-related and out-of-class experiences exert simultaneous and unique effects on students' intellectual curiosity, the two variable sets also exert a modest joint effect, together explaining between 2 and 12 percent of the variance not attributable uniquely to any other college experience or to students' precollege characteristics.

Identification of both unique and joint effects of students' classroom-related and out-of-class experiences is both theoretically and practically significant. From a theoretical point of view, this study (so far as we know) offers the first empirical evidence supporting long-held theoretical beliefs that students learn holistically, that learning is shaped both by their formal, classroom experiences and by their out-of-class experiences. Pascarella and Terenzini (1991) note that

> Most theoretical models of development in no way guarantee that any single experience will be an important determinant of change for all students. A majority of important changes that occur during college are probably the cumulative result of a set of interrelated experiences sustained over an extended period of time. (p. 610)

They conceded, however, that there was no empirical evidence to support this belief. Now there is. And given the present findings, it would appear that research on college's effects on students must take greater account of the multiple and interrelated sources of influence on any given educational outcome. Unless that is done, the magnitudes of those effects will be underestimated and the relative importance of various general or specific aspects of the college experience will remain unclear.

From a practical point of view, this finding suggests the importance of a more comprehensive perspective in educational program planning and development and closer collaboration among academic and student affairs divisions in the delivery of educational programs and services. Given the desire to intervene in students' lives in ways that maximize desired educational effects, faculty and administrators must take into account not only the most promising and proximate interventions, but also a wide range of student experiences -- in and outside the classroom -- that can mediate the extent to any particular goal is achieved. What students learn in the classroom does not remain untouched by what happens to them outside class. The evidence indicates that students' academic and non-academic experiences both separately and jointly shape student learning.

Gains in students' interest in academic learning appeared to be primarily a function of three kinds of experiences, two class-related and one out-of-class experiences, two positive and one negative. Whether controlling for precollege level of interest in academic learning or not, students' classroom experiences (e.g., participation in class discussions, trying to see how different ideas fit together, dong a paper or project requiring the integration of ideas from different sources) was the most powerful predictor of academic interest levels. Time spent studying was also positively related to this outcome. Both findings are quite consistent with Astin's (1985) hypotheses about the important, positive role of active student involvement in learning. In the out-of-class domain, however, the amount of time students spent socializing with friends was negatively related to gains in academic interest levels. Given that time is a finite commodity, time spent socializing is time unavailable for studying and the positive

benefits attached to that activity. The findings imply not all forms of involvement may be beneficial to students' intellectual development. It may well be, of course, that the relationship is curvilinear, with out-of-class socializing educationally beneficial in reasonable amounts but counterproductive for academic learning in larger doses. One might also speculate that different socializing experiences with student peers have different effects on academic development. Studies of both the nature and quality, as well as quantity, of student socializing might clarify this matter.

Three class-related experiences (one negative) and two out-of-class experiences (both positive) appear to be the major contributors to gains in the intrinsic value students find in learning. Students' experiences with faculty members (e.g., in- and after-class interactions, seeking criticism of one's work, working with a faculty on a research project), and their instructors' effectiveness in teaching the social sciences are both positively related to gains in this area. Use of the library for most purposes, however, appears (unaccountably) to be negatively related to gains in the intrinsic value attached to learning.

Outside the classroom, students' involvement in art, theater, or music is the strongest contributor to gains in the intrinsic value students attach to learning, as is the number of non-assigned books students read. Students' class-related involvement with faculty members and their art/theater/music-related activities have about the same level of influence on the level of intrinsic value students find in learning. Both of these latter activities are, of course, also consistent with Astin's (1985) "involvement" proposition.

The evidence in this study not only suggests some of the ways in which students' out-of-class experiences support class-related activities that promote positive changes in students' intellectual orientations, but it also identifies at least one way (i.e., the time spent socializing with friends) in which the out-of-class environment may militate against the achievement of instructional and academic goals. Future research will have to take these interconnected (positive and negative) relationships into account in analyzing college's effects on students. Similarly, faculty members and administrators are likely to benefit from taking these interconnections into account as they plan and develop educational activities intended to enhance student learning.

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