FIRST-GENERATION COLLEGE STUDENTS: Characteristics, Experiences, and Cognitive Development

Patrick T. Terenzini, Leonard Springer, Patricia M. Yaeger, Ernest T. Pascarella, and Amaury Nora

This study sought answers to three questions: (1) Do the precollege characteristics of first-generation students differ from those of traditional students? (2) Do first-generation students' college experiences differ from those of other students? (3) What are the educational consequences of any differences on first-year gains in students' reading, math, and critical thinking abilities? Answers come from 2,685 students (825 first-generation and 1,860 traditional students) who entered 23 diverse institutions nationwide in Fall 1992 and who completed one year of study. First-generation students differ from their traditional peers in both entering characteristics and college experiences. Although traditional students make greater net gains in reading during their first year, the two groups gain to about the same degree in math and critical thinking skills. Those gains, however, appear to result from somewhat different experiences.

As colleges and universities have become increasingly accessible to women, people of color, and students from low-income families, the profile of the undergraduate student body has changed with respect to students' age, enrollment status, attitudes, family conditions, and physical and psychological health, as well as gender and race/ethnicity (Hodgkinson, 1985; Levine and Associates, 1989; Upcraft, 1996). The evolution in the demographic profile of students entering higher education is projected to continue over the next decade. Many of these students will come from low-income homes and be the first in their families to pursue postsecondary education (Levine and Associates, 1989).

Patrick T. Terenzini, Professor and Associate Director, National Center on Postsecondary Teaching, Learning, and Assessment (NCTLA), The Pennsylvania State University, 403 South Allen St., Suite 104, University Park, PA 16801-5252. Leonard Springer, Research Assistant, NCTLA—The Pennsylvania State University. Patricia M. Yaeger, Research Assistant, NCTLA—The Pennsylvania State University. Ernest T. Pascarella, Professor and Director, National Study of Student Learning, NCTLA—University of Illinois–Chicago. Amaury Nora, Associate Professor and Associate Director, National Study of Student Learning, NCTLA—University of Illinois–Chicago.

1

While a daunting literature exists on "new" and disadvantaged students (e.g., Cross, 1981; Mow and Nettles, 1990; Solomon and Gordon, 1981), as well as on the relation between parents' education and college choice, persistence, and performance, surprisingly little is known about first-generation students. What we do know *specifically* about first-generation students falls into three broad categories that resemble the temporal order of the college-going process itself. The first category consists of studies of first-generation students' precollege expectations, planning, or their college choice process (Attinasi, 1989; Conklin and Dailey, 1981; Murphy, 1981; Pratt and Skaggs, 1989; Stage and Hossler, 1989; York-Anderson and Bowman, 1991). York-Anderson and Bowman, for example, found differences between first-generation and traditional students with respect to their basic knowledge of college, personal commitment, and level of family support, with first-generation students being at a disadvantage in most cases. Attinasi identified two process stages: one involving the attitudes and behaviors of students prior to matriculation (or "getting ready," as he calls it), and a second stage process involving "getting in," referring to students' attitudes and behaviors after matriculation as they attempt to become academically and socially integrated in their new institution. Stage and Hossler found a positive relation between several parental characteristics, including educational level, which had a significant effect on their expectations for the educational attainment of their ninth-grade children and, in turn, on their children's own educational plans.

A second category of research on first-generation students concentrates on the transition between high school or work and college. Some of these studies (e.g., Lara, 1992; Rendon, 1992; Rodriguez, 1975, 1982) provide poignant accounts of personal experiences the authors encountered as the first in their families to attend college. First-generation students face all the anxieties, dislocations, and difficulties of any college student, but their experiences often involve cultural as well as social and academic transitions (London, 1989; Weis, 1985, 1992). London examined the experiences of first-generation students struggling (as did Rendon and Rodriguez) to reconcile the conflicting roles and demands of family membership and educational mobility. London notes that, "It is only when we see that mobility involves not just gain but loss . . . that we can begin to understand the attendant periods of confusion, conflict, isolation, and even anguish that first-generation students report here" (p. 168). Similar findings are reported in Terenzini, Rendon, Upcraft, Millar, Allison, Gregg, and Jalomo (1994).

The third category of research on first-generation college students examines the effects of their college experiences on persistence during college, typically in comparison with their "traditional" peers (e.g., Attinasi, 1989; Bean and Metzner, 1985; Billson and Terry, 1982; Richardson and Skinner, 1992; Skinner and Richardson, 1988). These studies consistently indicate that first-generation

students are at greater risk with respect to both persistence and degree attainment than are their traditional peers largely because of lower levels of academic and social integration (Billson and Terry, 1982). While not specific to first-generation students, most studies of persistence or degree attainment include parents' education as a critical predictor variable (see the reviews of Spady, 1970; Tinto, 1975; Pantages and Creedon, 1978). With few exceptions, parents' education, or the broader concept of socioeconomic status, is positively related to student persistence and degree completion.

 Beyond factors shaping first-generation students' persistence behaviors, however, we found no studies examining first-generation students' experiences during college, or their cognitive or psychosocial development. Thus, this study sought answers to three questions: (1) Do first-generation students' precollege characteristics differ from those of "traditional" (i.e., not first-generation) students? (2) Do first-generation students' experiences during the first year of college differ from those of traditional students? (3) What are the consequences of any differences for students' cognitive development?

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 wide array of educationally relevant background characteristics (including level of cognitive development). These precollege characteristics are presumed to 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, also 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, policies, structures, and culture).

The present study is not a test of the validity of the causal structure of this model, but the model does serve two useful purposes. First, it identifies those categories of variables that have potential for shaping educational outcomes (in this case, cognitive development). Second, it suggests a causal sequence that forms the basis of the analyses undertaken to answer question 3 (see below). In addressing that question the study estimates the influence on first year cognitive gains by those aspects of college (i.e., students' curricular, classroom, and out-of-class experiences, as well as selected institutional characteristics) on which first-generation and traditional students may differ. These estimates are made *after* taking into account certain precollege characteristics on which the

Institutional Context

– – – – – – Reciprocal Causation
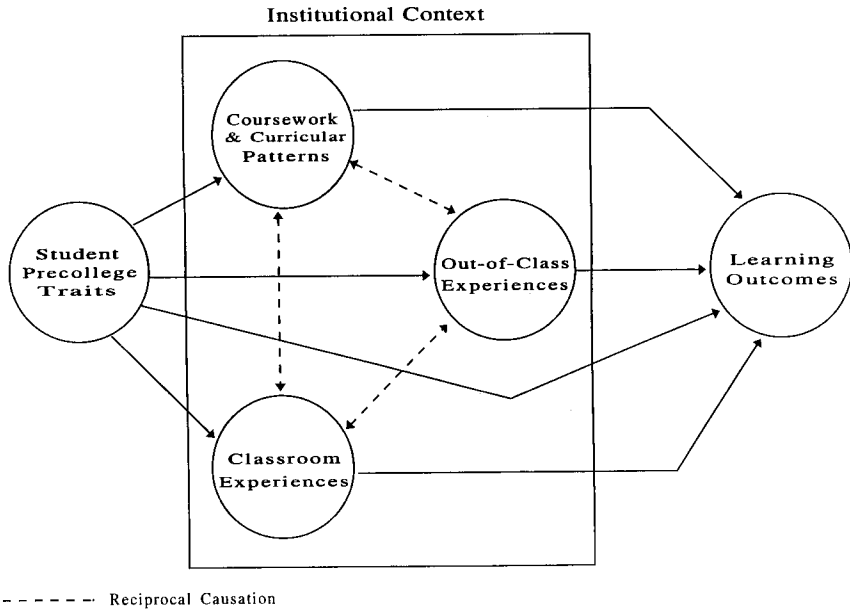
FIG. 1. A model of college impact.

two categories of students differ, including initial reading, math, and critical thinking abilities.

Institutional Sample

This study is part of the National Study of Student Learning (NSSL), a three-year, longitudinal, national study of some 4,000 new students who, in the Fall of 1992, entered 18 four-year and 5 two-year colleges and universities nationwide. NSSL is being conducted by the National Center on Postsecondary Teaching, Learning, and Assessment (NCTLA), a national research and dissemination center funded by the U.S. Department of Education's Office of Educational Research and Improvement (OERI).

Institutions were selected from the National Center for Education Statistics' Integrated Postsecondary Education Data System (IPEDS) database to represent differences in colleges and universities nationwide on a variety of characteristics, including institutional type and control (e.g., private and public research universities, private liberal arts colleges, public and private comprehensive universities, two-year colleges, historically black colleges), size, geographic location, commuter versus residential character, and the ethnic distribution of the undergraduate student body. In the aggregate, the student population of these 23 institutions approximates the national population of undergraduates by ethnicity and gender.

Student Sample and Instruments

The initial data collection was conducted in the Fall of 1992. Each of the 23 participating institutions was given a target sample size relative in magnitude to the respective sizes of the entering class at each institution. The overall target sample was 5,000 students. The overall obtained sample size (i.e., those students actually participating) for the Fall 1992 data collection was 3,840, a participation rate of 76.8 percent. Insofar as possible, students at each institution were sampled randomly from among new students.

The initial data collection lasted approximately three hours. Students were advised that they were participating in a national, longitudinal study of student learning and would be paid a $25 stipend for their participation. They were also advised that the information they provided would be kept confidential, would never become part of their institutional records, and that all that was expected of them was a good-faith effort on the test modules (see below) and a candid response to all other questionnaire items.

An NCTLA-developed precollege survey form gathered information on students' demographic characteristics and background, as well as their aspirations, expectations of college, and orientations toward learning. Participants also completed Form 88A of the Collegiate Assessment of Academic Proficiency (CAAP). The CAAP was developed by the American College Testing Program (ACT) specifically to assess selected general skills typically acquired by students during the first two years of college (ACT, 1989). The total CAAP consists of five, 40-minute, multiple-choice test modules, three of which—reading, math, and critical thinking—were used in this study.

A follow-up testing of the sample took place in the Spring of 1993. This data collection required about three and one-half hours and included Form 88B of the CAAP, Pace's (1984) College Student Experience Questionnaire (CSEQ) to measure students' first-year experiences in college, and a specially designed follow-up survey form assessing aspects of students' first-year experiences not covered by the CSEQ. Students were paid a second stipend ($35) for their participation in the follow-up data collection. Of the original sample of 3,840 students who participated in the Fall 1992 testing, 2,685 also took part in the Spring 1993 data collection, yielding a response rate of 69.9 percent. Of these respondents, 825 (30.7%) were first-generation students (i.e., have no parent with any college or university experience) and 1,860 (69.3%) were "traditional" students.

Given the high response rates at both testings, it is not particularly surprising that the sample was reasonably representative of the population from which it was drawn. Nonetheless, to adjust for potential response bias by gender, ethnicity, and institution, a sample weighting algorithm was developed. Specifically, within each individual institution, participants in the follow-up data col-

lection were weighted so as to be representative of the institution's first-year population by gender (male or female) and ethnicity (white, black, Hispanic, other). Thus, for example, if Institution A had 100 black men in its entering class and 25 black men in the sample, each black male in the sample was given a sample weight of 4.00. An analogous weight was computed for participants falling within each gender × ethnicity cell within each institution. The effect of applying sample weights in this manner was to adjust not only for response bias by gender and ethnicity, but also for differential response rates across institutions. Given the sampling plan that led to the selection of the 23 institutions in this study and the weighting of individual respondents within each institution, the weighted aggregate sample of 2,685 students is reasonably representative of the Fall 1992 national population of first-year students with respect to gender and ethnicity.

Variables

The dependent variables in question 3 of this study were the Spring 1993 scores on the CAAP reading, math, and critical thinking tests. The CAAP reading test contains 36 items that assess reading comprehension as a product of skill in inferring, reasoning, and generalizing. Passages cover topics in fiction, the humanities, the social sciences, and the natural sciences. The KR-20 internal consistency reliabilities for the reading test range between .84 and .86. The 35-item mathematics test is designed to measure a student's ability to solve mathematical problems encountered in many postsecondary curricula. The emphasis is on quantitative reasoning rather than formula memorization. The content areas tested include pre-, elementary, intermediate, and advanced algebra; coordinate geometry; trigonometry; and introductory calculus. The KR-20 reliability coefficients for the math test range between .79 and .81. The critical thinking module is a 32-item instrument that measures a student's ability to clarify, analyze, evaluate, and extend arguments. Each of four passages presents a series of subarguments that support a more general conclusion. Each passage is accompanied by a set of multiple choice questions. The KR-20 reliability coefficients range from .81 to .82 (ACT, 1989). In a pilot test with a sample of 30 college students, the CAAP critical thinking module scores correlated .75 with the total score on the Watson-Glaser Critical Thinking Appraisal (Watson and Glaser, 1980).

Following the conceptual framework for this study, five sets of independent variables were developed. The first set contained 37 precollege characteristics, including students' gender, race/ethnicity, total family income, degree aspirations, and students' precollege scores on the CAAP reading, math, and critical thinking tests. These variables are listed in Table 1, given in the Results section. Examination of the distributions of the nominal variables (e.g., race/ethnicity

and gender) indicated that the limited skewness present was unlikely to bias regression parameter estimates.

Four additional sets of independent variables were developed, each operationalizing a portion of the conceptual framework shown in Figure 1. The curricular experiences variable set contained 7 indicators. Students' formal academic experiences were reflected in 12 variables, their out-of-class experiences by 15 indicators, and their institution's structural and contextual characteristics by 16 variables. The specific variables in each set are listed in Table 2 (also given in the Results section).

Analytical Procedures

To answer question 1 (concerning initial differences between first-generation and traditional students), the 37 precollege characteristics were entered into an ordinary least-squares (OLS) multiple regression with group membership (1 = first-generation student, 0 = traditional; first-generation students were defined as those with no parent who had attended college). (Analyses were also done using logistic regression and discriminant function analysis, but the results were essentially the same. OLS was adopted as producing results that are easier to interpret and more familiar to most readers.) A stepwise procedure was employed. This method enters independent variables one at a time on the basis of each measure's ability to explain the largest amount of the total variance not attributable to variables already in the model. The result is an optimal prediction equation with as few variables as necessary to maximize the differences between groups.

To answer question 2 (differences between the groups in their experiences of college), a series of four setwise OLS regressions with group membership as the dichotomous, dependent variable was performed. Consistent with the conceptual framework shown in Figure 1, group differences were tested in the four areas listed above. Group membership was regressed separately on each of the four experience variable sets while controlling for those precollege characteristics on which the two groups differed in the analysis for question 1. In the regression for any given set of college experiences, the other experience variable sets were not included so as not to mask the influence of any variable in the target set that might be of practical or theoretical interest. The beta weights (standardized regression coefficients) were used to identify the specific experiences in each experience variable set that were statistically significant after controlling for precollege characteristics and all other variables in that same set.

In the analyses for question 3 (whether group differences in college experiences had differential effects on first-year cognitive developmental gains), three setwise OLS regressions (one for each dependent variable) were employed, each having three steps. In the first step, students' scores on one of the three

CAAP tests (reading, math, or critical thinking, in seriatim) at the end of the first year were regressed, first, on the precollege characteristics on which the two groups differed in the analysis for question 1. For this analysis, students' precollege scores on the appropriate CAAP module (e.g., precollege reading score when reading was the dependent variable) and group membership were also included as a control variable.

In the second step, the set of college experience variables (combined from all four influence areas) on which the groups differed (see analyses for question 2) were entered. Finally, to test whether the college experiences had differential educational effects (i.e., impacts that differed for the two groups) for any of the three cognitive outcome variables, a set of cross-product interaction terms was entered (group membership $\times$ each of the college experience variables on which the two groups differed in the analyses for question 2). If the addition of the set of interaction terms produced a statistically significant increase in the magnitude of the R^2 for the full, main effects model (i.e., the one containing all precollege characteristics and college experiences on which the two groups differed in the analyses for questions 1 and 2), then the significance of the regression weights was examined to identify those interaction terms that indicated a nonchance, differential effect. Significant interaction terms were then plotted (using the unstandardized regression weights) to gain an understanding of the nature of the differential effects.

At this point in the overall analytical plan, least-squares analysis of covariance techniques was also employed to determine whether first-generation and traditional students differed in their first-year gains on any of the three cognitive measures after controlling for differences in precollege characteristics.

RESULTS

Analyses for Question 1

The results of the analyses to answer question 1 are shown in Table 1. All beta weights shown there are statistically significant at $p < .05$ or beyond. First-generation and traditional students differed on 14 of the 37 precollege characteristics. As can be seen in the table, the largest differences between the two groups were on total family income and being Hispanic. In addition to being more likely to come from lower-income homes and to have Hispanic family origins, first-generation students (compared to their traditional peers) also had lower initial critical thinking abilities, lower degree aspirations (for this or any college), reported receiving less encouragement from family to attend college, spent less time socializing with peers and talking with teachers while in high school, and were more likely to be women. First-generation students also tended to be older, to have more dependent children, to expect to need additional time to complete their degrees, and to be more confident in their choice of a major field. While the significant beta weight suggests first-

TABLE 1. Precollege Characteristics on Which First-Generation and Traditional Students Differ

Step	Background Characteristics	Mean		SD		Beta Weight
		FG	Trad.	FG	Trad.	
1	Family income (14 intervals, 1 = < $6,000 to 14 = $150,000 or more)	5.57	8.46	3.17	3.30	−.23
2	Hispanic (1 = yes, 0 = no)	0.36	0.13	0.48	0.33	.14
3	Age	21.69	19.50	7.35	4.80	.06
4	CAAP critical thinking score (precollege measure)	59.65	62.72	5.42	5.52	−.09
5	Highest degree sought in lifetime anywhere (1 = none to 5 = doctorate)	3.95	4.25	0.87	0.73	−.06
6	Encouragement and support to attend college from high school teachers (1 = no support to 4 = extremely supportive)	3.27	3.23ᵃ	0.88	0.94	.11
7	Encouragement and support from family (1 = no support to 4 = extremely supportive)	3.52	3.77	0.77	0.62	−.08
8	No. of dependent children (1 = none to 5 = three or more children)	1.30	1.07	0.77	0.37	.07
9	Time spent talking with teachers outside class in high school (1 = never to 4 = very often)	2.46	2.59	0.88	0.81	−.06
10	Will need extra time to complete degree (1 = no chance to 4 = very good chance)	2.81	2.55	0.84	0.85	.06
11	Highest degree sought at this institution (1 = none to 5 = doctorate)	2.79	3.15	0.95	0.95	−.06
12	Time spent socializing in high school (1 = never to 4 = very often)	3.27	3.45	0.76	0.68	−.05
13	Gender (0 = female, 1 = male)	0.39	0.47	0.49	0.50	−.04*
14	Certainty about choice of major (1 = not certain to 4 = very certain)	2.90	2.74	0.99	1.04	.04*

*p < .05; all other beta weights significant at p < .01 or beyond.
ᵃTwo-tailed *t*-test indicates these means are not significantly different from one another (p < .05).
Background Variables: Importance of completing a degree at this institution; importance of completing a degree at any institution; year graduated from high school; encouragement and support to continue enrollment from friends; time spent studying in high school; time spent working for pay in high school; time spent on volunteer work in high school; time spent on exercising/sports in high school; time spent studying in the library in high school; time spent studying with friends in high school; time spent in clubs and organizations in high school; likelihood of stopping out; likelihood of transferring to another institution; precollege CAAP reading score; precollege CAAP math score; certainty student made the right college choice; college attendance prior to Fall 1992; racial composition of high school; racial composition of neighborhood; African-American; minority—not black or Hispanic; citizenship; English as a first language.

generation students were more likely than traditional students to report having received encouragement to attend college from their teachers. a simple t-test indicates the two means do not differ significantly. Thus, caution is advised in attaching practical importance to this finding.

Because of the moderate to high correlations among the three CAAP tests (range = .476 to .768), it appeared at least possible that students' initial reading and math skill levels did not enter the stepwise regression because of the dominance of the critical thinking test scores. Simple t-tests indicated that first-generation and traditional students did, indeed, differ at statistically significant levels ($p < .001$) in precollege reading and math skills. In both instances, traditional students scored higher than first-generation students (means = 62.06 v. 59.52, respectively, in reading, and 58.623 v. 56.360 in math).

Analyses for Question 2

Differences in first-generation and traditional students' experiences of college are shown in Table 2. As can be seen there, after controlling for the 14 precollege characteristics listed in Table 1, first-generation students (compared to their traditional peers) were likely to take fewer courses in the humanities and fine arts and to complete fewer total hours during their first academic year.

With regard to their instructional experiences and formal academic contacts with faculty members, first-generation students reported spending fewer hours per week studying and were less likely to participate in an honors program. While the beta weights suggest that first-generation (compared to traditional) students were also more likely to make use of the library and less likely to report receiving feedback from instructors, the group means are identical on the library scale and in the opposite direction of the beta weight's sign on the feedback scale. Two-tailed t-tests for group differences on both scales indicated no statistically significant differences. Thus, these latter findings appear to be artifactual, probably due to multicollinearity among the variables in the analysis.

In their out-of-class experiences, first-generation students (vs. traditional students) worked more hours per week off-campus and were less likely to perceive faculty members as concerned for student development and teaching. They were also less likely to participate in a racial/ethnic awareness workshop and to report receiving encouragement from friends to continue their enrollment. The beta weights also indicate first-generation students were more likely to report positive peer relations and to participate in orientation programs, but these two findings appear to be artifactual. Both reported peer relations and participation in orientation are inversely related (partial r's of $-.07$ and $-.05$, respectively) with being a first-generation student, and the direction of the differences in

TABLE 2. College Experiences on Which First-Generation and Traditional Students Differ

College Experience Variables	Mean		SD		Beta
	FG	Trad.	FG	Trad.	Weight[a]
Curricular Experiences					
No. of humanities and fine arts courses	1.93	2.68	2.07	2.34	−.05*
Total hours completed this academic year (1 = six or fewer to 6 = more than 24)	4.34	4.89	1.73	1.43	−.04
Academic Experiences					
Participation in an honors program (1 = yes, 0 = no)	0.06	0.14	0.24	0.36	−.05
Hours per week spent studying (1 = none to 6 = more than 20 hours)	3.25	3.56	1.29	1.36	−.05
CSEQ Library Experiences Scale	2.00	2.00[b]	0.59	0.57	.04
Instructor Feedback Scale	2.27	2.24[b]	0.74	0.71	−.04
Out-of-Class Experiences					
Perceived faculty concern for student development and teaching (5-item scale with items such as "The faculty I have had contact with are generally interested in students"; 1 = strongly disagree to 5 = strongly agree)	3.30	3.51	0.61	0.65	−.07
Hours per week employed off-campus (1 = none to 9 = more than 35)	3.86	3.05	2.97	2.67	.07
Participated in a racial/cultural workshop (1 = yes, 0 = no)	0.13	0.24	0.34	0.43	−.04
Encouragement from friends to continue enrollment (1 = strongly disagree to 5 = strongly agree)	4.14	4.29	0.87	0.78	−.04
Attended an orientation program (1 = yes, 0 = no)	0.81	0.85	0.40	0.36	.03
Relationship with student peers (7-item scale with items such as "Since coming to this institution I have developed close personal relationships with other students"; 1 = strongly disagree to 5 = strongly agree)	3.62	3.73	0.68	0.73	.06
Institutional Characteristics					
Personally experienced discrimination based on race or gender (a 2-item scale where 1 = strongly agree to 5 = strongly disagree)	3.99	3.90	0.96	1.01	.04
Environment has academic/scholarly emphasis (1 = weak emphasis and 7 = strong emphasis)	5.15	5.28	1.26	1.20	.07

Other College Variables Not Entering Analyses:
Curricular Variables
  Number of technical and preprofessional courses
  Number of social sciences courses

TABLE 2. (*Continued*)

College Experience Variables	Mean		SD		Beta Weight[a]
	FG	Trad.	FG	Trad.	
Number of minority/women's studies courses					
Number of mathematics courses					
Number of natural science and engineering courses					
Academic Experiences					
Perceived Effectiveness of Instruction Scale					
Hours/week spent studying with classmates					
CSEQ Writing Experiences Scale					
Number of advanced placement courses					
Assignments Promote Systematic Thinking Scale					
CSEQ Experiences with Faculty Scale					
CSEQ Course Learning Scale					
Learning from Other Students Scale					
Out-of-Class Experiences					
Joined a fraternity/sorority					
Played intercollegiate sports					
CSEQ Art, Music, and Theater Scale					
Perception student had made the right college choice					
Faculty Relations Scale					
Encouragement of family to continue enrollment					
CSEQ Clubs and Organizations Scale					
CSEQ Residence Life Scale					
Hours/week worked on-campus					
Institutional Characteristics					
Discrimination in Courses Scale					
Discriminatory Environment Scale					
Administrative Openness Scale					
Experienced overt discrimination					
Experienced covert discrimination					
Discriminatory Words Scale					
Environment emphasizes being critical, evaluative, and analytical					
Environment emphasizes esthetic, expression, and creativity					
Environment emphasizes personal relevance and practicality					
Environment emphasizes vocational and occupational competence					
Relationships with administrators					
Public/private institution					
2-year/4-year institution					
Historically black college or university					

*All beta weights significant at $p < .05$ or beyond.
[a]Controlling for 14 precollege characteristics and *only* those other variables in the same college experience variable set.
[b]Two-tailed t-test indicates these means are not significantly different.

group means is opposite that indicated by the sign of the beta weights. Thus, these two findings are discounted.

First-generation (vs. traditional) students were more likely to report having personally experienced discrimination. The beta weight in Table 2 also indicates that first-generation students were more likely to perceive their institution's environment as emphasizing academic, scholarly, and intellectual qualities, but this finding is also discounted as a statistical artifact inasmuch as the sign of the partial correlation with first-generation status ($-.05$) is opposite that of the beta weight, and the first-generation student mean is lower than that of traditional students.

Analyses for Question 3

The analyses of covariance (one each for reading, math, and critical thinking scores, controlling for the 13 significant precollege differences between the two groups plus precollege scores on the dependent measure) indicated no differences between first-generation and traditional students in first-year gains in mathematical or critical thinking abilities. That is, despite the initial differences in group scores on all three CAAP tests (first-generation students being lower on each), after controlling these and other precollege student differences, the two groups gained in math and critical thinking skills to about the same degree. Traditional students, however, made greater gains than their first-generation peers in reading comprehension, even after precollege reading abilities were controlled (gains = from a mean of 62.06 to 62.98 for traditional students, and from 59.51 to 59.96 for first-generation students).

As will be seen below, the entry of each of the three sets of interaction terms produced statistically significant, if small, increases in the amount of variance explained over and above that accounted for by the full, main-effects-only model. These findings suggest that differences between first-generation and traditional students in certain of their college experiences are associated with differential cognitive outcomes after one year.

Across the three cognitive outcomes, a total of 12 interaction terms produced statistically significant beta weights ($p < .05$ or beyond). Six of these, however, were ignored because of evidence reported in the preceding section suggesting their main effect beta weights were statistical artifacts. Table 3 summarizes the nature of the six remaining interaction terms. Plotting those interactions, however, yields a sometimes foggy, and sometimes counterintuitive, picture of the nature of those effects. Possible interpretations are discussed below.

In the analyses testing for differential effects of college experiences on students' year-end *reading comprehension* levels, students' background characteristics (including precollege reading level) produced an R^2 of .588. The addition of the college experiences variable set (main effects) increased the variance

TABLE 3. Summary of Nature and Degree of Statistically Significant
Interaction Effects

Interaction Term: Group[a] x . . .	Reading	Math	Critical Thinking
Hours spent studying	+/0[b]		
Number of hours worked off-campus	+/−		
Experienced personal discrimination	0/+		
Perceptions of faculty concern for student development and teaching	−/+ +		
Friends encourage continued enrollment	−/+		
Hours completed in first year			+ +/0

[a]Coded 1 = First-Generation, 0 = Traditional
[b]First-Generation/Traditional
+ + = strong positive effect
 + = positive effect
 0 = no effect
 − = negative effect

explained by .028 (2.8 percentage points), significant at $p < .001$. Entry of the 14 cross-product interaction terms produced a small (.008) but statistically significant ($p < .001$) increase (from .6153 to .6233) in the R^2 above and beyond that attributable to differences in first-generation and traditional students' precollege characteristics and experiences of college. Of the total of six statistically significant interaction terms that emerged from the analyses for all three dependent variables, five involved differential effects on gains in reading comprehension.

First-generation students benefitted more in their reading skills than their traditional peers (who benefitted not at all) from studying more hours. Similarly, the hours worked off campus appear to promote reading gains among first-generation students while it depresses gains among traditional students.

Experiencing racial or gender discrimination appears to have had no effect on first-generation students' reading skills, but it had a positive influence on reading gains among traditional students. Perceptions that faculty members were concerned with student development and teaching produced a pronounced positive effect on reading gains among traditional students, but the effect was negative for first-generation students. Similarly, the level of encouragement from friends to continue enrollment was also inversely related to reading gains among first-generation students but positively associated with gains among traditional students.

In the analysis of CAAP *mathematics* gains, students' precollege characteristics produced an R^2 of .69. Entry of the college experience variables (main effects) increased the variance explained by .014 (1.4 percentage points), statis-

tically significant at $p < .001$. Addition of the set of interaction terms also produced a small (.004; from .7093 to .7129), but statistically significant ($p < .01$) increment in the R^2 beyond that for the full model. None of the six significant terms, however, suggested college experiences had a differential effect on students' math skill development.

In the regression on students' CAAP *critical thinking* scores, students' background characteristics explained 63 percent of the variance ($R^2 = .6292$). Inclusion of the college experience variables (main effects) produced an increment of 1.9 percent (.019), statistically significant at $p < .001$. Addition of the set of interaction terms again produced a small (.003; from .6482 to .6516) but statistically significant ($p < .001$) increment in the R^2 value. One of the six statistically significant group $\times$ college experience interactions had a differential impact on year-end critical thinking abilities. Completing more hours during the first year had a strong, positive effect on gains in critical thinking skills among first-generation students, but the number of hours completed had little or no effect on critical thinking gains for traditional students.

Limitations

This study has several limitations. First, although the sample is multi-institutional and contains a broad range of two- and four-year institutions, the 23 colleges and universities were selected purposively and not at random. Thus, to an unknown degree, these institutions may not be representative of the national mix of colleges and universities.

Second, although attempts were made in the initial sampling design and subsequent weighting of respondents to yield a sample of students who, in the aggregate, would be representative of the national population of new students entering colleges and universities in the Fall of 1992, the time commitment and work required of each student participant undoubtedly led to some self-selection. One cannot be sure that those who were willing to participate in the study responded in the same fashion as would those who were invited but declined to participate.

Third, while the unique contributions of each of the college-influence variables (reflected in their beta weights) are statistically significant (perhaps due to the relatively large sample size), the magnitudes of those influences are comparatively small. The estimated effects sizes, however, may be constrained by measurement and analytical artifacts. First, many commercially available instruments are constructed so as to produce relatively stable measurements over time (Winter, 1979; Winter, McClelland, and Stewart, 1981), thus tending to underestimate the actual magnitude of change. Second, the estimates may be artificially low because of the high correlation between the precollege CAAP test scores for each learning outcome (included as a control variable in the appropri-

ate analysis) and their year-end counterpart scores (pre- and postyear score correlations: reading = .75, math = .82, and critical thinking = .79). With each precollege measure explaining half or more of the variance in the dependent measure, college experience variables are limited in the amount of unexplained variance for which they can account. In addition, the effect size estimates may be further constrained by the fact that most first-year courses do not specifically or systematically stress the development of students' reading, math, and critical thinking skills. Thus, despite the small effect sizes, the findings of this study must be considered at least suggestive of the dynamics of college impact on the cognitive gains of first-generation and traditional students and should probably be considered lower-bound estimates.

Fourth, while reading, math, and critical thinking are basic educational outcomes, they are certainly not the only dimensions along which students develop academically and intellectually during the college years. Moreover, alternative conceptualizations of the components of all three skill areas have been advanced, and the results might have been somewhat different had other measures of each skill area been used.

Finally, students develop their reading, math, and critical thinking skills over time and at varying rates. This study is limited by the fact that changes in these cognitive skill areas were examined after only one year of college. Changes in these areas in subsequent years may be greater or smaller than those reported here, and the sources of influence on those gains may themselves vary over time.

SUMMARY AND CONCLUSIONS

The findings of this study relating to first-generation students' precollege characteristics and college experiences are highly consistent with those reported in earlier studies based on small-sample, qualitative methods (e.g., Lara, 1992; London, 1989; Rendon, 1992; Richardson and Skinner, 1992; Rodriguez, 1975, 1982; Weis, 1985, 1992). This study paints a portrait of first-generation students as they enter college that differs in a number of ways from that of their traditional peers, and the differences suggest potential learning problems ahead for first-generation students. Compared to their traditional peers, first-generation students are more likely to come from low-income families, to be Hispanic, to have weaker cognitive skills (in reading, math, and critical thinking), to have lower degree aspirations, and to have been less involved with peers and teachers in high school. First-generation students also tend to have more dependent children, expect to take longer to complete their degree programs, and report receiving less encouragement from their parents to attend college. Only on the certainty of their academic major do first-generation students have an advantage over their traditional peers on variables known to be related to aca-

demic performance and persistence. Given that most of the variables on which first-generation and traditional students differ have been linked to academic performance and persistence (Pascarella and Terenzini, 1991), the combined portrait is one of students at academic risk. It is also worth remembering that the size and proportional representation of first-generation students on college and university campuses is expected to grow over the next decade.

One clear implication of this evidence is the need to smooth first-generation students' transitions from work or high school to college and to extend active, targeted support throughout their first year, if not beyond. "Bridge" programs involving collaboration between high schools, community colleges, and four-year institutions have proven to be successful. The most successful programs have provided "systematic and comprehensive academic support services (such as assessment and remediation, learning laboratories, tutorial services, intrusive advising, and monitoring of student progress) until a student was firmly established in a major" (Richardson and Skinner, 1992, p. 39). Rendon (1992), however, stresses the importance of more subtle forms of support, what she calls "validating" experiences—encounters with administrators, faculty, and other students who send important signals to first-generation students that they are competent learners, that they can succeed, that they have a rightful place in the academic community, and that their background and past experiences are sources of knowledge and pride, not something to be devalued. In this study, first-generation students were less likely than traditional students to perceive faculty as concerned with student development and teaching and to report receiving encouragement from friends to continue their enrollment.

Rendon (1992) stresses the importance of faculty and staff members reaching out to first-generation students. For Rendon, however, reaching out means more than advertising the availability of support services. It also means actively making contact with first-generation students and changing current practices or policies that impede rather than facilitate their academic and social integration and success. Institutions will have to change if they are to become more hospitable and accommodating to the learning needs of first-generation students.

First-generation students in this study not only brought to college background characteristics that put them at a potential disadvantage when compared to their traditional peers, the two groups also differed in their curricular, instructional, and out-of-class experiences, as well as in their perceptions of the environments of the institutions they were attending. In their academic lives, first-generation students (compared to traditional students) took fewer courses in the humanities and fine arts and completed fewer total hours during their first year. They were also less likely to be in an honors program, and they reported studying fewer hours.

In their out-of-class lives, first-generation students were also less likely than traditional students to have experiences associated with success and persistence

in college. First-generation students worked more hours off-campus, and they were less likely to attend a racial/cultural awareness workshop, to perceive faculty members as concerned with student development and teaching, and to receive encouragement from friends to continue their enrollment.

The two groups also differed in their perceptions of the climate of the institutions they attended. First-generation students were more likely than traditional students to report experiencing racial/ethnic or gender discrimination.

Thus, first-generation students differ from their traditional peers in both the personal and educational characteristics they bring with them to college and in the nature of the experiences they have during their first year there. With few exceptions, first-generation students are at a disadvantage in those comparisons. Overall, the picture suggests these students come less well prepared and with more nonacademic demands on them, and they enter a world where they are less likely to experience many of the conditions that other research indicates are positively related to persistence, performance, and learning.

The results indicate that despite the fact that first-generation students (compared to traditional students) entered college with lower reading, math, and critical thinking skills, the two groups gained in their math and critical thinking abilities to about the same degree during the first year of college. Traditional students, however, showed greater gains in reading comprehension, even after initial reading skill differences were controlled. The findings across all three outcome measures suggest that group differences in college experiences have a small, but statistically significant, differential effect on group learning gains.

Analyses investigating the nature of those differential effects, however, shed disappointingly little light. Of a total of 12 statistically significant interaction terms, 6 were ignored because they involved variables with suspicious main effect beta weights. Of the remaining 6, only 2 are consistent with what previous research or common sense would lead one to expect.

In the first of these differential effects, the number of hours spent studying appears to be more important for reading skill improvement among first-generation students than for their traditional peers. This finding implies a need to find ways to increase the study time available to first-generation students. Possible steps might include study groups, designated quiet areas in residence halls and/ or libraries, peer tutoring, forms of financial assistance that reduce the need to work, and perhaps reduced first-year involvement in nonacademic activities.

Similarly, the total number of hours completed, while unimportant for gains in critical thinking among traditional students, was strongly and positively associated with gains in critical thinking abilities among first-generation students. This finding is consistent with other analyses using the current database linking the degree of exposure to college (i.e., the number of hours enrolled) with first-year gains in critical thinking (Pascarella et al., 1996). The evidence from the present study, however, suggests that the generally beneficial effects of greater

college exposure on all students' critical thinking abilities may be particularly strong for first-generation students.

Given this possibility, it is well also to remember that first-generation students tend to have more dependent children, to come from families with lower annual incomes, and to work more hours off-campus. One implication of this evidence is the need to find ways to increase first-generation students' degree of exposure to college. Such ways might include financial aid for part-time students, more opportunities for on-campus work, and academic advising that stresses the importance to success of enrolling for more hours.

The remaining four interaction terms suggesting that differences in certain college experiences are associated with differential learning outcomes resist easy interpretation. One of these indicates that the number of hours worked off-campus depresses reading skill gains among traditional students but enhances such gains for first-generation students. One might speculate that working longer hours off-campus requires first-generation students to develop better time management skills and perhaps greater self-discipline and academic focus, and that these abilities, in turn, lead to greater gains in reading. Such an explanation, however, is not entirely satisfactory and clearly awaits further analysis and replication.

The three remaining significant interaction terms indicating differential learning effects associated with certain college experiences present even more difficult interpretive problems. As they relate to traditional students, the findings that receiving encouragement from friends to continue enrollment, perceiving faculty members as concerned with student development and teaching, and experiencing personal discrimination are positively associated with reading skill gains might all be theoretically or intuitively predicted (although the causal direction of the last finding is ambiguous). No such explanations are available, however, to account for the findings that two of these same three college experiences depressed reading skill gains among the first-generation students in this study, while the third experience (experiencing discrimination) had no effect on first-generation students' year-end reading scores.

While the analyses undertaken to identify (and explain) college experiences that might have differential learning effects for first-generation and traditional students produced results that were quite mixed in their interpretability (and in the degree of confidence one would be willing to invest in them), there appears to be enough evidence to suggest that certain college experiences probably do have differential effects on these two groups of first-year students. Such a conclusion must be considered tentative, however, inasmuch as significant interaction terms are difficult to replicate. At best, these findings only suggest certain aspects of the college experience that may be related to differential learning gains for different groups of students.

Overall, this study paints a portrait of a subgroup of students who are enter-

ing America's colleges and universities in increasing numbers, and they can be expected to continue to grow over the next decade both in number and as a proportion of the total undergraduate student population. In both precollege characteristics and their experiences during their first year in college, first-generation students differ in many educationally important ways from the students higher education has traditionally served. Because of these different characteristics and experiences, they are also a group at risk. They are a group clearly in need of greater research and administrative attention if they are to survive and succeed in college.

REFERENCES

American College Testing Program (1989). *Report on the Technical Characteristics of CAAP: Pilot Year 1, 1988–89.* Iowa City, IA: Author.

Astin, A. W. (1984). Student involvement: A developmental theory for higher education. *Journal of College Student Personnel* 25: 297–308.

Attinasi, L. C., Jr. (1989). Mexican Americans' perceptions of university attendance and the implications for freshman year persistence. *Journal of Higher Education* 60(3): 247–277.

Bean, J. P., and Metzner, B. S. (1985). A conceptual model of nontraditional undergraduate student attrition. *Review of Educational Research* 55(4): 485–540.

Billson, J. M., and Terry, B. T. (1982). In search of the silken purse: Factors in attrition among first-generation students. *College and University* 58(1): 57–75.

Conklin, M. E., and Dailey, A. R. (1981). Does consistency of parental encouragement matter for secondary students? *Sociology of Education* 54(4): 254–262.

Cross, K. P. (1981). *Adults as Learners: Increasing Participation and Facilitating Learning.* San Francisco: Jossey-Bass.

Hodgkinson, H. L. (1985). *All One System: Demographics of Education, Kindergarten Through Graduate School.* Washington, DC: Institute for Educational Leadership.

Lara, J. (1992). Reflections: Bridging cultures. In L. S. Zwerling and H. B. London (eds.), *First-Generation Students: Confronting the Cultural Issues* (pp. 65–70). New Directions for Community Colleges, No. 80. San Francisco: Jossey-Bass.

Levine, A., and Associates (1989). *Shaping Higher Education's Future: Demographic Realities and Opportunities, 1990–2000.* San Francisco: Jossey-Bass.

London, H. B. (1989). Breaking away: A study of first-generation college students and their families. *American Journal of Education* 97(1): 144–170.

Mow, S. L., and Nettles, M. T. (1990). Minority student access to, and persistence and performance in, college: A review of the trends and research literature. In J. S. Smart (ed.), *Higher Education: Handbook of Theory and Research*: (Vol. 6) (pp. 35–105). New York: Agathon.

Murphy, P. E. (1981). Consumer buying roles in college choice: Parents' and students' perceptions. *College and University* 56(2): 140–150.

Pace, C. R. (1984). *Measuring the Quality of College Student Experiences*. Los Angeles: University of California, Higher Education Research Institute.

Pantages, T. J., and Creedon, C. F. (1978). Studies of college attrition: 1950–1975. *Review of Educational Research* 48(1): 49–101.

Pascarella, E. T. (1985). College environmental influences on learning and cognitive development: A critical review and synthesis. In J. Smart (ed.), *Higher Education: Handbook of Theory and Research* (vol. 1). New York: Agathon.

Pascarella, E. T., Bohr, L., Nora, A., and Terenzini, P. T. (1996). Is differential exposure to college linked to the development of critical thinking? *Research in Higher Education* 37(2): in press.

Pascarella, E. T., and Terenzini, P. T. (1991). *How College Affects Students: Findings and Insights from Twenty Years of Research*. San Francisco: Jossey-Bass.

Pratt, P. A., and Skaggs, C. T. (1989). First-generation college students: Are they at greater risk for attrition than their peers? *Research in Rural Education* 6(2): 31–34.

Rendon, L. I. (1992). From the barrio to the academy: Revelations of a Mexican American "scholarship girl." In L. S. Zwerling and H. B. London (eds.), *First-Generation Students: Confronting the Cultural Issues* (pp. 55–64). New Directions for Community Colleges, No. 80. San Francisco: Jossey-Bass.

Richardson, R. C., Jr., and Skinner. E. F. (1992). Helping first-generation minority students achieve degrees. In L. S. Zwerling and H. B. London (eds.), *First-Generation Students: Confronting the Cultural Issues* (pp. 29–43). New Directions for Community Colleges, No. 80. San Francisco: Jossey-Bass.

Rodriguez, R. (1975). Going home again: The new American scholarship boy. *American Scholar* 44: 15–28.

Rodriguez, R. (1982). *Hunger of Memory: The Education of Richard Rodriguez—An Autobiography*. Boston, MA: Godine.

Skinner, E. F., and Richardson, R. C., Jr. (1988, May/June). Making it in a majority university: The minority graduate's perspective. *Change* 20(3): 34–42.

Solomon, L. C., and Gordon, J. J. (1981). *The Characteristics and Needs of Adults in Postsecondary Education*. Lexington, MA: Heath.

Spady, W. G. (1970). Dropouts from higher education: An interdisciplinary review and synthesis. *Interchange* 1(1): 64–85.

Stage, F. K., and Hossler, D. (1989). Differences in family influences on college attendance plans for male and female ninth graders. *Research in Higher Education* 30(3), 301–315.

Terenzini, P. T., Rendon, L. I., Upcraft, M. L., Millar, S. B., Allison, K. A., Gregg, P. L., and Jalomo, R. (1994). The transition to college: Diverse students, diverse stories. *Research in Higher Education* 35(1): 57–73.

Tinto, V. (1975). Dropout from higher education: A theoretical synthesis of recent research. *Review of Educational Research* 45(1): 89–125.

Tinto, V. (1987). *Leaving College: Rethinking the Causes and Cures of Student Attrition*. Chicago: University of Chicago Press.

Upcraft, M. L. (1996). Teaching and today's college students. In R. Menges and M. Weimer (eds.), *Teaching on Solid Ground: Using Scholarship to Improve Practice*. San Francisco: Jossey-Bass.

Watson, G., and Glaser, E. (1980). *Watson-Glaser Critical Thinking Appraisal*. San Antonio, TX: Psychological Corporation.

Weidman, J. (1989). Undergraduate socialization: A conceptual approach. In J. Smart (ed.), *Higher Education: Handbook of Theory and Research* (vol. 5). New York: Agathon.

Weis, L. (1985). *Between Two Worlds: Black Students in an Urban Community College.* Boston: Routledge and Kegan Paul.

Weis, L. (1992). Discordant voices in the urban community college. In L. S. Zwerling and H. B. London (eds.), *First-Generation Students: Confronting the Cultural Issues* (pp. 13–27). New Directions for Community Colleges, No. 80. San Francisco: Jossey-Bass.

Winter, D. (1979). Defining and measuring the competencies of a liberal arts education. In *Current Issues in Higher Education* (vol. 5). Washington, DC: American Association for Higher Education.

Winter, D., McClelland, D., and Stewart, A. (1981). *A New Case for the Liberal Arts: Assessing Institutional Goals and Student Development.* San Francisco: Jossey-Bass.

York-Anderson, D. C., and Bowman, S. L. (1991). Assessing the college knowledge of first-generation and second-generation college students. *Journal of College Student Development* 32(2): 116–122.