

THE EFFECT OF STUDENT-FACULTY INTERACTION ON STUDENTS' EDUCATIONAL OUTCOMES

Jean J. Endo and Richard L. Harpel

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This study examined the effects of four aspects of student-faculty interaction (frequency of formal interaction, frequency of informal interaction, quality of faculty advising, and helpfulness of faculty) on a variety of student outcomes after four years. These effects were examined within a context of a causal model adapted from Astin's general college impact model. Outcomes data were gathered from a 1975 Freshman Questionnaire and a 1979 Graduating Students Survey. The results provided support for the importance of student-faculty interaction on the intellectual and personal/social outcomes of college and students' satisfaction with their educational experience.

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Considerable research has been done on the impact of college on students, for example on their attitudes, values, aspirations, personality characteristics, vocational choices, and incomes after graduation. Despite this effort, only a small percentage of studies have examined the specific conditions under which students were affected in particular kinds of ways. Most of this research has been adequately reviewed by Feldman and Newcomb (1969), Lenning, Munday, Johnson, Well, and Brue (1974 a,b), Astin (1977), Bowen (1977), and Pace (1979). A portion of this research has included some investigation of the impact of increased student-faculty interaction and has generally concluded that more is better. However, only a small proportion of empirical studies have focused specifically on the importance of this environmental variable and its subsequent effects on a wide variety of student outcomes.

A more thorough investigation of the effects of student-faculty interaction is

Jean J. Endo, Assistant Director, Office of Academic Planning, and Richard L. Harpel, Assistant Vice Chancellor for Academic Affairs, University of Colorado, Boulder.

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warranted for several reasons. The significance of close interaction for effective education has been widely acknowledged (cf. Pascarella, 1980; Chickering, 1969; Sanford, 1967; Gaff, 1973). Interest in this area also complements the growing concern for reducing the perceived effects of the impersonal environment of large universities (Feldman and Newcomb, 1969; Taylor, 1971). Beyond the opportunity it provides for students to obtain academically related information, increased student-faculty interaction has been shown to have a broader impact on students' general ways of thinking, methods of problem solving, and interest in various life goals. Increasing interaction is also one way in which institutions, in an era of shrinking resources and declining student demand, might increase student satisfaction with specific programs, thereby helping to attract and retain highly qualified and motivated individuals. Although many institutions are making concerted efforts to increase student-faculty contact, much of this is being done without specific knowledge of the relationships between the nature and frequency of interaction and various student outcomes.

Previous research has indicated that student-faculty interaction is important in influencing students' occupational decisions (Feldman and Newcomb, 1969; Chickering, 1969; Wilson, Gaff, Dienst, Wood, Bavry, 1975), increasing students' educational aspirations (Thistlethwaite, 1960, 1962; Grigg, 1965; Gurin and Katz, 1966), encouraging students' persistence at an institution (Centra and Rock, 1971; Spady, 1970, 1971; Pascarella and Terenzini, 1977; Tinto, 1975; Rossman, 1967), and influencing intellectual/academic development (Wilson, et al., 1975; Pascarella and Terenzini, 1976, 1977, 1978, 1979; Terenzini and Pascarella, 1977, 1978, 1980; Bean, 1980; Centra and Rock, 1971; Astin and Panos, 1969; Chickering and McCormick, 1973; Newcomb, Brown, Kulik, Reimer, Revell, 1970; Spady, 1971), and personal/social development (Pascarella and Terenzini, 1976, 1978; Wilson, et al., 1975; Lacy, 1978; Chickering and McCormick, 1973; Weidman, 1979; Astin, 1977). Several studies have shown that the increased frequency of student-faculty interaction is related to students' satisfaction with the academic and nonacademic aspects of college (Astin, 1977; Wilson, et al., 1975; Heiss, 1967; Gregg, 1972; Pascarella and Terenzini, 1976; Spady, 1971; Newcomb, et al., 1970).

The most promising explanatory perspective for understanding the effects of student-faculty interaction has come from Spady (1970; 1971) and Tinto (1975), whose work is adapted from Durkheim's theory of suicide. Spady and Tinto have conceptualized the process of interaction between individuals in an institution to explain attrition. According to them, the degree to which a student is integrated into the academic/social system of a college will determine the degree of persistence. Spady emphasizes social integration, whereas Tinto identifies both academic and social integration as being important. Pascarella and Terenzini (1978) have used this conceptualization to explain the effects of the frequencies of student-faculty interaction for various purposes on three educational outcomes:

freshman year grade point average, intellectual development during the freshman year, and personal development during the freshman year. They found that student-faculty interaction positively influences these outcomes independent of 14 student pre-enrollment demographic/academic characteristics. Terenzini and Pascarella (1980) replicated this earlier research and also examined the effects of two measures of the quality of student-faculty contacts.

In another recent study, Lacy (1978) examined the value-related outcomes associated with two different college environments, a large liberal arts college and the small living-learning setting of a residential college within a large research university. Using a causal model, he found that the overall frequency and content of student-faculty interaction and satisfaction with faculty (as well as the nature of peer interaction) mediated some of the effects of college environments on student outcomes after one or two years.

Our study was guided by the explanatory perspective of Spady and Tinto and extends the previous work on student outcomes, including the recent research of Lacy and Terenzini and Pascarella. However, this study differed from previous work in the following ways:

1. This study examined the impact of student-faculty interaction on student outcomes after four years at one institution. Most previous work (e.g. Lacy and Terenzini and Pascarella) examined the effects of student-faculty interaction after only one or two years.
2. This study included a broad range of student outcome variables. In all, four categories of outcomes were examined. These will be discussed below.
3. Previous studies have focused on the overall frequency of student-faculty interaction or on the frequencies of interaction for specific purposes. This study examined two general social dimensions of frequency as well as two qualitative aspects of interaction. These will also be discussed further below.

This study examined the effect of student-faculty interaction on student outcomes after four years within the context of a causal model which was adapted from a general college impact model presented by Astin (1970). This model included three sets of variables: (1) students' background characteristics, (2) four aspects of student-faculty interaction, and (3) four categories of outcomes. Following Astin's impact model, these sets of variables were expected to be related in the following manner:

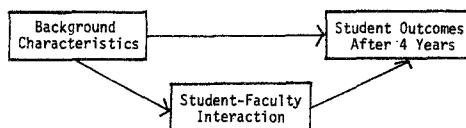


FIGURE 1. Expected Relation of Variables.

The student outcome variables were initially derived from an extensive review of the literature on goals for attending college (considered to be important by students, faculty, and administrators) and from items in the Higher Education Evaluation KIT of the Center for the Study of Evaluation, University of California at Los Angeles (Pace, 1971). A final set of outcomes was selected on the following basis. From earlier work (Endo, 1976) we knew that students reported the following outcomes to be among the most important: (1) to develop general career-related skills (skills in math, public speaking, writing, and research methods), (2) to develop independence, (3) to develop general knowledge, (4) to develop social self-confidence, and (5) to develop skills in solving problems. We supplemented this list with student-related outcomes for attending college that were considered important by faculty and other educators (Micek and Arney, 1974). These included: (1) to develop critical thinking skills, (2) to develop an interest in self-directed learning, (3) to train students for graduate education, (4) to develop intellectual interests, (5) to achieve academically (grades), (6) to develop cultural interests, (7) to participate in extracurricular activities, and (8) to have good social experiences at the institution.

We considered "importance of an outcome" to be a value developed as a result of attending college, whereas "progress toward an outcome" was the self-reported perception of how much students gained toward a particular outcome from attending an institution. In a few cases, we wanted to measure value rather than progress. We eliminated outcomes that were duplicative, that is, those that were previously found to be highly correlated with other outcomes (Endo and Harpel, 1980). For example, we eliminated development of critical thinking skills since it was highly correlated with development of problem-solving skills, and two career-related skills outcomes, writing and research methods, were eliminated because they were found to be highly correlated with development of public speaking and math skills, respectively. We grouped our outcomes into the four categories listed below:

1. Personal/Social Outcomes
 - Importance of self-directed learning
 - Importance of developing independence
 - Social self-confidence
 - Formal involvement in extracurricular activities
 - Good social experiences
2. Intellectual Outcomes
 - Adequacy of general knowledge
 - Adequacy of math skills
 - Development of problem-solving skills
 - Development of public speaking skills

- Progress toward intellectual goals
- Participation in cultural activities
- Highest degree planned
- 3. Academic Achievement
- 4. Satisfaction with Education

The students' background characteristics in the model included five demographic/academic variables, six expectation variables, and the initial value for each specific outcome measured (where an initial value was feasible). Our demographic/academic variables were sex, socioeconomic status, program type, academic ability, and religiousness. These variables were included because they have been found to have an impact on outcomes, for example, on intellectual and personal/social outcomes (Feldman and Newcomb, 1969; Astin and Panos, 1969; Spady, 1970; Tinto, 1975). All these variables were relatively common in previous outcomes research except for "religiousness." However, Astin (1977) reported that "religiousness" was related to student-faculty interaction.

Our expectation variables included degree aspiration, expectations for making friends (sociability), expectations for finding friendly faculty, expectations for exciting classes, expectations for participating in extracurricular activities, and openness to change. Students' expectations when they entered college were included because they have been found to affect outcomes. For example, Lacy (1978) and Feldman and Newcomb (1969) found that "openness to change" affected student outcomes. Expectations can also influence the nature and frequency of interaction with faculty members (Pascarella and Terenzini, 1978; Wilson et al., 1975).

Other possible background variables, such as interpersonal self-confidence and cultural interest (Astin, 1977), were not included as they had been previously found to be highly correlated with the above variables (Endo and Harpel, 1980). Finally, the initial values on specific student outcomes¹ were included in order to control for initial position while examining the impact of student-faculty interaction on those outcomes (Astin, 1970; Feldman and Newcomb, 1969).

The primary purpose of this study was to examine what types of student-faculty interaction had impacts on what types of student outcomes. We felt that in order to better investigate students' integration with faculty, it was necessary to go beyond measures which only enumerated the number of times students sought contact with faculty members on various topics (Cohen, Kamieniecki, and McGlen, 1980). We conceptualized the frequency of student-faculty interaction as being of two types: "formal" interaction and "informal" interaction. The informal type describes interaction where faculty members have a more friendly relationship with students and exhibit a personal and broad concern with students' emotional and cognitive growth. The informal type also incorporates the

characteristics of Snow's (1973) "high contact faculty." High contact faculty have an interactionist approach to students; they discuss a broader range of issues—issues related to students' growth—and also spend more time on class material compared to low contact faculty members. Formal interaction describes a perfunctory or professional approach with students. Discussions are limited to traditional academic and vocational advising topics. In our study, we examined the effects of the frequency of both informal and formal interaction.

Only a few earlier studies included variables dealing with the quality of student-faculty interaction. Lacy (1978) measured overall satisfaction with faculty, while Terenzini and Pascarella (1980) measured the influence of faculty relations and faculty concern for student development and teaching. We decided to examine two slightly more specific qualitative aspects of student-faculty interaction that might have programmatic implications: the quality of faculty academic and vocational advising and the helpfulness of faculty (which also provides some indication of the degree of faculty concern and willingness to interact with students).

We expected to find the following relationships between student-faculty interaction and outcomes, and these expectations formed the main hypotheses of our research. In general, we expected to find that student-faculty interaction affected personal/social outcomes, intellectual outcomes, academic achievement, and satisfaction with education. More specifically, we expected to find that:

1. The frequency of informal student-faculty interaction would have more overall effects than formal student-faculty interaction on personal/social outcomes, intellectual outcomes, academic achievement, and satisfaction with education.
2. The frequency of informal student-faculty interaction would have more overall effects on the personal/social outcomes and satisfaction with education than on the intellectual outcomes or academic achievement.
3. The helpfulness of faculty and quality of faculty advising would have more effect on satisfaction with education than the frequency of formal and informal student-faculty interaction.

The relationships in the first hypothesis were expected to occur because of the nature of informal versus formal student-faculty interaction. Frequency of informal student-faculty interaction describes student contacts with faculty where there is a concern for wide aspects of the students' development including personal/social and intellectual growth, academic achievement, and satisfaction with education. Frequency of formal interaction describes student contacts with faculty members where there is a more limited concern for specific intellectual or academic considerations.

The second hypothesis relates the frequency of informal student-faculty inter-

action with personal/social outcomes and satisfaction with education. Because informal student-faculty interaction encompasses a wide variety of topics and concerns and because of its relatively greater attention to nonacademic areas, it was felt that personal/social outcomes would be affected more than academic achievement or intellectual outcomes. Also, Gregg (1972) and Astin (1977) found that students who experienced high collegiality (i.e. informal interaction) with faculty members were very satisfied with their education.

The third hypothesis relates the helpfulness of faculty and quality of faculty advising to students' satisfaction with education. Even though previous research has associated frequency of student-faculty interaction with satisfaction with education, we felt that qualitative variables might be more important than frequency (quality is often regarded as more important than quantity)—especially in relation to a very general outcomes variable such as satisfaction with education. Also, Terenzini and Pascarella (1980) did find that their two qualitative measures of student-faculty interaction had greater effects on two general freshman year outcomes than their measures of the frequencies of student-faculty contact.

STUDY DESIGN

This study was a product of the Student Outcomes Model at the University of Colorado, which was developed in 1975 to examine the impact of institutional programs on student outcomes (Endo and Lenning, 1978). The model provides a structure for the systematic collection of student data through the use of surveys. The information gained through these surveys is used for needs assessment, program development, resource allocation, and evaluation. These surveys include variables related to students' background, attitudes, values, goals, abilities, and the extent of change in these variables. The model consists of five basic questionnaires: (1) Freshman Questionnaire, (2) Educational Experience Survey, (3) Exiting Students Survey, (4) Graduating Students Survey, and (5) Alumni Survey. The model allows for longitudinal and cross-sectional analysis. A complete cycle of surveys is administered every six years.

The present study used items that appeared on the 1975 Freshman Questionnaire and the 1979 Graduating Students Survey. Seventy-five percent ($n=2,830$) of the entering fall 1975 freshmen at the university completed a Freshman Questionnaire, which provided information on their family background, present and future plans, college expectations, personal and social orientation, self-evaluations of ability in particular skills, importance of goals for attending college, educational orientation, and extracurricular activities. In addition, demographic and academic data from institutional records on each student were combined with their survey responses.

Four years later in the spring 1979 term, a Graduating Students Survey was sent to a sample of 480 seniors who were scheduled to graduate in May. The

Graduating Students Survey contained many of the same items as those in the Freshman Questionnaire. Sixty-five percent of the sampled seniors ($n=311$) completed the Graduating Students Survey. The survey respondents were representative of the total cohort in terms of sex, ethnicity, field of study, and academic ability. There was a higher percentage of residents among the respondents (62%) than among the total cohort (54%).

DATA ANALYSIS

A number of items which appeared on the Freshman Questionnaire or the Graduating Students Survey were conceptually designed to be combined into scales which would measure one expectation variable, four student-faculty interaction variables, and nine outcome variables. These items were factor-analyzed to determine if they would cluster according to their conceptually appropriate dimensions. Initial factors were extracted using a least squares approach (principal axis factoring with iterations), and factors with eigen values greater than 1.0 were rotated according to a varimax criterion. Items were used only if they had rotated loadings of at least .40.² This method of constructing scales used only characteristic items rather than all items irrespective of the size of their factor loadings (Kim and Mueller, 1978: 70-72).³ Internal consistency reliability (or alpha) coefficients were computed for each of the factor scales.

Table 1 shows the items that made up nine scales which were used to measure nine of the outcomes variables in this study (along with the factor loadings and alpha reliability coefficients);⁴ four remaining outcome variables were measured by individual questionnaire items,⁵ and academic achievement was measured by students' final grade point average. Table 1 also shows the items that made up four scales which were used to measure the four student-faculty interaction variables,⁶ and the items that made up the one scale used to measure one of the expectation variables⁷ (the other five were measured by individual questionnaire items⁸). Of the remaining background variables, academic ability was measured by a two-item index consisting of respondents' first semester grade point average at the university and their composite score on the American College Tests (ACT); socioeconomic status was measured by a three-item index consisting of father's education, father's occupation, and family income; program type⁹ (1=professional, 2=liberal arts) and sex (1=male, 2=female) were treated as dichotomous variables; and religiousness was measured by a two-item index consisting of questions dealing with the importance of religious beliefs and participation in religious activities.¹⁰ Table 2 gives the means and standard deviations of all the above variables.

The effects of background characteristics and student-faculty interaction variables on each outcome were examined within the framework of the causal model presented earlier (Figure 1). Since there was no clear theoretical or logical basis

TABLE 1. Items in the Factor-Based Scales.

Factor Items	Loading	Alpha Reliability
OUTCOME VARIABLES		
<u>Importance of developing independence</u>		.75
Importance of developing independence and self-reliance	.79	
Importance of developing identity, self-worth, self-confidence	.68	
<u>Social self-confidence</u>		.77
At ease in speaking with a variety of people; ideas are communicated clearly and effectively	.42	
Not awkward in social situations	.92	
Not shy about making new friends	.75	
<u>Formal involvement in extracurricular activities</u>		.60
Became an officer in a special interest group (student government, athletics, etc.)	.53	
Volunteered in the community for a non-profit organization (church, club, clinic, etc.)	.43	
<u>Adequacy of general knowledge</u>		.71
Preparation in general knowledge	.61	
Preparation in applying knowledge to new situations	.70	
<u>Adequacy of math skills</u>		.81
Preparation in statistics and research methods	.56	
Preparation in general algebra	.87	
Preparation in advanced math	.89	
<u>Development of problem solving skills</u>		.80
Discovering new problems to think about	.56	
Seeking the best possible answer even if it takes a long time	.53	
Observing things and thinking about how they work or occur	.50	
Formulating own hypotheses about doing things	.56	
Seeking knowledge for its own sake	.55	
Discovering new ways of doing things	.69	
<u>Progress toward intellectual goals</u>		.72
Progress toward acquiring abilities to raise questions, examine different views, and solve problems	.67	

TABLE 1. (Continued)

Factor Items	Loading	Alpha Reliability
Progress toward acquiring skills for quantitative thinking	.66	
Progress toward acquiring skills for self-directed learning	.53	
Progress toward applying knowledge to new situations	.58	
<u>Participation in cultural activities</u>		.74
Attended one or more stage plays or read a play	.40	
Visited an art gallery or museum or completed a sketch or painting	.51	
Read one or more contemporary novels	.40	
Attended a concert, theatre, or exhibition which featured the art, music, or drama of another country, race or ethnic group	.64	
<u>Satisfaction with education</u>		.84
Satisfaction with overall quality of education	.70	
Satisfaction with selection of courses for general education requirements	.58	
Satisfaction with quality of program in major	.79	
Satisfaction with variety of courses in major	.60	
Satisfaction with challenge of courses in major	.60	
Satisfaction with classroom equipment and facilities	.42	
Satisfaction with overall academic experiences	.60	
INTERACTION VARIABLES		
<u>Frequency of formal student-faculty interaction</u>		.73
Number of instructors who gave academic advice	.49	
Number of instructors who gave career advice	.60	
Number of times faculty members advised on academic topics	.48	
Number of times faculty members advised on vocational counseling	.73	
<u>Frequency of informal student-faculty interaction</u>		.75
Number of instructors who discussed a wide range of topics	.58	
Number of instructors who encouraged continuation of education	.49	

TABLE 1. (Continued)

Factor Items	Loading	Alpha Reliability
Number of instructors who gave extra help in coursework	.40	
Number of instructors who gave academic advice	.45	
<u>Helpfulness of faculty members</u>		.81
Helpfulness of faculty members	.73	
Accessibility of faculty members	.87	
<u>Quality of faculty advising</u>		.72
Quality of academic advising	.46	
Quality of career advising	.97	
EXPECTATION VARIABLE		
<u>Expectations for making friends</u>		.67
Expectations for making many close friends in college	.91	
Expectations for finding many persons of the opposite sex to date	.52	
Expectations for fitting in easily with other freshmen	.41	

for specifying distinct causal sequences among the four student-faculty interaction variables, these were placed in similar intermediate positions in the model. General least squares regression techniques applicable to linear recursive models were used to quantify the effects of the background and student-faculty interaction variables (Heise, 1975; Duncan, 1975).¹¹

RESULTS

To simplify the interpretation of all results, one variable was considered as having an effect on another only if the standardized regression (beta) coefficient was at least twice its standard error. Table 3 contains the primary results of the data analysis and shows the direct effects of background variables and student-faculty interaction variables on specific outcome variables.¹²

Before discussing Table 3, it should be noted that we did compute the direct effects of background variables on each of the four student-faculty interaction variables for each outcome variable.¹³ When we examined these results, program type was usually found to affect frequency of formal interaction (beta values ranged from $-.10$ to $-.12$), frequency of informal interaction ($.10$ to $.12$), and quality of faculty advising ($-.07$ to $-.10$). Professional program students had

TABLE 2. Measurement of the Variables.^a

Variables	Range		Mean	S.D.
	Low Value	High Value		
BACKGROUND VARIABLES				
Sex ^b	1	2	1.53	.50
Academic ability	14	37	28.02	3.90
Socioeconomic status	17	110	76.4	23.4
Degree aspiration	1	5	2.81	1.31
Program type ^c	1	2	1.53	.50
Religiousness	2	8	4.71	2.05
Expectations for making friends	4	12	9.43	1.53
Expectations for friendly faculty	1	4	1.93	.73
Expectations for exciting classes	2	4	3.31	.59
Expectations for extracurricular activities	1	4	3.16	.66
Openness to change	1	4	2.40	.90
INTERACTION VARIABLES				
Frequency of formal SF interaction	4	16	10.29	2.83
Frequency of informal SF interaction	4	16	10.17	2.65
Helpfulness of faculty members	2	8	6.06	1.47
Quality of faculty advising	2	8	4.74	1.61
PERSONAL/SOCIAL OUTCOMES				
Importance of self-directed learning	1	4	3.47	.73
Importance of developing independence	3	8	6.51	.95
Social self-confidence	3	12	8.78	2.37
Formal involvement in extracurricular activities	2	4	2.75	.75
Good social experiences	1	4	3.27	.75
INTELLECTUAL OUTCOMES				
Adequacy of general knowledge	3	7	5.50	.78
Adequacy of math skills	3	12	8.47	2.61
Development of problem solving skills	9	24	19.35	3.11
Development of public speaking skills	1	4	2.73	1.00
Progress toward intellectual goals	7	16	12.38	2.11
Participation in cultural activities	4	14	6.52	1.28
Highest degree planned	1	5	3.16	.95
ACADEMIC ACHIEVEMENT	1.95	4.00	3.08	.48
SATISFACTION WITH EDUCATION	7	28	16.50	2.34

a. N=311

b. Male=1, female=2

c. Professional program=1, liberal arts=2

more frequent formal and less frequent informal student-faculty interaction than liberal arts students. In addition, degree aspiration (.10 to .12), religiousness (.10 to .12), and expectations for formal involvement in extracurricular activities (.08 to .10) usually affected students' perceptions of the quality of advising. None of the background variables were related to the helpfulness of faculty variable.

When we examined the effects of the background variables on the four categories of outcomes (Table 3), academic ability, sex, program type, degree aspiration, and expectations for making friends were found to affect several of the intellectual and personal/social outcomes. Sex, academic ability, degree aspirations, religiousness, and expectations for making friends affected satisfaction with education. Sex and academic ability influenced academic achievement. Surprisingly, socioeconomic status did not have an impact on any of the 14 specific outcomes. In most cases, the initial value on a particular outcome (if available) had the greatest effect on the final (senior year) value of the same outcome.

The three hypotheses of this study were concerned with the effects of the four student-faculty interaction variables on student outcomes (Table 3). We found that our overall expectation was confirmed—that student-faculty interaction generally affected student outcomes even after controlling for background variables. More specifically, the frequency of informal interaction was found to affect two of the five personal/social outcomes, six out of seven intellectual outcomes, and satisfaction with education. Neither frequency of informal student-faculty interaction nor frequency of formal student-faculty interaction was found to influence academic achievement, although the latter came close. Since Terenzini and Pascarella (1980) found that the frequency of intellectual and career-related student-faculty interaction had an impact on achievement at the end of the freshman year, our latter finding may have partly reflected the decreased variability in grade averages by the end of the senior year which makes the possible effect of formal student-faculty interaction harder to detect. In all, frequency of informal student-faculty interaction affected 9 of the 14 outcomes, whereas frequency of formal student-faculty interaction influenced only 2 of the 14 outcomes—formal involvement in extracurricular activities and satisfaction with education (negatively). These results generally supported the first hypothesis (except for academic achievement)—that frequency of informal interaction would have more overall effects than frequency of formal student-faculty interaction on the four categories of outcomes.

With regard to the second hypothesis, frequency of informal student-faculty interaction affected satisfaction with education but only two out of five personal/social outcomes. And while frequency of informal student-faculty interaction did not affect academic achievement, as expected, it did influence most of the intellectual outcomes. Thus, our second hypothesis was only partly confirmed.

Helpfulness of faculty greatly affected satisfaction with education; it also affected progress toward intellectual goals and participation in cultural activities. However, quality of faculty advising did not influence satisfaction with education; it had an impact on only one outcome, social self-confidence. Also, both frequency of informal student-faculty interaction and frequency of formal student-faculty interaction affected satisfaction with education (the latter had a negative effect, discussed below). Our results did not confirm the third hypoth-

TABLE 3. Direct Effects of Background Variables and Student-Faculty Interaction Variables on Student Outcome Variables (Standardized Regression Coefficients)^a

Background/ Interaction Variables	Sex ^b	Academic Ability	Socio-economic Status	Degree Aspiration	Program Type ^c	Religiousness	Expectations for Making Friends	Expectations for Friendly Faculty	Expectations for Exciting Classes	Expectations for Extracurricular Activities	Openness to Change	Initial Value	Frequency of Informal Interaction	Frequency of Formal Interaction	Helpfulness of Faculty Advising	Quality of Faculty Advising	DF for Coefficients
<i>Personal/Social Outcomes</i>																	
Importance of self-directed learning	.15*	.05	-.04	.12*	-.08	-.01	.07	.05	.12*	-.14*	.10*	.16*	.00	.22*	-.04	-.02	1/294
Importance of developing independence	.14*	.07	-.07	.13*	.06	-.12*	.11*	.03	.09	-.07	.13*	.17*	.01	.04	.04	.06	1/294
Social self-confidence	.06	-.23*	-.02	.05	-.03	-.05	.05	.06	.00	.05	-.02	.41*	-.03	.03	.04	.10*	1/294
Formal involvement in extracurricular activities	.04	-.08	-.02	.14*	-.22*	.08	.06	-.05	-.02	.08	-.06	.16*	.18*	-.03	-.06	-.06	1/294
Good social experiences	.20*	-.03	.03	-.01	.04	.03	.12*	.10*	-.08	.05	-.14*	-	.00	.10*	.09	.07	1/295
<i>Intellectual Outcomes</i>																	
Adequacy of general knowledge	-.06	.04	-.01	.10*	.04	.00	.12*	.02	.01	.13*	.04	-	.09	.26*	.03	.03	1/295

Adequacy of math skills	-.26*	.23*	.01	.09	-.15*	.04	-.12*	.08	.15*	-.04	-.06	-	.09	.18*	.03	-.01	1/295
Development of problem solving skills	-.09	.02	-.04	.05	.09	.04	.00	-.02	.04	-.03	.09	.45*	.00	.16*	.00	.06	1/294
Development of public speaking skills	-.02	.06	.05	.06	-.07	-.04	.04	-.03	-.01	.10*	-.07	.45*	.00	.16*	.01	.07	1/294
Progress toward intellectual goals	-.09	-.04	-.09	.06	-.04	.04	-.02	-.07	.14*	-.04	.07	-	-.03	.24*	.16*	-.02	1/295
Participation in cultural activities	.12*	.10*	.07	.05	.11*	.08	.13*	.10*	.00	-.06	.01	.30*	-.04	.19*	.12*	-.02	1/294
Highest degree planned	-.02	.22*	.02	.30*	.18*	.04	-.01	.04	.00	-.02	.06	-	.04	.04	.09	-.02	1/295
Academic achievement	.10*	.42** ^d	.00	.02	-.02	.07	.01	-.03	.05	-.06	.00	-	.08	.00	.02	.01	1/295
Satisfaction with Education	-.11*	.10*	-.01	.12*	-.01	.11*	.15*	.06	.07	-.07	.05	-	-.11*	.19*	.32*	.08	1/295

^an=311.

^bMale=1, Female=2.

^cProfessional program=1, liberal arts=2.

^dAcademic ability measured by composite ACT score only.

*Coefficient is at least twice its standard error.

esis which states that helpfulness of faculty and quality of faculty advising would have more effect on satisfaction with education than frequency of informal or frequency of formal student-faculty interaction.

Another approach to a review of our results is to examine the joint effects of background and interaction variables on specific outcomes. We will examine one example of an intellectual outcome, one personal/social outcome, and satisfaction with education. Before discussing these examples it should be noted that the background and interaction variables explained more of the variance in development of public speaking skills, development of problem-solving skills, satisfaction with education, social self-confidence, and adequacy of math skills than in the other outcome variables (Table 4). Also, the addition of the interaction variables to the regression analysis greatly increased the amount of variance explained in satisfaction with education and progress toward intellectual goals (Table 4).

No variables other than the initial value (.45) and frequency of informal interaction (.16) affected the development of problem-solving skills (an intellectual outcome). There were some very small indirect effects primarily between program type and development of problem-solving skills through frequency of informal interaction.¹⁴ This outcome concerns the discovery of new problems to analyze, trying to find the best solution to problems, and seeking knowledge for its own sake. Previous studies have indicated that faculty tend to be more responsive to students who have similar orientations and values as themselves. Therefore, when students exhibit an interest in developing problem-solving skills, faculty probably tend to encourage additional interaction, which in turn affects the development of these skills. Despite controlling for background variables, our analysis showed that the frequency of informal interaction influenced the development of problem-solving skills.

Program type (-.22), degree aspiration (.14), initial value (.16), and frequency of formal interaction (.18) affected formal involvement in extracurricular activities (a personal/social outcome). There were some very small indirect effects primarily between program type and involvement in extracurricular activities through frequency of formal interaction. Program type had the greatest effect on formal involvement in extracurricular activities. The initial value did not affect this outcome as much as initial values influenced other outcomes, perhaps because involvement in extracurricular activities received different emphases in high school than in college. The frequency of formal student-faculty interaction had an impact on formal involvement in extracurricular activities, and it appears that such participation may be influenced by college advising programs.

Expectations for making friends (.15), degree aspiration (.12), religiousness (.11), sex (-.11), academic ability (.10), helpfulness of faculty (.32), frequency of informal interaction (.19), and frequency of formal student-faculty interaction (-.11) affected satisfaction with education. There were some very small indirect

TABLE 4. Multiple Regression Summary.*

Outcome Variables	R ² Background Variables	Degrees of Freedom	R ² Increase Due to Interaction Variables	Degrees of Freedom	Total R ² All Main Effects	Degrees of Freedom
PERSONAL/SOCIAL OUTCOMES						
Importance of self-directed learning	.1133**	12/298	.0451**	4/294	.1584**	16/294
Importance of developing independence	.1454**	12/298	.0048	4/294	.1502**	16/294
Social self-confidence	.2605**	12/298	.0128	4/294	.2733**	16/294
Formal involvement in extracurricular activities	.1527**	12/298	.0272*	4/294	.1799**	16/294
Good social experiences	.1063**	11/299	.0321*	4/295	.1384**	15/295
INTELLECTUAL OUTCOMES						
Adequacy of general knowledge	.0787**	11/299	.0536**	4/295	.1323**	15/295
Adequacy of math skills	.2479**	11/299	.0244*	4/295	.2723**	15/295
Development of problem solving skills	.2683**	12/298	.0242*	4/294	.2925**	16/294
Development of public speaking skills	.2818**	12/298	.0324**	4/294	.3142**	16/294
Progress toward intellectual goals	.0404	11/299	.0847**	4/295	.1251**	15/295
Participation in cultural activities	.2137**	12/298	.0379**	4/294	.2516**	16/294
Highest degree planned	.2068**	11/299	.0107	4/295	.2175**	15/295
ACADEMIC ACHIEVEMENT	.1924**	11/299	.0092	4/295	.2016**	15/295
SATISFACTION WITH EDUCATION	.1294**	11/299	.1479**	4/295	.2773**	15/295

a. N=311

* p < .05

** p < .01

effects primarily between program type and satisfaction with education through frequency of formal and informal student-faculty interaction. It is interesting to note that frequency of formal student-faculty interaction negatively affected satisfaction with education. This finding might be explained by the fact that frequency of informal interaction positively influenced satisfaction with education. In other words, the greater the informal interaction, the less likely the interaction will continue on a formal level, and if it does, satisfaction will decrease. Our findings might also be explained by the fact that many students who are dissatisfied with aspects of their academic work are likely to engage in interaction with faculty that is primarily formal.

In summary, our results provided support for the importance of the impact of student-faculty interaction on the intellectual and personal/social outcomes of college students. More specifically, this study distinguished between the frequency of formal and the frequency of informal student-faculty interaction. Interaction which was characterized as informal had the greater impact on these student outcomes. In addition, frequency of informal student-faculty interaction had a positive effect on overall satisfaction with the college experience.¹⁵

DISCUSSION

As pointed out earlier, this study differed from much of the previous work on student outcomes by examining the impact of student-faculty interaction after four years, by including a broad range of educational outcome variables, and by focusing on two general social dimensions of interaction frequency as well as two qualitative aspects of interaction. Nevertheless, our research can be seen as extending the work of Terenzini and Pascarella (1980) and Lacy (1978), and some comparisons will be made here with their results.

Our study confirmed the general thrust of Terenzini and Pascarella's work, which showed that the frequency and quality of student-faculty interaction had positive impacts on personal, intellectual, and academic outcomes even while controlling for 14 student pre-enrollment characteristics. However, because of differences in the actual variables used, only a few specific comparisons can be made. For example, in both studies, the *frequency* of student-faculty interaction variables, taken together, had a somewhat greater effect on intellectual outcomes than on personal/social outcomes. In terms of the *quality* of student-faculty interaction, Terenzini and Pascarella found that faculty concern for student development and teaching affected only intellectual development; in our research, helpfulness of faculty, a complementary if not roughly comparable measure, affected progress toward intellectual goals. The major specific difference between the two studies, mentioned previously, is the greater effects of the frequency of student-faculty interaction variables on academic achievement in the work of Terenzini and Pascarella.

Our findings also supported the results of the investigation conducted by Lacy, which showed that the frequency, content, and quality (as measured by satisfaction) of student-faculty interaction affected several value-related outcomes and mediated the effects of college environments. However, Lacy found that the frequency and nature of peer interactions had even greater overall effects on these outcomes. It may well be that faculty influence only goes so far. Even in our study, while the frequency of informal student-faculty interaction had a greater impact on educational outcomes than frequency of formal student-faculty interaction, the outcomes most affected were those categorized as intellectual outcomes as opposed to personal/social outcomes. Faculty may be strong models for intellectual growth, but peers may be the primary models for personal/social and value-related outcomes.

CONCLUSION

This study has implications for faculty, students, and administrators. Faculty need to be reminded how important they are in the overall impact of college on student outcomes. They can make a difference. In taking this fact seriously, faculty must also realize that mere frequency of interaction with students is not enough. Interaction must also be characterized by a certain quality. Students respond to informal interaction more than just formal advising. That is to say, friendly contacts which operate at a more personal level and cover a broad range of issues have a greater impact than contacts which are rather perfunctory and limited to specific academic and vocational topics or requirements. Faculty need to be more helpful and accessible to students. Many faculty are tempted to forsake informal interaction under the pressures of research or other time constraints. Many peer advising programs have been developed in colleges and universities in the past few years and these must guard against allowing such advising to take the place of informal faculty interaction. Peer advising can supplement faculty interaction but should never replace it.

Students should be more persistent in seeking opportunities to be involved with faculty members outside the classroom. They should take advantage of structured events such as registration advising or faculty office hours to develop informal relationships with faculty. They should also avoid generalizing one bad faculty interaction experience to all future experiences. Finally, students must not limit their efforts in getting to know faculty members to their own disciplines (major fields) but should be open to interaction with responsive faculty whenever they may be found.

Administrators must begin to see the value of those structural situations on their campus which foster student-faculty interaction. Residential colleges in living units on the campus have been shown to provide an environment which enhances student-faculty interaction. The use of faculty in student recruitment by

the admissions staff can also help to establish initial student (albeit prospective student) interaction which can be built upon following enrollment. Finally, administrators must believe enough in the significance of student-faculty interaction that they will use the reward structure to recognize such activity in a tangible way.

The growing body of literature on the impact of student-faculty interaction is becoming difficult to ignore. Faculty do make a difference, both positively and negatively, on student outcomes. This study should assist faculty to understand that to the extent that they have interactions with students which are more personal and reflect a broad concern with students' emotional and cognitive growth, student intellectual growth can be increased. Future studies could evaluate those campus programs based upon student-faculty interaction that produce the most positive results.

NOTES

1. The following outcomes had an initial value: importance of self-directed learning, importance of developing independence, social self-confidence, formal involvement in extracurricular activities, development of problem-solving skills, development of public speaking skills, and participation in cultural activities.
2. A number of items which appeared on both the Freshman Questionnaire and the Graduating Students Survey were conceptually designed to be combined into scales which would measure the five outcome variables that had initial values. These items were factor-analyzed separately for each survey to determine if they would cluster according to their conceptually appropriate dimensions. The results of the two factor analyses were almost identical in that both sets of items tended to cluster in the same ways. This similar patterning of relationships provided some assurance that these items measured the same attributes at two different points in time. Factor-based scales were constructed using the factors generated from the Graduating Students Survey.
3. While this method of constructing scales can produce measures which are somewhat correlated, care was taken to ensure that these, and in fact all 14 outcome variables, were relatively independent. As mentioned earlier, outcomes that we found to be highly correlated with other outcomes in previous work were not examined in this study. Also, the intercorrelations between all possible pairs of outcomes were examined. Of 91 possible pairs, 79 had correlations below .20 (most were below .10). Only three pairings had "moderate-level" correlations of over .30: social self-confidence with adequacy of general knowledge ($r = .35$), social self-confidence with development of public speaking skills ($r = .39$), and progress toward intellectual goals with satisfaction with education ($r = .40$). A complete correlation matrix is available from the authors.
4. Answers to these items were obtained by using four Likert-style response categories. For example, answers to the items making up the importance of developing independence outcome were obtained by using categories ranging from "not important" to "very important."
5. Three of these individual questionnaire items dealt with the importance of acquiring skills for self-directed learning, satisfaction with social experiences at the university, and ability to speak before a group; answers to these items were obtained by using four Likert-style response categories. The fourth questionnaire item dealt with the highest degree planned, and answers were obtained by using five response categories ranging from "none" to "doctorate degree."
6. Answers to these items were obtained by using four Likert-style response categories. For example, answers to the items making up the frequency of formal student-faculty interaction outcome were obtained by using the categories "none," "one," "few," and "many."
7. These items appeared on the Freshman Questionnaire. Answers to these items were obtained by using four Likert-style response categories.

8. These items appeared on the Freshman Questionnaire. Four of these items dealt with the expectations that professors will be friendly, that most classes will be exciting and challenging, of involvement in extracurricular activities, and that values and beliefs will change; answers to these items were obtained by using four Likert-style response categories. The fifth item asked: "After you complete your undergraduate studies, what is the highest degree you plan to pursue?" and answers were obtained by using five response categories ranging from "none" to "doctorate degree."
9. Liberal arts students were those whose majors were in the College of Arts and Sciences while professional program students were those from the College of Business and Administration, College of Engineering, College of Environmental Design, College of Music, School of Education, School of Journalism, and School of Pharmacy.
10. These items appeared on the Freshman Questionnaire. Answers were obtained by using four Likert-style response categories.
11. Prior to this, the extent to which the demographic/academic background variables were independent was assessed by examining their intercorrelations. Of 55 possible variable pairings, 53 had correlations below .20 (most were below .10). The exceptions were degree aspiration with expectations for exciting classes ($r = .23$) and expectations for making friends with expectations for extracurricular activities ($r = .32$). Demographic/academic background variables were therefore judged to be relatively independent in this study. Also, when demographic/academic background variables were correlated with initial outcome values, no moderate or high correlations were found. Complete correlation matrices are available from the authors.
12. In order to test for the possible presence of important statistical interactions among variables, a preliminary analysis was conducted where the 4 student-faculty interaction variables were crossed with the 10 demographic/academic background variables to create 40 interaction terms. These were then incorporated into the framework of the causal model as separate variables and their direct effects on specific outcomes examined. Very few interaction terms were found to have effects on specific outcomes.
13. A table containing the direct effects of background variables on student-faculty interaction variables is available from the authors.
14. Results presented in Table 3 do not show the indirect effects between background variables and outcome variables through student-faculty interaction variables.
15. Our results should be interpreted with caution, given the usual assumptions that must be made for linear recursive causal modeling, for example linearity, uncorrelated error terms, interval level measurement, homoscedasticity, and measurement reliability (Heise, 1975). We are aware of the problems regarding unique variance in measured variables and the development of approaches to causal modeling for unobserved variables (Goldberger and Duncan, 1973; Jöreskog, 1973, 1977; Jöreskog and Sorbom, 1978).

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REFERENCES

- Astin, A. The methodology of research on college impact (I). *Sociology of Education*, 1970, 43, 223-254.
- Astin, A. *Four critical years: effects of college on beliefs, attitudes, and knowledge*. San Francisco: Jossey-Bass, 1977.
- Astin, A., and Panos, R. *The educational and vocational development of college students*. Washington, D.C.: American Council on Education, 1969.
- Bean, J. Dropouts and turnover: the synthesis and test of a causal model of student attrition. *Research in Higher Education*, 1980, 12, 155-187.

- Bowen, H. R. *Investment in learning: the individual and social value of American higher education*. San Francisco: Jossey-Bass, 1977.
- Centra, J. A., and Rock, D. A. College environments and student academic achievement. *American Educational Research Journal*, 1971, 8, 623-634.
- Chickering, A. *Education and identity*. San Francisco: Jossey-Bass, 1969.
- Chickering, A., and McCormick, J. Personality development and the college experience. *Research in Higher Education*, 1973, 1, 43-70.
- Cohen, S., Kamieniecki, S., and McGlen, N. Graduate student-faculty relationships. *Teaching Political Science*, 1, 1980, 131-152.
- Duncan, O. D. *Introduction to structural equation models*. San Francisco: Academic Press, 1975.
- Endo, J. 1975-76 freshman class. Office of Academic Planning and Analysis, University of Colorado at Boulder, 1976.
- Endo, J., and Harpel, R. A longitudinal study of student outcomes at a state university. Paper presented at the 1980 Annual Meeting of the Association for Institutional Research, Atlanta, April 1980.
- Endo, J., and Lenning, O. Using the NCHEMS outcomes structure to test the adequacy of outcomes lists: tryout at a state university. Paper presented at the 1978 Annual Meeting of the Association for the Study of Higher Education, Chicago, March 1978.
- Feinberg, L. Faculty-student interaction: how students differ. *Journal of College Student Personnel*, 13, 1972, 24-27.
- Feldman, K. A., and Newcomb, T. M. *The impact of college on students, volume I: an analysis of four decades of research*. San Francisco: Jossey-Bass, 1969.
- Gaff, J. C. Making a difference: the impacts of faculty. *Journal of Higher Education*, 1973, 605-622.
- Goldberger, A. S., and Duncan, O. D. *Structural equation models in the social sciences*. New York: Seminar Press, 1973.
- Gregg, W. E. Several factors affecting graduate student satisfaction. *Journal of Higher Education*, 1972, 43, 483-498.
- Grigg, C. *Recruitment to graduate study: college seniors' plans for postgraduate education and their implementation the year after commencement*. Atlanta: Southern Regional Education Board, 1965.
- Gurin, P., and Katz, D. *Motivation and aspiration in the negro college*. Ann Arbor, Michigan: University of Michigan Survey Research Center, Institute for Social Research, 1966.
- Heise, D. R. *Causal analysis*, New York: Wiley, 1975.
- Heiss, A. M. Berkeley doctoral students appraise their academic programs. *Educational Record*, 1967, 48, 30-44.
- Kim, J., and Mueller, C. *Factor analysis: statistical methods and practical issues*. Beverly Hills: Sage, 1978.
- Jöreskog, K. G. A general method for estimating a linear structural equation system. In A. S. Goldberger and O. D. Duncan (Eds.), *Structural equation models in the social sciences*. New York: McGraw-Hill, 1973.
- Jöreskog, K. G. Structural equation models in the social sciences: specification, estimation and testing. In P. R. Krishnaiah (Ed.), *Application of statistics*. Amsterdam: North Holland, 1977.

- Jöreskog, K. G., and Sorbom, D. *LISREL-estimation of linear structural equation systems by maximum likelihood methods*. Chicago: International Education Services, 1978.
- Lacy, W. B. Interpersonal relationships as mediators of structural effects: college student socialization in a traditional and an experimental university environment. *Sociology of Education*, 1978, 51, 201-211.
- Lenning, O. T., et al. *Nonintellective correlates of grades, persistence and academic learning in college: the published literature through the decade of the sixties*. Iowa City: American College Testing Program 1974(a).
- Lenning, O. T., et al. *The many faces of college success and their nonintellective correlates: the published literature through the decade of the sixties*. Iowa City: American College Testing Program, 1974(b).
- Micek, S., and Arney, W. *The higher education outcome measures identification study*. Boulder: National Center for Higher Education Management Systems at WICHE, 1974.
- Newcomb, T., Brown, D., Kulik, J., Reimer, D., and Revelle, W. Self-selection and change. Pp. 137-160 in J. Gaff (Ed.), *The cluster college*. San Francisco: Jossey-Bass, 1970.
- Pascarella, E. T. Student-faculty informal contact and college outcomes. *Review of Educational Research*, 1980, 50, 545-595.
- Pascarella, E. T., and Terenzini, P. T. Informal interaction with faculty and freshmen ratings of the academic and non-academic experience of college. *Journal of Educational Research*, 1976, 70, 35-41.
- Pascarella, E. T., and Terenzini, P. T. Patterns of student-faculty informal interaction beyond the classroom and voluntary freshman attrition. *Journal of Higher Education*, 1977, 48, 540-552.
- Pascarella, E. T., and Terenzini, P. T. Student-faculty informal relationships and freshman year educational outcomes. *Journal of Educational Research*, 1978, 71, 183-189.
- Pascarella, E. T., and Terenzini, P. T. Interaction effects in Spady's and Tinto's conceptual models of college dropout. *Sociology of Education*, 1979, 52, 197-210.
- Pace, C. R. *Higher Education measurement and evaluation KIT*. Los Angeles: Center for Study and Evaluation, Graduate School of Education, University of California, 1971.
- Pace, C. R. *Measuring outcomes of college: fifty years of findings and recommendations for the future*. San Francisco: Jossey-Bass, 1979.
- Rossman, J. An experimental study of faculty advising. *Personnel and Guidance Journal*, 1967, 46, 160-164.
- Sanford, N. *Where colleges fail*. San Francisco: Jossey-Bass, 1967.
- Snow, S. G. Correlates of faculty-student interaction. *Sociology of Education*, 1973, 46, 489-498.
- Spady, W. Dropouts from higher education: an interdisciplinary review and synthesis. *Interchange*, 1970, 1, 64-85.
- Spady, W. Dropouts from higher education: toward an empirical model. *Interchange*, 1971, 2, 38-62.
- Taylor, H. *How to change colleges: notes on radical reform*. New York: Holt, Rinehart, and Winston, 1971.
- Terenzini, P., and Pascarella, E. Voluntary freshman attrition and patterns of social and

- academic integration in a university: a test of a conceptual model. *Research in Higher Education*, 1977, 6, 25-44.
- Terenzini, P., and Pascarella, E. The relation of students' precollege characteristics and freshman year experience to voluntary attrition. *Research in Higher Education*, 1978, 9, 347-366.
- Terenzini, P., and Pascarella, E. Student/faculty relationships and freshman year educational outcomes: a further investigation. *Journal of College Student Personnel*, 1980, 27, 521-528.
- Thistlethwaite, D. L. College press and changes in study plans of talented students. *Journal of Educational Psychology*, 1960, 51, 222-234.
- Thistlethwaite, D. L. Fields of study and development of motivation to seek advanced training. *Journal of Educational Psychology*, 1962, 53, 53-64.
- Tinto, V. Dropout from higher education: a theoretical synthesis of recent research. *Review of Educational Research*, 1975, 45, 89-125.
- Weidman, J. Nonintellective undergraduate socialization in academic departments. *Journal of Higher Education*, 1979, 50, 48-62.
- Wilson, R. C., Gaff, J. G., Dienst, E. R., Wood, L., and Bavry, J. L. *College professors and their impact on students*. New York: Wiley, 1975.

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