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ABSTRACT

This study examined the extent to which each of four factors contributes to students' estimates of their development in college. These factors are: (1) student/faculty interaction; (3) student involvement; (3) quality of a student's effort; and (4) peer interaction. A mail survey was completed by 484 students. The instrument used was the College Student Experience Questionnaire (C. Pace, 1983), a measure of the quality and level of college student involvement in a range of campus activities. Academically related peer interaction was found to make a greater contribution to students' estimates of gains than did the other three factors. Peer interaction had a strong predictive capacity for student outcomes, surpassing, by a considerable extent, the other factors. (Contains 2 tables and 69 references.) (SLD)

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THE INFLUENCE OF ACADEMICALLY-FOCUSED PEER INTERACTION ON COLLEGE STUDENTS' DEVELOPMENT

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ABSTRACT

In an analysis of college students, academically-related peer interaction was found to make a greater contribution to students' "estimates of gains" than did the factors of 1)student/faculty interaction, 2) the student's effort, or 3) student involvement.

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Pre-college characteristics, such as academic ability and high school grades, account for much of the variance in college student achievement (Willingham, Young and Morris, 1985; Pace, 1984; Nelson, Scott and Bryan, 1984). However, what a student does while enrolled in college also extensively determines the success he/she experiences. Historically, in research on college students' development, several factors can be seen as having consistently emerged as important influences on student outcomes. These may be classified into three broad categories: 1) student/faculty interaction, 2) student involvement, and 3) the quality of a student's effort. More recently, a fourth factor has emerged, as researchers have begun to explore the role of peer interaction, specifically revolving around academic and intellectual issues, in producing positive student gains. (Astin,1992; Ayres and Bennett, 1982; Goodsell, Mather, Tinto, 1992; Light, 1991, 1992; Whitt, Edison, Pascarella, Nora, and Terenzini, 1999; Treisman, 1985; Winston and Zimmerman, 2003).

This study examines the extent to which each of these four factors contributes to students' estimates of their intellectual development in college. As will be explained, there is considerable conceptual and empirical evidence to conclude that the more recently identified factor of academically focused peer interaction exhibits a comparatively strong influence on student outcomes. Consequently, it is argued that academically focused peer interaction is critical to a full understanding of both the outcomes of the college experience and the organizational dynamics of colleges and universities.

Before undertaking an empirical analysis, each of the four factors employed in the study is explained below. The relevance of student/faculty interaction in influencing positive gains for college students is intuitively obvious. Students look to their teachers as

the primary, formal guides for their intellectual development. Numerous studies have found that extended, close contact with faculty members has a positive impact on cognitive development (Endo and Harpel, 1982; Elfner, McLaughlin, Williamsen, and Hardy, 1985; Pascarella, 1980; Pascarella and Terenzini, 1981; Terenzini and Pascarella, 1980; Terenzini and Wright, 1987). Other studies have placed student learning in the context of a social system and examined the role of faculty, as well as students, as primary agents of socialization (Endo and Harpel, 1983; Pascarella, Duby, Terenzinia, 1983; Volkwein, King and Terenzini, 1986). However, the measures of student peer relationships typically employed in these studies are more oriented toward issues of socializing and bonding than to collaborative academic development. However, there are exceptions to this pattern. For example, Pascarella's (1989) analysis of growth in critical thinking skills employed a measure of the number of intellectually focused interactions students had with faculty and peers. But these measures produced only trivial and statistically non-significant relationships.

The quality of a student's effort is another intuitively obvious element in producing positive outcomes. Indeed, it is so obvious that until fairly recently it was a somewhat neglected factor in research on college effects. Nevertheless, a number of studies demonstrate that the intensity of effort a student devotes to the college experience does have an influence on achievement (Astin, 1984, 1985; Kuh, 2002; Pace, 1980, 1984, 1987, 1990; Pascarella, 1989; Ory and Braskamp, 1988). But in analyzing student effort, these studies frequently combine measures of intellectual and academic commitment with interpersonal experiences related to involvement in a range of college activities that can be classified as non-academic. The factors, of effort and of involvement, should be treated as conceptually distinct. We use quality of effort as a measure of academic engagement and

employ the term involvement to apply to the broad array of interpersonal and institutionally structured collegiate activities in which a student may voluntarily engage. Involvement in this study, therefore, denotes a student's general connectedness to a college's social system, whereas quality of effort is explicitly a measure of academic commitment. Quality of effort is similar to, but much broader than, the concept of "time on task" which traditionally appears in the psychology of learning literature.

Since Tinto's (1975) classic explication of a sociological theory of retention, in which a student's integration into the social structure of a college figured prominently, the concept of involvement has been construed as a central element in student success in college (Astin, 1984; Pace, 1980). Its importance in influencing student retention and satisfaction has been consistently demonstrated (Pascarella and Terenzini, 1978; Terenzini and Pascarella, 1980). The most comprehensive formulation of the role of involvement in student outcomes, however, was offered by Astin (1984, 1985), who proposed a "theory of involvement" to explain the dynamics of student development. His theory rejects an earlier notion of students as the passive recipients of education (Astin, 1970, 1977) and explores the interplay between individual psychological characteristics and an institutional environment, reflecting the dynamic process by which development is induced when a student interacts with or becomes involved in the college experience. The central postulates of Astin's theory are that involvement requires the investment of psychological and physical energy on the part of the student and that the efficacy of an educational practice is related to its capacity to engender such involvement (Astin, 1985).

Like involvement, peer interaction has been a focus of college student research for many years (Newcomb, 1962), but the particular emphasis of research on this phenomenon generally has been on peer interaction as an agent of socialization.

Consequently, such research has either examined the relationship of peer interaction to broad questions of human development (Chickering, 1969) or analyzed it in terms of a student's integration into the social fabric of an institution (Tinto, 1975). In the latter case, the central concern has been the role peer interaction plays in creating social bonds that impact on such variables as student retention and satisfaction (Bean and Bradley, 1986; Tinto, 1975; Terenzini and Pascarella, 1980). Evidence presented by Pascarella, Duby, Terenzini, and Iverson (1983) has demonstrated the importance of peer interaction as a positive influence on institutional persistence and self-reported measures of intellectual and personal development during the first year of college. However, the measures of peer interaction utilized in their study were largely oriented to social relationships with peers. In a similar vein, peer interaction in residence halls has been analyzed as a salient component in the environment of a college community (Milem, 1998; Moos, 1979).

In none of these streams of research, however, has the focus of peer interaction been placed explicitly on academic and intellectual issues and attempted to relate them to the broad learning outcomes of a college education. The focus on peer interaction in this study, therefore, is not on social interaction. Rather, the emphasis here is on students' self-reported perceptions of behaviors which constitute a climate in which intellectually and academically directed peer relations contribute to students' judgments of positive gains on global measures of intellectual development.

In addition to those studies cited above, there are four broad areas of research and theory that increasingly underscore the value of academically related peer interaction. The first is a growing movement for collaborative learning in higher education. This movement emphasizes active learning as opposed to passive modes and reveals the potential of students to learn from one another, including peer teaching situations, as a key ingredient

in intellectual development during the college years (Johnson, Johnson and Smith, 1991; Kuh, 2003; Smith, 1986; Whitman, 1988).

Secondly, there exists a long tradition in the educational psychology literature of research on peer learning in small groups (Webb, 1982). However, this research is generally not focused on college students per se, and more importantly, it relies heavily on studies utilizing small, intact, nominal groups engaged in learning tasks in controlled, experimental settings (Webb, 1982). Consequently, such studies typically contain very limited task structures which examine cognitive functioning related to highly constrained and bounded or precise outcomes as opposed to broad intellectual development. An exception to this pattern is the work of Johnson, Johnson and Smith (1991), which examines groups of college students engaged in comprehensive intellectual activities. Both Astin (1996) and Schulman (2000) have attempted to integrate this body of research into the practice of higher education.

A third, highly important field of research, which has generally been overlooked in the higher education literature draws on developmental psychology. Its theoretical development and empirical support focus primarily on early childhood development. Nevertheless, the work of some developmental psychologists, particularly Vygotsky (1978), identifies the importance of peer interaction in promoting intellectual development early in life (Bornstein and Bruner, 1989). The implications of this work for higher education should not be overlooked.

A fourth area of research relevant to student/peer interaction, is drawn from organizational theory. Research in the last decade has revealed that effective organizations possess strong organizational cultures. They embody interactions among their members that act independently of other factors, such as resources, structure, or

environmental conditions, to exert a transformative effect on those organizations (Peters and Waterman, 1982; Cameron and Techirhart, 1992; Goleman, Boyatzis and McKee, 2003). This transformative effect induces members to be more productive and effective in achieving organizational goals and related beneficial outcomes. It is reasonable to assume that this line of inquiry in organizational theory has application to colleges and universities (Kuh and Whitt, 1988). Specifically, it may be inferred, as Peterson (1997) does, that effective student cultures induce students to perform at a more optimal intellectual level than do those in which academic values are less pronounced.

In this vein, a number of studies are especially intriguing (Ayers and Bennett, 1983; Light, 1990, 1991; Treisman, 1985). In part, they have relied on ethnographic rather than experimental data-gathering techniques. For example, Treisman's (1985) ethnographic study of achievement in college math found that those students who worked jointly outside of class, challenging and supporting one another and integrating their studying and social activities, evidenced much greater achievement than did those students for whom studying was a solitary, asocial activity.

Ayers and Bennett (1983), in a comparative analysis of institutions, observed that students enrolled in institutions where they experienced the greatest gains in learning described their peers as supportive of academic achievements. Interestingly, in their initial quantitative analysis (Ayers and Bennett's [1983]) found that faculty characteristics were the most important influence on student achievement. But data obtained in the follow-up interviews undertaken as part of their study, highlighted the extensive role of peer interaction in positive intellectual outcomes for students. A related study of fraternity groups (Shrager, 1986) found that freshman achievement was higher in groups that emphasized academic achievement and college completion and lower in groups that

emphasized student social influence. The widely influential reports on the Harvard Assessment Seminars (Light, 1990, 1991) underscore the value of small study groups to enhance students' learning as a promising direction for future research. A conclusion of these reports is that the rewards of small study groups in producing marked gains in achievement, as measured by test scores, are modest. A greater value of small study groups is evident, however, on measures of student's enthusiasm for learning and their pursuit of topics to more advanced levels. It may also be inferred that the processes involved in such group work also enhance students' skills in civic engagement, the development of which are increasingly seen as a critical mission of higher education (see for example Colby, et al, 2003), although few empirical studies examining this relationship have been undertaken to date.

Instrumentation and Method

The instrument used in this study was the College Student Experience Questionnaire (CSEQ) (Pace, 1983). The CSEQ measures the quality and level of college student involvement in a broad range of campus activities. One of the central features of the CSEQ is a ten-item set of questions that asks students to rate on a five-point Likert-type scale the extent to which they have taken advantage of the opportunities for learning at their institution. These include items questioning the effort they have put forth in maximizing their capabilities (e.g.. hours spent studying, note taking, listening attentively in classes, using the library, etc.). These items represent a self-assessment of the degree to which a student is investing quality of effort in his/her own education. An additional ten-item scale in the CSEQ asks students to rate the nature of their interactions with faculty members (e.g.. discussed ideas for a term paper or class project with a faculty member, visited with a faculty member after class, worked with a faculty member on a research

project, discussed career plans or ambitions with a faculty member, etc.). Another ten-item scale asks students to rate their involvement in the college community through clubs and organizations (e.g.. attended a meeting of a club, organization, student activity, worked in some student organization or special project, etc.)

The CSEQ also contains questions regarding academically related peer interaction. These items were combined conceptually to create a fifteen-item factor eliciting responses to such issues as: separate questions inquiring if a student has talked with other students about their classes, in art, music, theater, or politics; discussed religion, philosophy, or social problems with other students; asked another student to read something they wrote; tested their understanding of a scientific principle by seeing if they could explain it to another student; studied with other students in the residence unit.

The CSEQ also contains a scale that was used as an outcome measure in this study. This factor examines students' perceived "estimate of gains" in college. It is comprised of 21 items, including the following: gaining a broad general education about different fields of knowledge; developing an understanding and enjoyment of art, music and drama, ability to think analytically and logically, ability to learn on your own, broadening your acquaintance and enjoyment of literature, understanding the nature of science and experimentation. Students rate their gains on a four-point scale ranging from "very much" to "very little." The CSEO was distributed by mail to a random sample of 1,900 undergraduates at a moderate sized public college in the Northeast. Four hundred and eighty-four useable questionnaires were available for this analysis.

The four factors used as predictor variables were placed in a stepwise, multiple regression and regressed on the outcome criterion of students' "estimate of gains." A stepwise procedure was employed because it offers a parsimonious solution and

affords a means of highlighting a specific phenomenon.

Results

Table I presents the correlations among the variables. These data provide an indication of the differences between the predictor variables and the criterion variable, as well as indication of the overlap of the predictor variables with each other.

INSERT TABLE I

TABLE II presents the summary of the stepwise multiple regression analysis. It can be observed that the variables under consideration account for approximately 39 percent of the variance in student estimates of gains. The Beta weights, or the coefficients of the standardized predictor variables, reveal that academically related peer interaction (Beta=.396, F=85.20, p=<.001) exhibits the greatest relative importance of the four factors examined. Peer interaction is followed by student quality of effort (Beta=.286, F=54.38, p=<.001), student/faculty interaction (Beta .104, F=6.28, p<.001), and student involvement (Beta .044, F=1.51). Peer interaction, which as the first variable entered into the stepwise regression analysis, has an R2 of .303 and accounts for more than twice the variance in student estimate of gains than does the next most important factor, student/faculty relations which has a squared partial correlation coefficient of .122.

INSERT TABLE II

TABLE I

Correlations Among Variables

	Estimate Gains	Peer Interaction	Quality of Effort	Faculty Interaction	Involvement
Estimate of Gains	1.00				
Peer Interaction	.55	1.00			
Quality of Effort	.45	.31	1.00		
Faculty Intervention	.39	.43	.34	1.00	
Involvement	.27	.44	.08	.35	1.00

TABLE II
Stepwise Multiple Regression on Estimates of Gains
Summary Table

Variable	Beta	R	R2	F
STEP 1				
Peer Interaction	.550	.550	.303	209.80*
STEP 2				
Peer Interaction				
Quality of Effort	.307	.623	.388	152.69*
STEP 3				
Peer Interaction	.412			
Quality of Effort	.281			
Student/Faculty Interaction	.114	.631	.398	105.91*
STEP 4				
Peer Interaction	.396			
Quality of Effort	.286			
Student/Faculty Interaction	.104			
Student Involvement	.044	.632	.399	79.74*

*p<.001.

Limitations

This study contains a number of limitations. The sample was not representative of the entire population of the institution. The sample contained a greater proportion of students with high grades and students living in residence halls. Furthermore, the stepwise regression procedure may have provided unwarranted emphasis to peer interaction by discounting inter-correlation among the variables because peer interaction as the variable with highest correlation with the criterion variable was entered into the analysis first.

Discussion

This analysis reveals that peer interaction represents a strong predictive capacity on student outcomes, surpassing, by a considerable extent, the contribution of the other factors examined, including student/faculty interaction. As described earlier, student/faculty interaction has been widely studied (see for example, Endo and Harpel, 1982, 1983; Pascarella, 1980; Terenzini and Pascarella, 1980; Terenzini and Wright, 1987), and is of intuitively obvious importance in the educational enterprise. It has often been perceived as the fundamental relationship in which learning occurs. Nevertheless, when the outcomes of college are framed broadly (as they were in this study) focusing on students' perceptions of their growth on a wide range of variables, the character of academically directed peer relations existent throughout the total college environment accounted for an even greater proportion of the variance in student perceptions of their intellectual growth than student/faculty interaction.

That students should be intellectually influenced by other students is hardly startling, of course. Students spend the greatest amount of time in college with other students, therefore, they are the primary agents of socialization for one another in a variety of domains. However, general college involvement seemingly has far less influence on

students' perceived intellectual gains than does academically related peer interaction. This latter factor is also apparently of even greater importance than the quality of student effort, defined in the context of individual activity.

Perhaps, then, since this study suggests the high degree to which perceived student learning occurs through intellectually and academically focused peer interaction, it reinforces the potential utility of collaborative learning and the movement which is developing around this notion (Brufee,1993; Kuh, 1996; Lazar, 1996; Whipple, 1987). The concept of collaborative learning has important implications for practice, both in the manner in which classes are conducted, as well as the way in which colleges are structured. For example, the use of discussion groups, joint projects, and peer teaching may be useful ways of facilitating learning in a variety of settings. While these pedagogical devices are increasingly widespread in American higher education, they may have even greater efficacy in terms of influencing broad learning outcomes than they do in affecting performance in an individual class (Light, 1991).

Additionally, organizing the campus environment to facilitate peer interaction focused on academic issues may produce particularly important benefits in shaping the character and climate of a college (Kuh, et al 1991). For example, residence halls can be structured to accommodate collaborative learning by coordinating residence assignments to interface with common class schedules in a manner that enables instructors to comfortably assign group projects, readings, and out-of-class discussions. Another valuable consequence of such activities may be the partnerships they enable between student affairs professionals and teaching faculty who could be encouraged to jointly formulate campus environments that facilitate peer interaction on academic and intellectual matters. The benefits of such strategies have been elucidated by other recent analyses

(see for example: Magolda, 1992). Peer interaction may also become far more central in student academic life with the increased use of new educational technologies. These technologies offer significant opportunities for students to interact electronically in commenting on another's work, responding to each other's ideas in writing and in real time, and engaging in joint research projects often from separate, remote sites.

A further implication of this study is the support it lends to a small but growing body of research highlighting the significance of academically related peer interaction in student development. A greater understanding of academically related peer interaction may contribute to changing conceptions of the nature of colleges and of knowledge itself. In recent years there has been growing concern with both the quality of community and of communal values in colleges (Gabelnick, MacGregor, Matthews and Smith, 1990; Nichols, 1989; Palmer, 1998;). This concern relates to the way in which members of a college community support, validate and attend to one another. It rejects radical, isolated individualism and embodies a corresponding search for a basis of substantive commitments to other human beings, as well as values that promote a balance between individual needs and public well-being (Bellah, Madsen, Sullivan, Swidler, Tyston, 1991; Colby, Ehrlich, Beaumont and Stephens, 2003; Putnam, 2000).

These civic concerns also foreshadow contemporary notions of the curriculum and of knowledge. In recent years there has been growing awareness of the way in which knowledge is socially constructed (Berger and Luckman, 1967; Brufee, 1981, 1986; Rorty, 1979). In this conception, learning is not simply a cognitive process involving the manipulation of constructs and data, but a social process in which ways of knowing and knowledge itself are shaped through interaction with others. As Gamson (1984) has pointed out, learning is as much a sociological as a psychological process. From this

perspective, it is incumbent on colleges to design curricula and promote values that engender cooperation rather than competition among students, as well as encourage them to support one another's intellectual development (Astin, 1987, 1988; Bricker, 1989; Johnson and Johnson, 1989, 1991; Johnson, Johnson and Smith, 1991; Nichols, 1989).

The results of this study then, have implications for both research and practice. They contribute to a promising direction for research on student learning outcomes by illuminating the importance of academically related peer interaction on student's self-perceptions of their development while in college. The study also suggests the potential value of exploring avenues by which not only individual classes but also college environments in their entirety may be restructured to facilitate such peer interaction.

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