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CHANGES IN SELF-RATINGS AND LIFE GOALS AMONG STUDENTS AT COLLEGES WITH DIFFERENT CHARACTERISTICS

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Summary

Eleven self-ratings on personal characteristics and life goals were re-administered, after a one-year period, to freshmen and sophomore students at a sample of ten diverse colleges and universities. Comparisons across institutions were made of students giving the same initial response to determine (a) whether students at different colleges showed differential changes on the self-ratings and goals, and (b) whether or not these changes were correlated with such objective measures of college characteristics as enrollment, selectivity, or the proportion of students in various curricula. Differential changes were observed on self-ratings of popularity and scholarship as well as for goals involving religious values, participation in public affairs, and making a contribution to science. In each case, change appeared to be related to several college characteristics. While some of the change measures were correlated with the initial means at the institutions studied, the findings did not appear to be accounted for solely by regression phenomena. Consequently, we concluded that hypotheses relating institutional characteristics to personality change in college students had been prematurely rejected.

Changes in Self-Ratings and Life Goals Among Students at Colleges with Different Characteristics[1]

Rodney Skager, John L. Holland, and Larry A. Braskamp

In their review of the literature, McCullers and Plant (1964) suggested that recent research in higher education had eliminated "... college experience as an independent variable" in personality change (p. 605). This conclusion appears to have been based primarily on the work of Plant (1962) and Telford and Plant (1963), whose data revealed that changes in scores on several personality scales were not the result of "college impact," but rather occurred in brighter than average young adults whether or not they attended college. Recent research by Lehmann, Sinha, and Hartnett (1966) is in large part consistent with these findings. Until other explanations can be found, changes on traits such as open-mindedness or flexibility presumably must be attributed to maturation within the broader cultural-temporal context rather than to experience associated with attending college.

In spite of the above negative evidence, researchers in higher education have given no sign of abandoning theory and research on college effects. Recently, Sanford (1966) provided a number of interesting hypotheses as to how colleges may influence personality development.

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Available during the period covered by the McCullers and Plant (1964) review was Astin's (1963a) study which reported many relationships between college characteristics and self-estimates of growth in a variety of skills, interests, and values. Nichols (1965) observed a significant correlation between eighteen college measures and change on a variety of personality scales. Using a method similar to Nichols', Thistlethwaite and Wheeler (1966) reported significant relationships of environmental press and college experiences with changes in level of aspiration for graduate training, controlled for initial aspiration and other variables.

The present research differs from much previous work on the effects of college experience in that we have studied changes in self-ratings and the relative importance given various goals rather than changes on standardized personality scales. The purposes of this research are (1) to determine whether or not there are consistent differences among colleges in the extent of change on the goals and self-ratings, and (2) to relate observed changes to institutional characteristics such as size, expenditure, and type of environment.

Method

This research is based on responses to a longitudinal study of college students at 48 colleges and universities described in Abe, Holland, Lutz, and Richards (1965). The original questionnaire was administered to freshmen in the spring of 1964 at 31 of the institutions (Spring Sample) and in the fall of 1964 (Fall Sample) at the remainder. A follow-up questionnaire was administered to students still enrolled during the spring of

1965, when members of the Spring Sample were at the end of the sophomore year and members of the Fall Sample were completing the freshman year.

Ten of the original institutions were selected for the present research, five each from the Spring and Fall Samples. This selection was designed to maximize variation in institutional characteristics as provided in Astin's (1965) normative data and to restrict the study to institutions with a relatively large percentage of successful follow-up. On the latter point, loss of subjects during the period separating initial and follow-up testing was due to widely differing rates of attrition at the various colleges, as well as to varying degrees of local success in eliciting cooperation from the original subjects still enrolled. (Data on female students were not available at one of the colleges.)

The sample of institutions studied here is a deliberately varied rather than a representative one. While we have agreed not to identify the participating institutions, the heterogeneity of the ten colleges selected is indicated by the following variety in characteristics: enrollments, at the time the data were collected, ranged from approximately 1,000 to 17,000 students; the expenditure per student varied from approximately $500 to $4,000 per annum; selectivity on Astin's (1965) standard scale ranged from less than 40 to over 70; the number of major fields in which baccalaureates were granted varied from less than 10 to over 60, and so on. If the institutional measures studied do relate in any way to changes in self-ratings and goals, such relationships would presumably show up for this

sample.

Self-Ratings and Goals

Eight items requiring self-ratings and eight items describing desirable accomplishments, aspirations, or goals were administered in identical form in the 1964 and 1965 surveys. Before processing the data, six self-ratings and five goals were designated of special interest for further study.

For the self-ratings, students were instructed in part to "Rate yourself as you really think you are when compared to the other members of your college class." The following four-point scale was used: 1 = Below Average; 2 = Average; 3 = Above Average; and 4 = Top Ten Percent. The self-ratings used in this research were:

Scholarship

Expressiveness

Practical-Mindedness

Popularity

Sensitivity to the Needs of Others

Self-Confidence (Intellectual)

For the goal items students were asked to "Indicate the importance you place on the following kinds of accomplishments, aspirations, goals, etc." The scale used for these items was: 1 = of little or no importance; 2 = somewhat important for you to achieve; 3 = very important for you to achieve, but not essential; and 4 = essential to you, something you must achieve. The goals and aspirations studied were:

Becoming accomplished in one of the performing arts (acting, dancing, etc.)

Becoming influential in public affairs

Making a theoretical contribution to science

Following a formal religious code

Being well-read

Institutional Characteristics

Institutional measures used in this research were based on objective data available in various statistical sources on higher education. Relations among these and other institutional characteristics were studied by Astin (1962). In all except one case the measures, which follow, have been recomputed by the present authors on the basis of more recent data.

1. Enrollment--total number of students enrolled in 1965. (U. S. Office of Education, 1966)
2. Expenditure per student--ratio of educational and general funds in year 1962-63 to total number of students enrolled. (Cartter, 1964)
3. Masculinity--percentage of male students enrolled. (USOE, 1966)
4. Variety of curriculum--number of different fields in which bachelor degrees were granted in the year 1964. (Tolliver, 1966)
5. Selectivity--number of high aptitude students applying for admission to the institution per 1,000 freshmen enrolled in

1961. (Astin, 1965) (This measure was not recomputed.)

Variables 6 through 12 compose the Environmental Assessment Technique (EAT) described by Astin and Holland (1961) and Astin (1962, 1963a). These variables characterize the "climate" at educational institutions in terms of the numbers of degrees conferred in various classifications.

6. Realistic Orientation--proportion of baccalaureate degrees granted in "practical" fields such as agriculture, engineering, and trade and industry. (Tolliver, 1966)

7. Intellectual Orientation--proportion of degrees granted in scientific and rational fields such as physical and biological sciences, mathematics, and philosophy. (Tolliver, 1966)

8. Social Orientation--proportion of degrees conferred in service and social fields such as education, nursing, and social work. (Tolliver, 1966)

9. Conventional Orientation--proportion of degrees conferred in business and commercial fields such as accounting and business. (Tolliver, 1966)

10. Enterprising Orientation--proportion of degrees granted in persuasive and status-oriented fields such as law, political science, public administration, and industrial relations. (Tolliver, 1966)

11. Artistic Orientation--proportion of degrees granted in esthetic and humanistic fields such as literature, art, foreign language,

and music. (Tolliver, 1966)

12. Homogeneity of Environment--difference between the highest and lowest EAT measures. The more students are concentrated in a single academic area the higher the score. (Tolliver, 1966)

Measuring Change

While techniques appropriate for the measurement of change are an inevitable prerequisite to the study of growth, there is, perhaps, no other single effort in which the researcher is more easily misled. Lord (1963), for example, has emphasized that the most appealing "common sense" ideas about measuring change are usually inaccurate.

In the present study, common sense might suggest that change in the students at each institution can be determined for each item simply by subtracting mean initial score from mean final score. If students at some institutions showed significantly more or less change for a given item than the average, we could presumably conclude that different institutions induce different amounts of change in their students. Moreover, if a certain college characteristic were found to be correlated with such a measure of change, we might further conclude that change on the trait in question is related to that characteristic. Unfortunately, these seemingly obvious conclusions may often be utterly misleading due to the effects of regression, error of measurement, and the fact that change is restricted by "ceiling" and "floor" effects in the four-choice item format we have used.

"Floor" and "ceiling" effects mean people at the extremes on the initial testing cannot become more extreme later, while regression and error of measurement are two ways of explaining the fact that, over a period of time, originally extreme cases tend to move back toward the mean. In the case of regression effects, with which we are especially concerned, Lord (1963) has used the measurement of human weight as an example. If a group of men were weighed twice with perhaps a year separating the two measurements, the men who were at the extreme of thinness at the beginning would, in general, have gained some weight a year later. Those who were heaviest at the beginning would, on the average, be somewhat lighter. Subtracting initial score from final score would yield positive gain scores for the originally thin men and negative gain scores for the men who were originally heavy. If other characteristics were correlated with these regression-influenced gain scores, then positive correlations would occur for variables which were negatively related to initial weight. For example, a serious illness shortly before the first measurement might correlate negatively with initial weight but positively with the gain score. The simple-minded conclusion from studying the gain scores alone would be that a history of serious illness induces gain in weight. More relevant to this report, institutions at which entering freshmen tended to be at the low extreme on self-perceptions of scholastic ability, for example, would show the most "growth." The converse would be true for institutions at which entering freshmen were at the high extreme. There would be a tendency for institutional characteristics related solely to low

initial self-ratings on scholastic ability to be correlated with the regression-influenced gain scores, giving a false impression about what is related to change on the characteristic in question.

However, it is possible to do something about these misleading effects. With appropriate data (e.g., meeting the assumptions of the product-moment correlation coefficient and using available reliability estimates) Lord (1963) has advised the use of partial correlations corrected for attenuation to achieve regression- and error-free measures of relationship between change and other variables. The four-choice items used in this research are probably not suited to such elegant treatment. However, some control of initial status can be achieved by making comparisons (among institutions) of only those students who made the same initial response. The purpose of this procedure is to take into account floor and ceiling effects inherent in our items as well as the tendency for groups with extreme initial mean scores to have lower final mean scores. While it does not correct specifically for the effects of error of measurement, the analyses described below are based on group means rather than individual scores, thereby being less subject to such unreliability.

Table 1, which provides data on one of the items studied, best illustrates our reasoning: namely, for a given self-rating, those students who initially gave themselves the lowest rating of "1" are compared with one another across institutions, those who initially rated themselves as "2" are compared with one another, etc. In Table 1, the column headings 1 through 4 refer to classification by the 1964 response to the goal item,

Table 1

Means and Ranks of 1965 Responses by Male Ss

to Performing Arts Goal Item, Classified by 1964 Response

Institution	1964 Response							
	1		2		3		4	
	Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank
I	1.43	1	2.06	1	3.00	1	2.70	4
II	1.22	10	1.47	9	2.00	8	2.60	5
III	1.36	3	2.00	2	1.57	10	3.00	1
IV	1.24	8	1.79	4	2.11	7	2.07	9
V	1.28	6	1.56	8	2.22	4	2.50	7
VI	1.35	4	1.40	10	2.12	6	2.25	8
VII	1.39	2	1.93	3	2.19	5	2.00	10
VIII	1.31	5	1.72	5	2.38	2	2.95	2
IX	1.23	9	1.65	7	1.89	9	2.54	6
X	1.27	7	1.71	6	2.27	3	2.78	3

"Being accomplished in the performing arts." The numbers within each column are the 1965 means on the item for all Ss at each institution giving the response at the top of the column in 1964. For example, at Institution I, the subjects responding "1" in 1964 had a mean of 1.43 on the same item in 1965. The regression of extreme scores, by the way, is clearly apparent in these data. The first column shows that, for all colleges, students responding "1" in 1964 gave, on the average, higher responses in 1965. The last column shows that groups responding "4" in 1964 gave lower responses in 1965.

At the right of each group mean in Table 1 is a within-column rank. Thus, for all students who responded "1" in 1964, Institution I has the highest 1965 mean (showing the most "growth" for this category) while

Institution II has the lowest. In interpreting these data, we are first concerned with the degree of consistency of the ranks for each institution irrespective of initial response. If the four ranks for each college were not similar, it would mean that students at the several institutions did not show any consistent pattern of change. If change within each institution were a random phenomenon, it would be fruitless to proceed with relating institutional characteristics to the change measures. There is at least the appearance of consistency in the data in Table 1. Students at Institution I rank first in three of the columns and fourth in one. Students at Institutions II and IX are generally ranked near the bottom on the change measure.

The data for the six self-rating items and the five goal items were classified separately by sex in tables like the above, and the 1965 means were ranked within each column to provide a measure of change at each level of initial response. Statistical treatment of these ranked data will be described below.

Results

Table 2 indicates for each institution the number and percentage of students in the original (1964) sample completing the 1965 follow-up questionnaire. While the N's at the various colleges differ, the analyses are based on institutional means rather than on individual students. The percentage of follow-up varies considerably and is quite low for two institutions. This situation makes it improbable that our sample corresponds to any "real" population. However, the question of generalization is secondary to the more fundamental issue of whether or not some students

in a varied group of institutions change differentially and whether such change is related to characteristics of the colleges.

Table 2

N's and Percent Follow-Up at Institutions Studied

Institution	Men		Women	
	N	% Follow-Up	N	% Follow-Up
I	121	68	393	74
II	126	54	164	49
III	74	76	66	67
IV	322	50	216	42
V	205	34	184	39
VI	109	17	173	20
VII	221	85	265	90
VIII	516	55	691	65
IV	759	70	875	78
X	238	92	---	--

As reasoned above, if it is true that students change differentially in different educational environments, then each institution would have similar rankings across the four levels of initial response. The consistency of the tables of rankings for each item was tested by means of the Kendall (1955) coefficient of concordance (W). This statistic may be converted into a X^2 approximation for testing the overall similarity of the sets of rankings; it also provides an estimate of the average Spearman rank correlation between columns.

These statistics are summarized in Table 3, separately for male and female students. Two observations are important. First, while the average between column Spearman rank correlations for the several ratings and goals vary from .01 to .55, <u>all</u> are in the positive direction. If there were

Table 3

Consistency of Changes in Self-Ratings and Goals Within Institutions

Variable	Men (df = 9)				Women (df = 8)			
	W*	$\bar{r}_s$**	X^2	p	W	$\bar{r}_s$	X^2	p
Self-Ratings								
Expressiveness	.38	.17	13.56	--	.31	.08	9.98	--
Intellectual Self-Conf.	.38	.17	13.56	--	.26	.01	8.25	--
Popularity	.52	.36	16.92	.05	.66	.55	21.20	.01
Practical-Mindedness	.44	.25	15.67	.10	.28	.04	8.88	--
Scholarship	.50	.34	18.19	.05	.42	.23	13.51	.10
Sensitivity to Needs of Others	.34	.12	12.20	--	.48	.30	15.28	.10
Goals								
Being Well Read	.42	.23	15.26	.10	.18	.10	5.61	--
Performing Arts	.45	.27	16.36	.10	.28	.04	8.85	--
Public Affairs	.54	.38	19.32	.05	.60	.46	19.06	.02
Religious Code	.42	.23	15.17	.10	.49	.32	15.80	.05
Science	.44	.26	15.95	.10	.49	.32	15.68	.05

*Coefficient of Concordance

**Average Spearman rank correlation coefficient between pairs of columns. (See example given in Table 1.)

no consistency in the change measures within institutions, an approximately equal number of positive and negative correlations would have been observed. Secondly, significance tests reported in Table 3 suggest that, for both sexes on at least five of the items, different amounts of change did occur at the institutions studied. Thus, regardless of initial status, there is a consistent tendency for students at each college to show similar relative amounts of change and to differ from students at other colleges.

The procedure by which the change scores were obtained controls for regression of the various college means to the mean for all colleges. However, another type of regression was not taken into account. Individual students within each college could be seen as regressing to the mean for their own college rather than to the mean for all colleges in the sample. At a college where the modal initial response was high for a given item, initially low scorers might tend to move upward more than at other institutions, in spite of the fact that the mean for the institution, as a whole, regressed somewhat to the general mean. The reverse would be true for an institution where the modal initial response on the item was low. Were there no other influences operating on the data, the upshot of such "within-institutional" regression would be a relatively high rank on the change measure for students at the first institution and a relatively low rank for students at the second.

While this type of regression could not be taken into account when comparing institutions, we can get some idea of whether or not it was

present. First of all, if the colleges did not differ markedly in the proportion of students initially choosing each of the four responses to a given item, then differential within-institutional regression effects would be unlikely. Therefore, the proportion of students at each institution initially selecting each of the four responses to the eleven items was inspected separately for the two sexes. Such differences appeared to be slight. In the majority of the 22 frequency tables, the modal initial response was in the same response category for all colleges. For all but one of the remaining tables, the modes were in adjacent categories. However, chi-square tests for institutional differences in the distributions of initial frequencies were significant for all items.

This reasoning is the basis for our method of investigating whether the change measures were related to the initial response. If the mean response to a given item were initially high at some colleges, then within-institutional regression to that mean would pull lower scores upward, producing high change scores. The reverse would be true for institutions with initially low means. Where such effects exist, we would expect positive correlations between the change measures and the initial mean of the item.

For those items on which there appeared to be differential change (Table 3), Spearman rank correlations across institutions were computed between the change measures at each level and the rank of the mean initial response. The average of these four correlations, for each sex and on each item, are reported in the last column of Table 4, along with initial

and final means and standard deviations.

Table 4 reveals that non-trivial positive correlations between the change scores and initial response exist for both sexes on the public affairs goal, for males only on the popularity and, possibly, the religion items, and for females on the science goal. In the case of the scholarship self-rating, the negative correlation for males indicates that some systematic effect is working against the regression hypothesis. In general, regression to the institutional mean may account for differences between institutions on the change measures in about half of the comparisons in Table 4.

Table 4

Initial and Final Means and Standard Deviations and Average Correlations of Change Measures with Mean Initial Response at Each Institution

Variable		Initial Mean	Initial S.D.	Final Mean	Final S.D.	Average r_s
SR-Popularity	M	2.49	0.726	2.33	0.641	.47
	F	2.41	0.692	2.24	0.553	.21
SR-Scholarship	M	2.58	0.754	2.42	0.773	-.47
	F	2.64	0.787	2.37	0.715	-.06
G-Religious Code	M	2.60	1.120	2.47	1.120	.32
	F	2.91	1.109	2.84	1.103	.12
G-Public Affairs	M	2.03	0.885	2.06	0.810	.54
	F	1.74	0.821	1.69	0.703	.46
G-Science	M	1.72	0.882	1.68	0.862	.16
	F	1.34	0.691	1.26	0.588	.45

Since we observed differential change on several items, we felt it

appropriate to relate the institutional characteristics to the change measures. Items selected for further study were: the self-ratings of popularity and scholarship and the goals of being influential in public affairs, following a formal religious code, and making a theoretical contribution to science.

The colleges were ranked according to such characteristics as size and expenditure, and for each item, Spearman rank correlations were computed between these institutional rankings and the change rankings at each level of initial response. These four correlations for each item were then averaged to give an overall relationship between change and each institutional characteristic. Table 5 presents these correlations separately for males and females.

While a significance test for average Spearman coefficients is not available, the data in Table 5 strongly suggest that systematic relationships do exist between several college characteristics and change on each of the five self-ratings and goals. With the partial exception of the religious goal there is usually close agreement between corresponding correlations for the two sexes.

Change in self-ratings of popularity is negatively related to enrollment and Realistic Orientation (EAT) and positively related to Artistic Orientation (EAT). For self-ratings of scholarship all of the sizable correlations are negative. These include enrollment, expenditure per student, selectivity, variety of curriculum, masculinity (percent male students), and perhaps Realistic Orientation (EAT). Expenditure per student and selectivity are related characteristics, both rationally and empirically.

Table 5

Average Spearman Rank Correlations between Institutional Characteristics and Change on Five Self-Ratings and Goals*

Institutional Characteristics	Self-Ratings		Goals		
	Popu-larity	Scholar-ship	Public Affairs	Religious Code	Science
1. Enrollment	-35	-26	-23	24	22
	-34	-40	04	-34	38
2. Expenditure/ Student	-15	-44	-17	-33	37
	-28	-37	12	-35	40
3. Masculinity	-03	-45	08	-18	27
	10	-17	46	-08	45
4. Variety of Curriculum	-20	-35	-08	28	24
	-23	-38	22	-17	56
5. Selectivity	08	-46	-09	-38	25
	-05	-35	22	-37	32
6. Realistic (EAT)	-35	-25	-23	36	35
	-35	-33	00	-21	49
7. Intellectual (EAT)	-13	-22	19	16	23
	19	03	52	02	46
8. Social (EAT)	11	17	-07	-28	-23
	-08	18	-42	26	-56
9. Conventional (EAT)	-03	-06	-02	21	33
	00	-35	30	-42	64
10. Enterprising (EAT)	-08	-11	00	08	13
	-01	-19	24	-30	17
11. Artistic (EAT)	42	06	35	-11	-16
	40	14	43	00	09
12. Homogeneity (EAT)	10	23	-01	-22	-21
	00	24	-30	32	-47

*The first row of correlations for each institutional characteristic is based on males and the second on females.

For the present sample of ten institutions, the Spearman rank correlation between the two variables is .88.

Change in the goal of being influential in public affairs is positively related to Intellectual and Artistic Orientation (EAT). For females, this goal is negatively related to Social Orientation (EAT) and masculinity. The goal of developing a religious code, though showing a number of apparent differences between the sexes, does relate negatively for both sexes with expenditure per student and selectivity. Finally the goal of making a theoretical contribution to science shows relatively substantial positive correlations with over half of the variables studied, including enrollment, expenditure per student, masculinity, variety of curriculum, selectivity, Realistic Orientation (EAT), Intellectual Orientation (EAT), and Conventional Orientation (EAT). The science goal is negatively related to Social Orientation (EAT) and Homogeneity of Environment (EAT). In general, correlations between change in this goal and the college characteristics are higher for females than males.

Discussion

We have observed that students at different colleges show differing amounts of relative change on several self-ratings and goals. Our data suggest that for about half of the comparisons the differential changes are not likely to be due to within-institutional regression effects. We are, therefore, inclined to conclude that in several cases these differential changes may be attributed in part to characteristics of the colleges. The fact that the change measures were frequently related to college variables

reinforces this conclusion. It is still true that students entering different institutions are not the same, even when comparisons are based only on groups giving the same initial response. Possibly later research may identify student input characteristics which account for the effects we have observed.

Students at larger institutions or institutions where there are relatively large numbers of students majoring in practical fields such as agriculture, engineering, or industrial arts develop a relatively lower estimate of their own popularity than do students elsewhere. Obviously there will be a greater feeling of anonymity and estrangement at sizable colleges. While not as obvious, it is at least reasonable to expect that a peer environment characterized by emphasis on practical and vocational training may also imply less intensive social and intellectual interaction. In this regard, Astin (1965) suggested that the Realistic institution is characterized by "...an aversion to intensive emotional experiences" (page 56). Our data also suggest that relatively higher self-ratings of popularity are associated with a peer environment in which many students are enrolled in esthetic and humanistic studies. While conforming to reasonable expectation, these interpretations must be qualified by the fact that within-institutional regression effects may exist for the popularity self-rating.

With the possible exception of Homogeneity of Environment, all of the apparent correlates of change in self-ratings of scholarship are in the negative direction. Students develop relatively lower estimates of their own scholastic ability at colleges with high enrollment, a selective admission

policy, large funds per student, a more varied curriculum, a higher percentage of male students, and many students majoring in practical and technical fields. These college characteristics are inter-related. For example, institutions with low enrollment are usually also low on Realistic Orientation (EAT), since small institutions seldom have schools of agriculture or engineering. (For our sample of 10 colleges, the Spearman rank correlation between enrollment and Realistic Orientation /EAT/ was .74.)

A college climate accentuating esthetic and humanistic pursuits apparently promotes interest in the wider society. Students of both sexes develop relatively more interest in the goal of prominence in public affairs at colleges when many of their peers major in the arts, literature, and languages. For females, change on the public affairs goal is also positively related to the proportion of male students and to the proportion of students majoring in intellectual fields such as natural science, mathematics, philosophy, and anthropology.

For both sexes, change in the relative importance of the religious goal is negatively related to expenditure and selectivity, characteristics that are likely to imply institutional prestige as well as sophistication of the student body. Several other institutional measures have opposite effects for the two sexes. For male students, change on the religious goal shows relatively low positive relationships with enrollment, proportion of students majoring in practical and technical fields, and proportion of students with business or business-related majors. The same relationships are somewhat

higher and in the opposite direction for females. Indeed, female students behave more as we might hypothesize, since the climate at a large institution with relatively strong emphasis on technical or business-related training would probably not be conducive to the increased importance of religious values.

A different type of sex difference is evident for the science goal. Here the majority of institutional characteristics are related to change, and most of them in the positive direction. But, whether positive or negative, relationships between change on the science goal and the college measures are in every case higher for females than for males. The science goal was considerably less important for females than males, both at the initial and final testing. Because of their initially lower motivation toward science, female students may be more susceptible to institutional characteristics promoting a higher valuation of scientific achievement.

Astin (1963b) has already observed that growth in scientific interest is positively related to the number of students enrolled. In our data, it is also positively related to the proportion of students in practical and technical fields, scientific fields and, surprisingly, business and business-related fields such as economics. Emphasis on educational and health fields as well as the concentration of students in a single curriculum are negatively related to change in the importance of the science goal. For the colleges studied, these two characteristics tend to go together. In most cases, colleges ranking relatively high on both Social Orientation (EAT) and Homogeneity of Environment (EAT) are primarily teacher

training institutions.

While our findings are in general similar to those of Astin (1963b), Nichols (1965), and Thistlethwaite and Wheeler (1966), we have not attempted to equate groups at the various institutions statistically on measures other than the initial response to the goals and self-ratings. While such methods are in no sense wrong, in the final analysis it is impossible to correct for all of the ways in which groups of students entering different colleges might initially differ. Equation on ten or twenty measures does not mean that the groups will be identical on an unavailable twenty-first measure. In general, we advocate a different approach. If, having taken the initial standing on a given variable into account, we find change to be correlated with a college characteristic, then other initial group differences that might account for the findings should be hypothesized. These specific hypotheses can be tested through appropriately designed follow-up research. When not based on reasonable alternative hypotheses about the effects of initial group differences, it is hard to see how the statistical equation of groups on available data assures the validity of the results.

The findings reported for this research are clearly inconsistent with the negative conclusions about college effects drawn by McCullers and Plant (1964). We have observed different degrees of change in self-ratings and life goals among students at different colleges. Although relationship does not necessarily establish causation, our evidence does suggest that college characteristics are related to such changes.

Why then are our results different? Part of the answer may lie in

the fact that this research differs in a number of ways from the studies cited by McCullers and Plant, and hence by no means invalidates the direct conclusions drawn from such earlier work. For example, Plant (1962) and Lehmann, Sinha, and Hartnett (1966) compared persisting students with dropouts within a single institution, while we have been concerned entirely with students still enrolled but have made comparisons among a variety of institutions. Also, our change measures are based on responses to direct self-descriptions rather than on scores on personality scales. Our items are closely related to the kinds of experiences that colleges offer. Indeed, one conclusion that might have been considered by the earlier investigators who did not find differential college effects on the extensively used Dogmatism Scale (Rokeach, 1960) or Inventory of Values (Dressel & Lehmann, 1965) is that the measures themselves were ineffective for the purpose to which they had been applied. We strongly advocate that research on college effects be extended to more easily defined self-images, aspirations, and plans.

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