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ABSTRACT

A report of the University of Delaware's Committee on the Evaluation of Teaching Effectiveness, recommended that the University Impact Study develop a program for assisting departments in measuring change in student knowledge, values, and abilities. The present report examines the relationship between the cumulative grade point average, an external measure of academic achievement obtained at the end of the sophomore year, and an external measure of academic achievement obtained in the senior year. It also studies change in the standing of the various curriculum groups and individual departments on the two external measures of academic performance. This can be used as a measure of the relative effectiveness of teaching in various curriculum groups or departments as compared with the rate at which the class as a whole progressed. (Author/HS)

THE RELATIONSHIP BETWEEN GRADES AND TWO EXTERNAL MEASURES OF ACADEMIC ACHIEVEMENT

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University Impact Study
University of Delaware
Newark, Delaware

The Relationship Between Grades and Two External Measures of Academic Achievement

Introduction

The report of the Committee on the Evaluation of Teaching Effectiveness (April 30, 1969), recommended that the University Impact Study develop a program for assisting departments in measuring change in student knowledge, values, and abilities. Separate reports for each of the eleven curriculum groups at the University, dealing with changes in values which occurred during the four undergraduate years for one class have recently been distributed.

The present report examined the relationship between the cumulative grade point average, an external measure of academic achievement obtained at the end of the sophomore year, and an external measure of academic achievement obtained at the end of the senior year. It also studied change in the standing of the various curriculum groups, and individual departments on the two external measures of academic performance. This can be used as a measure of the relative effectiveness of teaching in various curriculum groups, or departments, as compared with the rate at which the class as a whole progressed.

Description of the Measuring Instruments Used

The tests administered at the end of the sophomore year were the General Examinations of the College-Level Examination Program (CLEP). These examinations cover the following areas:

English Composition
Humanities (subscores in Fine Arts and Literature)
Mathematics (subscores in Basic Skills and Course Content)
Natural Sciences (subscores in Biological Science and Physical Science)
Social Sciences (subscores in Social Sciences and History)

These examinations were developed by examining committees consisting of faculty members from various colleges and universities. Committee members defined the topics to be covered, reviewed the test specifications, and prepared and reviewed test questions. The committees were assisted by test-development specialists on the staff of Educational Testing Service at Princeton, New Jersey. Finally panels of distinguished teachers in the various areas covered appraised the examinations, and generally guided the committees and consultants.[1]

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1 Names of panel members, and committee members responsible for the tests used in this study can be found in College-Level Examination Program: Description and Uses, 1967. CEEB, Princeton, N.J., pp. 38-44.

With the exception of the test in English Composition, the General Examinations are 75 minutes in length. The English Composition test has a time limit of 60 minutes. Scores for the five areas are reported on a standard score scale ranging from 200 to 800, with a mean of 500 and a standard deviation of 100. Subscores are reported on a 20 to 80 scale with a mean of 50 and a standard deviation of 10.

The tests administered at the end of the senior year were the Area Tests of the Graduate Record Examinations (GRE). These tests were designed to measure general knowledge in the three broad areas of the liberal arts: the social sciences, the humanities, and the natural sciences. All three tests are included in one booklet, and each has a time limit of 70 minutes. Questions are constructed to test the students' grasp of basic concepts and his ability to apply them in various fields. Because of the differences which exist among various institutions and courses, specific details are not stressed.

Like the CLEP tests, the GRE tests are developed by a committee of examiners made up of scholars in each field, representing a variety of institutions. The committees determine the subject matter areas to be included in each test and specify their relative scope and emphasis.

Students Tested and Dates of Administration

In April, 1967 approximately 1200 University of Delaware sophomores took the five General Examinations of the CLEP. The English, Natural Sciences, and Mathematics tests were administered one afternoon, and the Humanities and Social Science tests on the following afternoon. Not all students took all five examinations, but a large majority did complete the full battery.

In April, 1969 over 1200 University of Delaware seniors took the GRE Area Tests. Of this class, 732 had completed the full battery of CLEP General Examinations as sophomores. Of those students who had taken both sets of tests 577 were classified as second-semester seniors by the Office of Admissions and Records at the end of the Spring semester, 1969. Only these second-semester seniors were used in the section of the study which relates grades to external measures of academic achievement, since they are the students who have progressed through the four undergraduate years at the expected rate.

Procedures and Results

i) The Relationship between CLEP Scores, GRE Scores and Grades

Distributions for the average CLEP General Examinations scores, average GRE Area Test scores, and cumulative grade point averages (GPA) were prepared for the 577 students for whom both sets of test scores were available and who were classified as second-semester seniors at the end of the

1968-69 academic year. From these distributions all scores and GPA's were converted into stanines,[1] which are standard scores that make direct comparisons between the three sets of results possible. Intercorrelations were calculated between average CLEP scores, average GRE scores and GPA. Table 1 gives a breakdown by curriculum group of GRE and CLEP averages, GRE and CLEP stanines, GPA's and GPA stanines, and the rank order of the eleven curriculum groups, based on the average GRE, CLEP and GPA stanines.[2]

ii) Discrepancy between Test Scores and Grades

Since both the correlation for individuals, and the rank order correlation for curriculum groups, between GRE and CLEP is high, the stanines for these two sets of tests were combined and averaged, yielding one test score for each curriculum group. These scores were compared with the mean grade-point stanines for each curriculum, and the discrepancy between the two noted. These results are shown in Table 2, and represented graphically in Figure 1. The curriculum groups in Table 2 and Figure 1 are arranged in order of the amount of discrepancy between test results and the cumulative grade point average.

iii) Relationship between the Three Sub-tests Common to CLEP and GRE

Three of the General Examinations in the CLEP battery cover the same ground as the three Area Tests of the GRE (Social Science, Humanities and Natural Science), and the same subjects took both batteries. Change in the relative position of various curriculum groups on one or more of the tests, should, therefore, indicate which departments or curriculum groups were most successful in bringing about change in their students, and in what areas. For this part of the study all the students who had taken both batteries were used (N=732). The distributions for these 732 subjects on the six tests (three CLEP and three GRE) were prepared, and from these distributions all scores were converted into stanines. The GRE and CLEP scores and stanines for each department are shown in Tables 4 and 5, as well as the average score and stanine for each curriculum group. The curriculum group profiles are shown graphically in Figure 2. In this figure the curriculum groups were arranged in order of their mean GRE stanines. These appear in Table 6, together with the mean CLEP stanines, the difference between

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1 The stanine is a 9-point normalized standard score, with mean of 5, standard deviation of 2. To obtain stanines the following conversion was used:

Percentile Rank:	1-4	5-10	11-22	23-40	41-59	60-77	78-89	90-95	96-99
Stanine:	1	2	3	4	5	6	7	8	9

2 Individual stanines have been averaged, rather than averaging raw scores and then converting to stanines. This accounts for the fact that the rank order for raw scores and stanine scores are not always identical.

the two, and the rank orders for the two sets of stanines. Table 7 was prepared to show the change in stanine scores for the three corresponding tests between the 1967 and 1969 administrations, and the significances of these changes determined by t-tests for matched pairs. The level of significance for all differences significant at the .05 level or better is shown in the last column, headed "p-value." Figures 3-8 were prepared, showing the GRE and CLEP profiles for each department, using only those departments represented by five or more majors. Since the numbers for each major were usually small, t-tests for individual majors were not calculated.

Discussion of Results

i) Relationship between CLEP Scores, GRE Scores and Grades

The average GRE Area Test score (3 tests) and the average CLEP General Examination score (5 tests) correlated with each other .76, CLEP and four-year cumulative grade-point average correlated .48, and GRE and GPA correlated .44. These results were obtained from the 577 students who had taken both batteries of tests, and were also classified as second-semester seniors in the Spring of 1969. These results are similar to those found in a previous study,[1] where senior GRE's and four-year GPA's correlated .40, sophomore GRE's and GPA's .41, and two measures of general cultural information (the GRE Area Tests and the Cooperative General Culture Test) correlated .79. The correlations between the three corresponding tests of the GRE and CLEP were also calculated, using all members of the senior class who had taken both batteries (N=732). The Social Science tests correlated .72 with each other, the Humanities tests .79, and the Natural Science tests .75. These correlations are almost as high as test-retest reliability coefficients. However, if the amount of exposure to a specific curriculum does change students' relative standing, with regard to knowledge in that field, then correlations approaching unity would not be expected. This point will be explored further in Section iii of the discussion.

ii) Discrepancy between Test Scores and Grades

In Table 2 and Figure 1 it can be seen that the ranking of the curriculum groups in terms of the discrepancy between test stanine and GPA stanine coincides almost exactly with the ranking of the curriculum groups in terms of their average test scores ($\rho = .93$). In other words, students in a curriculum group with high test scores are likely to be receiving lower grades than one would have predicted from their test scores. Conversely, students in a curriculum group with low scores are receiving grades higher than one would expect. Curriculum groups cluster about the mean (5.00 on the stanine scale) more closely for grades than they do for test scores.

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1 Pemberton, Carol F. An Evaluation of the Cumulative Grade Point Average as a Means of Identifying Superior Students. University Impact Study, University of Delaware, Newark, Delaware, May 1966.

The deviations from the mean for grades and test scores are shown in Table 3. For the whole class the average discrepancy from the mean is .29 for grades, .62 for test scores. Averaging the mean discrepancies for the eleven curriculum groups, the GPA discrepancy remains .29, the test discrepancy rises to .78. Results similar to these have been found before,[1] and are not surprising. Each instructor uses the particular class he is teaching as its own norm, and does not compare the students in that class with the total University population. Grades and test scores are not completely unrelated, however. For the class as a whole CLEP scores and GPA correlated .48, GRE scores and GPA correlated .44, and the rank order correlation for the eleven curriculum groups, between test averages and cumulative GPA is .50.

These results again reveal the need for a revision of student evaluation procedures.[2] The Arts and Science curricula and Engineering tend to be under-evaluated by grades. The only curriculum group for which the two measures coincide is Business and Economics. For Home Economics, Agriculture, Nursing, Education and Physical Education grades are high relative to test scores. These results closely parallel those found in the 1966 study,[3] the only difference being that in the earlier study Engineering obtained higher grades than test scores, and in the present study this has been reversed.

iii) Relationship between the Three Sub-tests Common to CLEP and GRE

Three of the CLEP General Examinations correspond in subject matter with the three Area Tests of the GRE. For the 732 students who took both sets of tests, the correlations were all over .70 between the corresponding sub-tests. All test scores were converted to stanines, and profiles were plotted for the various curriculum groups (Figure 2), as well as for all majors containing five or more students who had taken both tests (Figures 3-8). The profiles for the sophomore testing closely parallel the senior profiles. However, exposure to a particular curriculum should allow groups of students to progress more rapidly in one field, relative to the progress made by the class as a whole. To find whether this was the case, Table 7 was prepared. This table shows the sophomore CLEP stanines, senior GRE stanines and the significance of the differences between the two. Of the thirty-three possible comparisons, only six reach statistical significance. Three of these differences are in a positive direction, indicating that the students in these curriculum groups were able to

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1 Ibid. pg. 16.

2 Pemberton, W.A. A Recommendation for Revision of Student Procedures, Student Counseling Services, University of Delaware, Newark, Del.

3 Pemberton, Carol F. op. cit. pg. 16.

improve their standing on particular tests between their sophomore and senior years. These were Humanities students on the Humanities test, Social Science students on the Social Science test, and Engineering students on the Natural Science test. Physical Science and Biology students maintained their initially high standing on the Natural Science test, but the gains they made were not statistically significant. On three tests students ranked lower as seniors than they did as sophomores, compared with the class as a whole. Humanities seniors obtained lower stanines on the Natural Science test than they had as sophomores, Engineering seniors obtained lower Social Science stanines than they had as sophomores, and Nursing seniors lower Humanities stanines. This does not mean that these students knew less about these areas as seniors than as sophomores. It only means that their knowledge has increased more slowly than that of the class as a whole.

An examination of Figure 2, and Table 7, shows how similar the shapes and levels of the profiles have remained. The only curriculum group in which the shape of the profile has changed is Nursing, which, during the sophomore year, looked more like Home Economics and Education, with a peak for Humanities, but as seniors the profile more nearly resembles that for Physical Education and Biology majors, with the Natural Science score being highest, and Social Science lowest.

One can distinguish four main types from these profiles:

a) Natural Science high, with Humanities scores lower than Social Science: Engineering, Agriculture, Physical Science and Biology as sophomores (Physical Science orientation)
b) Natural Science high, with Humanities scores higher than Social Science: Physical Education, Biology as seniors, Nursing as seniors (Biological Science orientation)
c) Humanities high, Social Science, and Natural Science relatively low: Humanities, Education, Home Economics, Nursing as sophomores (Humanities orientation, typical for women)
d) Social Science high, Humanities and Natural Science relatively low: Social Science, Business and Economics (Social Science orientation)

Three curriculum groups, which have previously been shown to be high on "social service" orientation (viz. Nursing, Education, and Physical Education) have the lowest Social Science scores. Perhaps a larger number of Social Science courses should be required in these curricula, if it is thought that a theoretical knowledge of the Social Sciences would be valuable to people entering social service occupations. In a field, such as Nursing, there may be so many technical courses which must be included in the curriculum, that it would be impossible to add any more Social Science courses. The Social Science courses which are available to non-majors may need to be revamped, to cover several areas rather than offering only specific courses in Economics, Sociology or some other specialized branch of the Social Sciences.

When studying Figures 3-8, it must be stressed that the small numbers in certain departments should make one cautious about drawing conclusions. However, the similarity usually found between the CLEP profiles and the GRE profiles, even for those departments with as few as five majors, gives added assurance that these test results are fairly stable, even when dealing with small numbers.

In most cases the GRE profiles closely parallel the CLEP profile, for the individual departments, in the same way they did for the curriculum groups. Usually change is in the expected direction, i.e., English majors have pulled ahead of the class as a whole on the Humanities test, Sociology majors on the Social Science test, etc. A discussion of profiles yielded by individual departments, grouped under ten curriculum areas, follows:

Natural Science majors: The profile for the natural science majors is typically very high on the Natural Science test, intermediate on the Social Science test, and lowest on Humanities (see Figure 3). Physics majors tend to have the highest test scores of any major as sophomores, but their high standing in the Social Sciences and Humanities drops somewhat by their senior year. Chemistry majors rank next highest, and both their standing on the Social Science test and Natural Science test rises between the sophomore and senior years. The only other department in which the three GRE and the three CLEP stanines are all over the mean of 5.00, is Biology.[1] Statistics and Computer Science majors as sophomores have all three scores above the mean, but their relative standing on all three sub-tests drops slightly by the senior year.

The Mathematics majors have a somewhat atypical profile. Their superiority on the Natural Science test is not as great as for the other four majors diagrammed, and the Humanities stanine is above the Social Science stanine. This probably reflects the fact that the Mathematics majors here represented are about 50% women, whereas in the other four curriculum groups men predominate. For example, in Biology men outnumber the women three to one.

Social Science Majors: The typical Social Science profile is high on the Social Science score, intermediate on Humanities, and relatively low on the Natural Science test (refer to Figure 4). All the Social Science majors make gains on the Social Science test, but the greatest gains are made by Sociology and Political Science majors. The American Studies profile more closely corresponds to the Humanities profiles, and should probably have been included with

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1 Biology majors shown in Figure 3 exclude Medical Technology majors. The profile for Biology shown in Figure 2 includes Medical Technology majors.

Humanities, rather than with the Social Sciences. Psychology majors show less discrepancy between the various scores than any other major. As sophomores their Social Science and Natural Science scores are at about the same level and Humanities is slightly higher, as seniors their Social Science and Humanities scores are comparable, and Natural Science slightly lower.

Humanities Majors: All the Humanities majors exhibit very similar profiles, having a high peak for the Humanities test, with both the Social Science and the Natural Science stanines considerably lower (see Figure 5). Usually the Social Science score is slightly higher than the Natural Science score, but for Speech majors this is reversed. English majors make the greatest improvement in their relative position on the Humanities test. On the whole the sophomore and senior profiles parallel each other rather closely for the Humanities majors.

Engineering Majors: The profiles for Chemical, Civil, Electrical and Mechanical Engineering majors were similar to those of the typical Natural Science major (see Figures 3 and 6). There is a tendency for the relative standing of the Engineering majors to go up slightly on the Natural Science test between the sophomore and senior years, for the Social Science standing to drop, and for Humanities to remain about the same.

Business and Economics Majors: Economics majors have a profile similar to the typical Social Science major (see Figures 4 and 6), and they show great improvement on their Social Science standing between the sophomore and senior years. Majors in Accounting and Business Administration differ from the typical Social Science profile, in that their Humanities stanine is lower than their Natural Science stanine. Business Education majors have the typical Social Science profile as sophomores, but look more like Education and Home Economics majors as seniors. Their sophomore standing was rather low, but they have made gains in all three areas tested during their last two years in college.

Home Economics Majors: Home Economics Education majors have a profile similar to that for Education majors, with the Natural Science score somewhat higher than that for the typical Elementary Education major (see Figures 2 and 7). The profiles for the sophomores and seniors parallel each other fairly closely for this major. The profile changes between the sophomore and senior years for Textile and Clothing majors, and Food and Nutrition majors are greater than changes found for other majors. Perhaps too much should not be made of this fact due to the relatively small numbers involved. The change may reflect the fact that Food and Nutrition majors are required to have only 15 credit hours

in the Humanities, whereas Textiles and Clothing are required to have 27. The change in profile for Child Development majors is somewhat similar to that for food and nutrition, except that for Child Development majors the Natural Science standing goes up, rather than down. As Child Development is only required to have 15 credit hours in Natural Science, whereas, Food and Nutrition is required to have 29, this is hard to explain.

Agriculture Majors: Most of the Agriculture majors have profiles similar to those for the Natural Sciences and Engineering (see Figures 3, 6 and 8). The exception is Agricultural Business. The profile for this major more closely corresponds with the profiles made by Accounting and Business Administration students.

Elementary Education: Elementary Education majors comprise the majority of students whose profile is shown in Figure 2, since Secondary Education majors have been included under their appropriate field of specialization. The profile for Elementary Education most closely corresponds with the profiles for Humanities and Home Economics majors. A gain is made on the relative standing of Education majors on the Humanties test, and slight losses on the Social Science and Natural Science tests. Elementary Education and Physical Education are the only two curriculum groups in which the stanines for the three sophomore tests and the three senior tests were all below the mean of 5.00.

Nursing: As already pointed out, Nursing majors as sophomores had a profile similar in shape to Home Economics majors, but as seniors their profile more nearly corresponds with the shape of that for Biology and Physical Education majors, (see Figure 2). The relative standing of Nursing majors on the Humanities and Social Science tests drops between the sophomore and senior years, probably due to the fact that there are only 15 credit hours allotted to electives during the junior and senior years, and presumably these could all be taken in scientific fields if the student chose.

Physical Education: Physical Education majors fall below stanine 4.00 on the tests taken both as sophomores and as seniors. The shape and level of their profile stays much the same, their highest score being on the Natural Science test, and their lowest being on Social Science.

Summary

This study indicates that student achievement at the end of the senior year is closely related to student characteristics which existed in the sophomore year. In only three curriculum groups was a statistically significant improvement in relative standing on one of the three area tests brought about, namely, Humanities students raised their standing on the Humanities test, Social Science students raised their standing on the Social Science test, and Engineering students improved their standing on the Natural Science test. Three curriculum groups failed to maintain their sophomore standing on one of the three tests, namely Humanities on the Natural Science test, Engineering on the Social Science test, and Nursing on the Humanities test. It must again be stressed that this does not mean that these curricula actually declined in knowledge in these areas during the last two years in college, but merely that they did not progress at the same rate as the class as a whole.

It is hoped that the profiles presented for individual departments will help the faculty in the process of self-evaluation. These profiles point up the caliber of students attracted to a particular major, and the relative strengths and weaknesses of students in this major in the areas of the Social Sciences, Humanities, and Natural Sciences. Individual departments must decide whether they are satisfied with the type of profiles yielded by their students. If it is decided that certain students are somewhat one-sided in their achievement, degree requirements should be re-examined, and the possibility of adding courses in the area of special weakness should be considered. These profiles also indicate areas in which the greatest improvement is being made during the last two years in college; and therefore, can be used as a measure of teaching and curriculum effectiveness. However, it would seem that differences in student achievement in the senior year are more dependent on variations in student characteristics as sophomores, than upon characteristics of the curriculum group in which they are enrolled. This conclusion is similar to that arrived at by Astin, concerning undergraduate achievement and institutional "excellence."[1]

This study also compares grades and test scores as means of evaluating students. Test scores show greater deviation from the mean than grades, both for individuals and for various curriculum groups. Arts and Science and Engineering majors achieve higher test scores than grades, Business and Economics is the only curriculum group in which the two measures coincide, whereas, Home Economics, Agriculture, Nursing, Education and Physical Education majors achieve higher grades than test scores. This points to the undesirability of giving academic honors purely on the basis of grades, and to the desirability of including test results on the academic transcript.

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1 Astin, Alexander W. Undergraduate Achievement and Institutional "Excellence." Science, August 16, 1968, Vol. 161, pp. 661-668.

Table 1

GRE and CLEP Scores, and GPA's for Students Classified as Second Semester Seniors in Spring 1969

Curriculum Group	N	GRE Total	GRE Stan.	CLEP Total	CLEP Stan.	GPA	GPA Stan.	GRE Rank	CLEP Rank	GPA Rank
Biology	54	571	6.1	583	5.9	2.89	5.5	1	2	1
Physical Science	52	560	5.8	596	6.3	2.83	5.3	2	1	3
Social Science	96	554	5.7	553	4.9	2.65	4.5	3	5	10
Humanities	88	538	5.3	558	5.1	2.78	5.1	4	4	5
Engineering	61	529	5.0	567	5.4	2.77	5.0	5	3	6
Home Economics	46	522	4.9	539	4.5	2.82	5.2	6	7	4
Agriculture	29	498	4.3	519	3.9	2.73	4.9	7	10	7.5
Business & Econ.	54	500	4.2	524	4.1	2.56	4.2	8.5	8	11
Nursing	25	495	4.2	538	4.6	2.83	5.4	8.5	6	2
Education	61	485	3.9	521	4.0	2.74	4.9	10	9	7.5
Physical Education	11	452	3.2	477	2.5	2.68	4.7	11	11	9

Rank order correlation between GRE and CLEP : .87
Rank order ocrrelation between GRE and GPA : .48
Rank order correlation between CLEP and GPA : .61

Table 2

Test Stanines and GPA Stanines

Compared for Different Curriculum Groups

Curriculum Group	N	GRE + CLEP Av.Stan	GPA Stan	d	Test Rank	GPA Rank	d Rank
Social Science	96	5.31	4.53	+.78	3	10	1
Physical Science	52	6.05	5.29	+.76	1	3	2
Biology	54	5.98	5.48	+.50	2	1	3
Engineering	61	5.22	4.95	+.27	4	6	4
Humanities	88	5.21	5.07	+.14	5	5	5
Business and Economics	54	4.18	4.17	+.01	8	11	6
Home Economics	46	4.71	5.22	-.51	6	4	7
Agriculture	29	4.12	4.90	-.78	9	8	8
Nursing	25	4.40	5.36	-.94	7	2	9
Education	61	3.92	4.93	-.99	10	7	10
Physical Education	11	2.81	4.73	-1.92	11	9	11

Rank order correlation between test rank and discrepancy : .93
Rank order correlation between test rank and grade rank: .50
Rank order correlation between GPA rank and discrepancy: .17

Table 3

Deviations of Test-Score Stanines
and GPA Stanines from the Mean

Curriculum Group	N	Test Stanine	GPA Stanine	Discrepancy from 5.00	
				Tests	GPA
Physical Science	52	6.05	5.29	1.05	.29
Biology	54	5.98	5.48	.98	.48
Social Science	96	5.31	4.53	.31	.47
Engineering	61	5.22	4.95	.22	.05
Humanities	88	5.21	5.07	.21	.07
Home Economics	46	4.71	5.22	.29	.22
Nursing	25	4.40	5.36	.60	.36
Business & Econ.	54	4.18	4.17	.82	.83
Agriculture	29	4.12	4.90	.88	.10
Education	61	3.92	4.93	1.08	.07
Physical Educ.	11	2.81	4.73	2.19	.27
Individual Average	577			.62	.29
Curriculum Average	11			.78	.29

Table 4

GRE and CLEP Scores and Stanines for Arts and Science Majors

		GRE						CLEP					
Major	N	S.S. Score	S.S. Stan.	Hum. Score	Hum. Stan.	N.S. Score	N.S. Stan.	S.S. Score	S.S. Stan.	Hum. Score	Hum. Stan.	N.S. Score	N.S. Stan.
Humanities													
English	54	527	5.26	627	7.46	496	4.15	556	5.46	605	6.74	520	4.43
Art History	1	620	7.00	700	9.00	530	5.00	618	7.00	674	8.00	467	3.00
Art	12	498	4.75	598	6.83	482	3.67	517	4.42	595	6.50	478	3.58
Latin	1	590	7.00	660	8.00	560	5.00	503	4.00	620	7.00	506	4.00
Spanish	8	480	4.25	548	5.75	496	4.00	535	5.00	566	5.88	531	4.75
Speech	7	481	4.29	561	6.14	527	4.71	523	4.57	583	6.14	559	5.00
French	14	539	5.43	572	6.21	479	3.64	560	5.29	593	6.50	538	4.86
German	3	457	3.67	577	6.33	453	3.33	509	4.33	547	5.67	485	3.67
Music	13	465	3.85	560	6.08	495	4.08	509	4.15	587	6.31	503	3.92
Philosophy	3	520	5.00	657	8.00	530	5.00	568	5.67	638	7.33	563	5.67
Total	116	512	4.92	601	6.90	495	4.07	543	5.08	596	6.54	519	4.39
Social Science													
Anthropology	1	400	3.00	520	5.00	490	4.00	521	5.00	532	5.00	478	4.00
Sociology	17	600	6.76	558	6.00	489	3.94	577	5.76	560	5.71	515	4.18
Economics	8	604	6.63	523	5.25	548	5.13	577	6.00	543	5.38	525	4.50
Am. Studies	10	479	4.20	501	4.80	403	2.10	497	3.80	529	4.90	460	2.90
History	34	614	6.85	536	5.56	510	4.41	614	6.56	555	5.62	521	4.41
Political Sci.	24	645	7.29	563	6.25	504	4.25	605	6.38	554	5.71	514	4.21
Psychology	23	553	5.65	546	5.65	559	5.35	560	5.35	549	5.48	569	5.35
Int. Relat.	9	602	6.67	484	4.33	497	4.11	584	5.89	504	4.22	497	3.67
Total	126	593	6.44	539	5.60	508	4.33	583	5.88	548	5.44	521	4.34
Physical Science													
Chemistry	14	596	6.50	546	5.86	676	7.36	574	5.79	568	5.86	646	6.79
Stat & Comp S	6	513	5.00	490	4.33	590	6.00	578	5.67	536	5.17	611	6.50
Geology	1	560	6.00	640	8.00	610	6.00	612	7.00	663	8.00	675	7.00
Geography	1	450	4.00	480	4.00	560	5.00	475	3.00	521	5.00	602	6.00
Physics	6	605	6.33	563	5.83	697	8.00	661	7.50	587	6.33	689	7.83
Mathematics	33	510	4.85	507	5.00	565	5.39	529	4.70	522	4.73	554	5.06
Total	61	539	5.39	521	5.25	606	6.16	557	5.33	543	5.25	597	5.92
Biology													
Med. Tech.	4	445	3.25	533	5.50	588	5.75	548	5.00	561	5.50	619	6.25
Biology	57	543	5.42	530	5.42	652	7.04	566	5.53	542	5.26	631	6.86
Total	61	536	5.28	530	5.43	648	6.95	565	5.49	543	5.28	630	6.82

Table 5

GRE and CLEP Scores and Stanines for the Professional Majors

Major	N	GRE						CLEP					
		S.S. Score	S.S. Stan.	Hum. Score	Hum. Stan.	N.S. Score	N.S. Stan.	S.S. Score	S.S. Stan.	Hum. Score	Hum. Stan.	N.S. Score	N.S. Stan.
Agriculture													
Ag. Bus. Mgm.	5	562	5.80	436	3.20	492	4.00	588	5.80	484	4.00	499	4.00
Ag. Ed.	1	510	5.00	460	4.00	560	5.00	521	5.00	472	4.00	619	6.00
Horticulture	8	468	4.13	434	3.38	519	4.63	463	3.00	441	2.50	571	5.25
Animal Sci.	5	448	3.40	408	2.80	614	6.20	492	3.80	478	3.80	655	7.40
Agronomy	4	423	3.00	420	3.00	580	5.75	466	3.25	461	3.75	598	6.00
Ent; Ent & Pl Path	7	479	4.00	440	3.43	587	5.86	509	4.43	502	4.14	623	6.57
Ag. Engin.	5	476	4.20	386	2.00	560	5.40	522	4.60	441	2.60	514	4.20
Ag. Econ.	5	540	5.20	448	3.80	560	5.20	541	4.80	483	3.60	582	5.80
Total	40	486	4.28	427	3.15	556	5.25	509	4.20	470	3.45	580	5.63
Business & Econ.													
Accounting	19	524	5.05	424	3.16	503	4.21	538	4.95	468	3.42	480	3.63
Business Adm.	43	522	5.09	438	3.40	507	4.33	539	4.93	481	3.88	508	4.16
Business Educ.	7	483	4.29	483	4.43	467	3.57	505	4.00	486	3.86	440	2.57
Economics	10	607	6.60	540	5.60	518	4.60	561	5.40	541	5.50	548	4.90
Total	79	530	5.20	451	3.71	504	4.27	538	4.91	486	3.97	501	3.99
Education													
Elementary Ed.	66	462	3.86	503	4.88	490	4.05	512	4.23	518	4.76	524	4.39
Secondary Ed.	2	615	7.00	590	6.50	590	6.00	621	6.50	532	5.00	574	5.50
Total	68	467	3.96	506	4.93	493	4.10	515	4.29	519	4.76	525	4.43
Engineering													
Chemical	31	527	5.16	463	4.00	635	6.74	559	5.32	493	4.19	638	6.71
Civil	15	479	4.33	451	3.73	599	6.13	548	5.27	477	3.73	547	5.07
Electrical	25	497	4.60	454	3.80	620	6.48	535	4.88	477	3.76	581	5.64
Mechanical	18	464	4.00	447	3.67	598	5.94	523	4.67	475	3.56	582	5.61
Total	89	498	4.63	455	3.83	617	6.40	543	5.06	482	3.87	595	5.91
Home Economics													
Text. & Cloth	15	503	4.67	525	5.33	524	4.67	528	4.60	515	4.53	525	4.60
General H.E.	3	593	6.67	617	7.33	593	6.00	588	6.00	581	6.00	628	6.67
Food & Nut.	8	510	4.88	494	4.63	544	5.13	523	4.50	559	5.88	563	5.38
H.E. Educ.	12	483	4.25	507	5.00	538	4.92	530	4.58	541	5.42	543	4.92
Child Devel.	11	509	5.00	518	5.18	575	5.73	522	4.64	552	5.64	574	5.45
Total	49	506	4.80	519	5.22	546	5.12	530	4.67	541	5.31	553	5.12

Table 5 cont'd.

Major	N	GRE						CLEP					
		S.S. Score	S.S. Stan.	Hum. Score	Hum. Stan.	N.S. Score	N.S. Stan.	S.S. Score	S.S. Stan.	Hum. Score	Hum. Stan.	N.S. Score	N.S. Stan.
Nursing	27	450	3.78	480	4.37	540	5.00	505	4.22	534	5.15	551	4.96
Physical Ed.													
Women's P.E.	7	404	2.57	447	3.57	474	3.57	483	3.43	476	3.86	461	3.14
Men's P.E.	9	426	2.89	436	3.44	482	4.00	441	2.89	451	3.00	523	4.56
Total	16	416	2.75	441	3.50	479	3.81	459	3.12	462	3.38	496	3.94

Table 6

Mean GRE Stanines and Mean CLEP Stanines for the Social Science, Humanities, and Natural Science Tests Combined

Curriculum Group	N	Mean GRE Stanine	Mean CLEP Stanine	d	GRE Rank	CLEP Rank
Biology	61	5.89	5.86	.03	1	1
Physical Science	61	5.60	5.50	.10	2	2
Social Science	126	5.46	5.22	.24	3	4
Humanities	116	5.30	5.34	-.04	4	3
Home Economics	49	5.05	5.03	.02	5	5
Engineering	89	4.95	4.95	.00	6	6
Business and Econ.	79	4.39	4.29	.10	7	10
Nursing	27	4.38	4.78	-.40	8	7
Education	68	4.33	4.49	-.16	9	8
Agriculture	40	4.23	4.43	-.20	10	9
Physical Education	16	3.35	3.48	-.13	11	11

Table 7

Change in CLEP and GRE Stanines
Between the 1967 and 1969 Administrations

Curriculum Group	N	Test	GRE Stan. (1969)	CLEP Stan. (1967)	d	p-value
Humanities	116	S.S.	4.92	5.08	-.16	n.s.
		Hum	6.90	6.54	.36	.01
		N.S.	4.07	4.39	-.32	.05
Social Science	126	S.S.	6.44	5.88	.56	.002
		Hum	5.60	5.44	.16	n.s.
		N.S.	4.33	4.34	-.01	n.s.
Physical Science	61	S.S.	5.39	5.33	.06	n.s.
		Hum	5.25	5.25	.00	n.s.
		N.S.	6.16	5.92	.24	n.s.
Biology	61	S.S.	5.28	5.49	-.21	n.s.
		Hum	5.43	5.28	.15	n.s.
		N.S.	6.95	6.82	.13	n.s.
Agriculture	40	S.S.	4.28	4.20	.08	n.s.
		Hum	3.15	3.45	-.30	n.s.
		N.S.	5.25	5.63	-.38	n.s.
Business & Econ.	79	S.S.	5.20	4.91	.29	n.s.
		Hum	3.71	3.97	-.26	n.s.
		N.S.	4.27	3.99	.28	n.s.
Education	68	S.S.	3.96	4.29	-.33	n.s.
		Hum	4.93	4.76	.17	n.s.
		N.S.	4.10	4.43	-.33	n.s.
Engineering	89	S.S.	4.63	5.06	-.43	.02
		Hum	3.83	3.87	-.04	n.s.
		N.S.	6.40	5.91	.49	.002
Home Economics	49	S.S.	4.80	4.67	.13	n.s.
		Hum	5.22	5.31	-.09	n.s.
		N.S.	5.12	5.12	.00	n.s.
Nursing	27	S.S.	3.78	4.22	-.44	n.s.
		Hum	4.37	5.15	-.78	.01
		N.S.	5.00	4.96	.04	n.s.
Physical Education	16	S.S.	2.75	3.12	-.37	n.s.
		Hum	3.50	3.38	.12	n.s.
		N.S.	3.81	3.94	-.13	n.s.

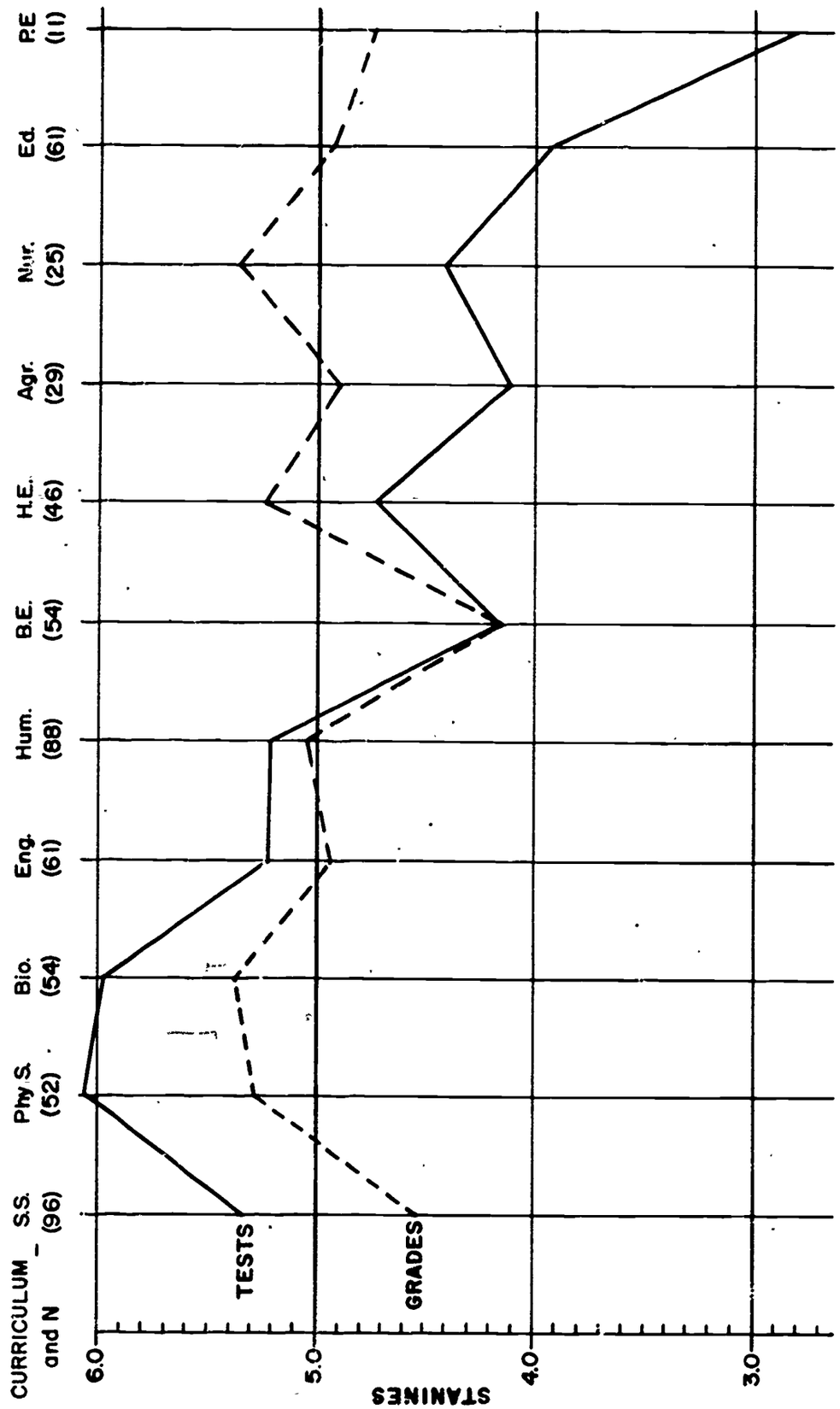

Fig. I TEST STANINES COMPARED WITH CUMULATIVE GRADE-POINT STANINES

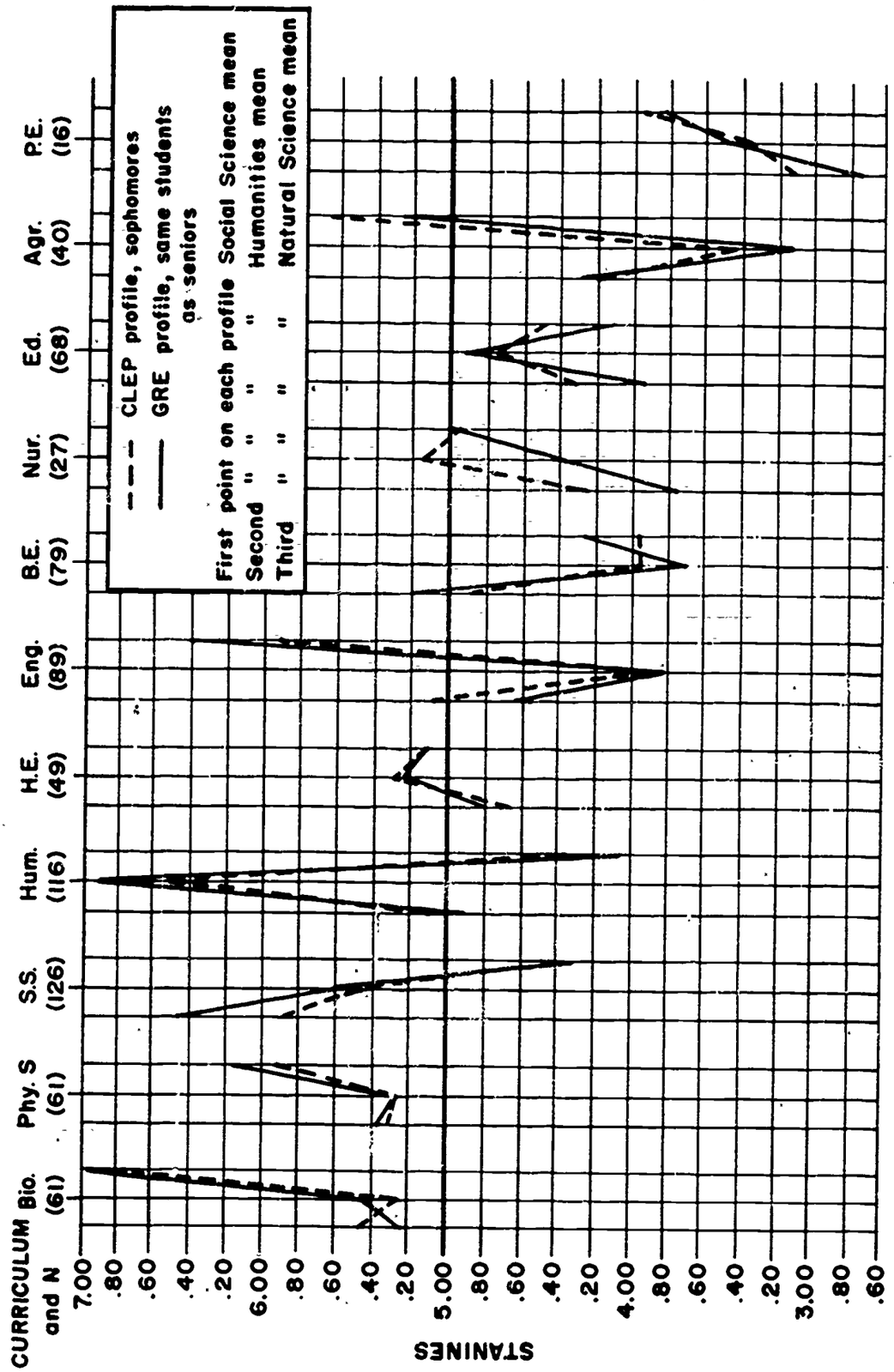

Fig.2 CLEP AND GRE PROFILES FOR THE SOCIAL SCIENCE, HUMANITIES AND NATURAL SCIENCE TESTS

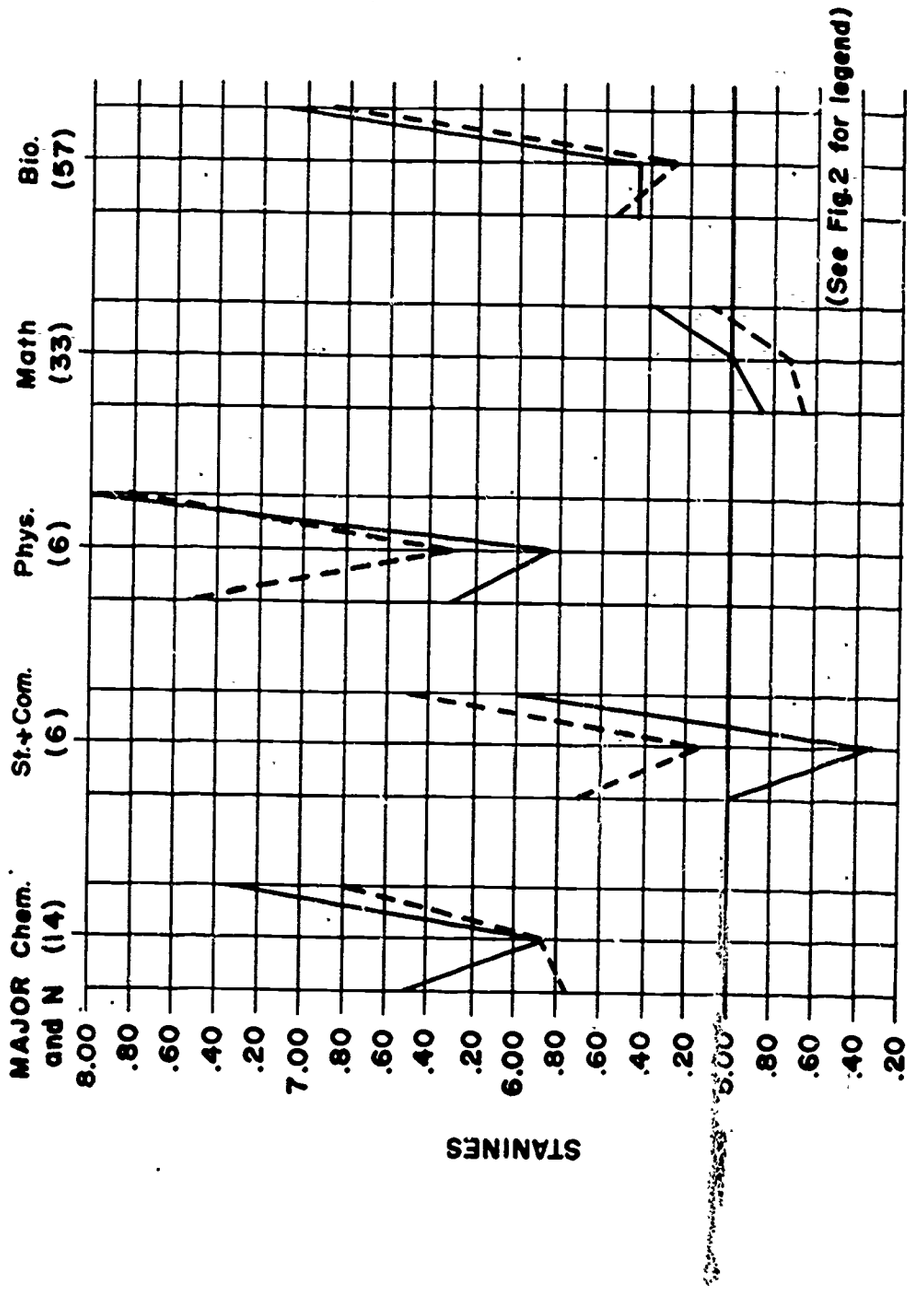

Fig.3 CLEP AND GRE PROFILES FOR NATURAL SCIENCE MAJORS

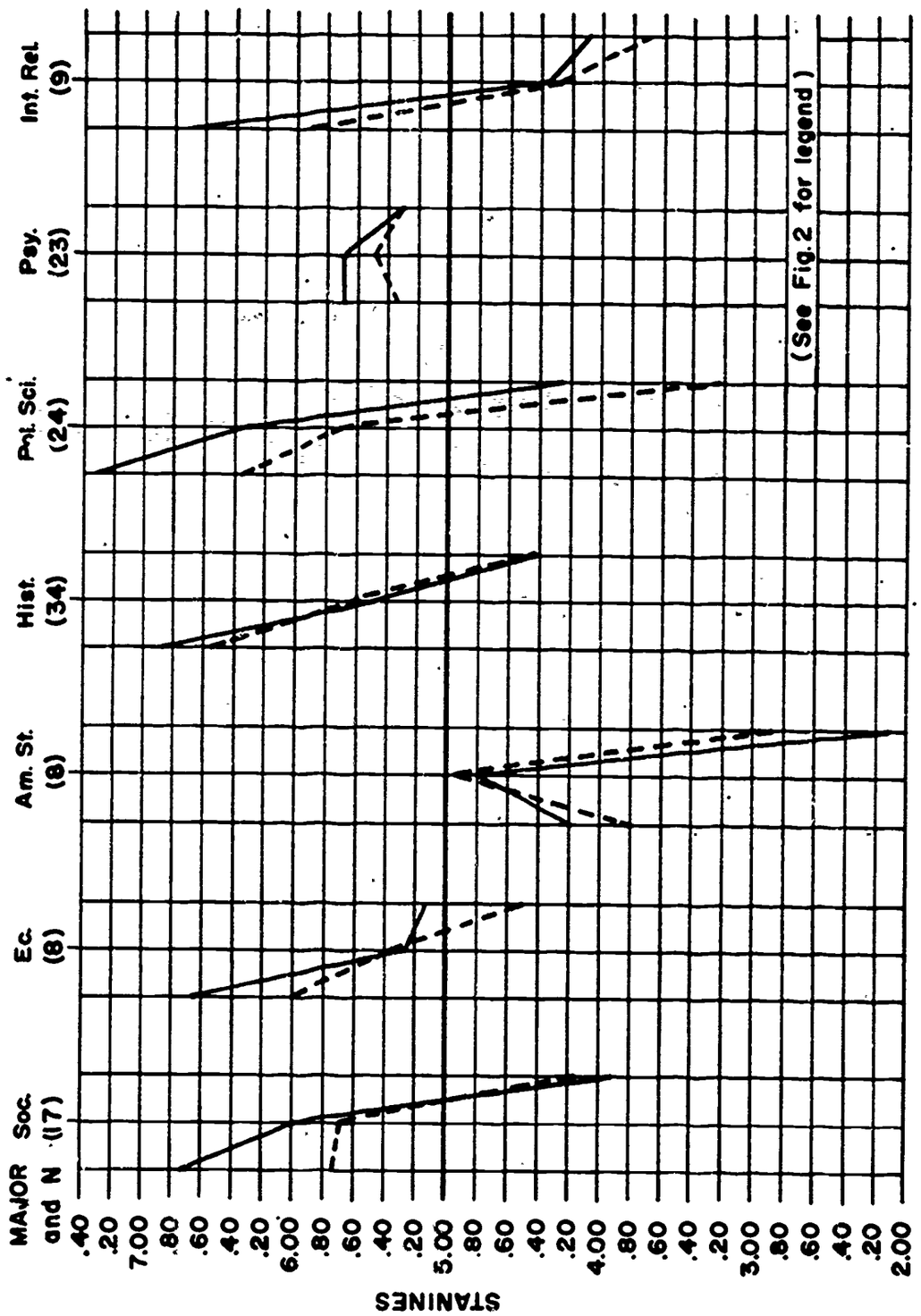

Fig.4 CLEP AND GRE PROFILES FOR SOCIAL SCIENCE MAJORS

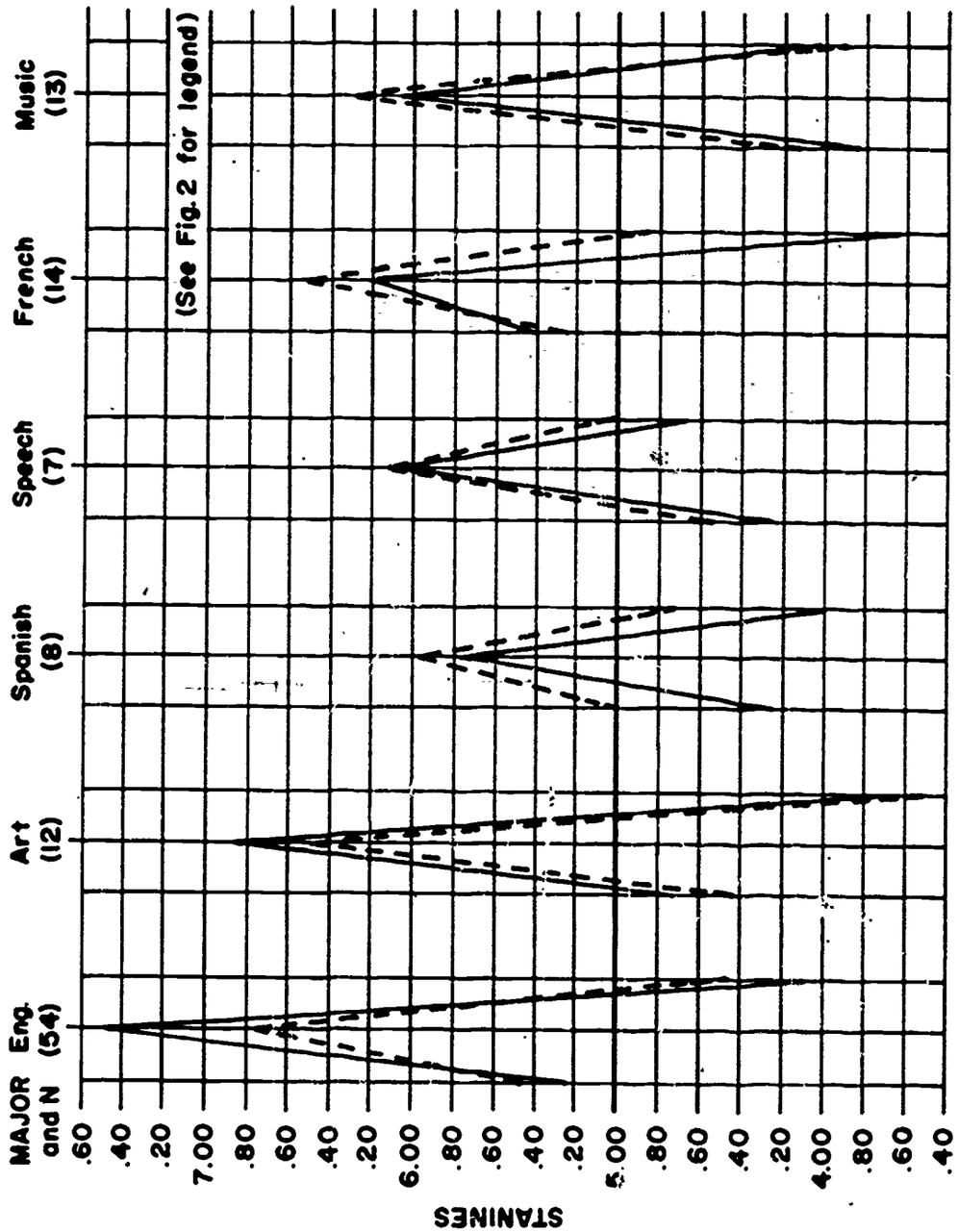

Fig. 5 CLEP AND GRE PROFILES FOR HUMANITIES MAJORS

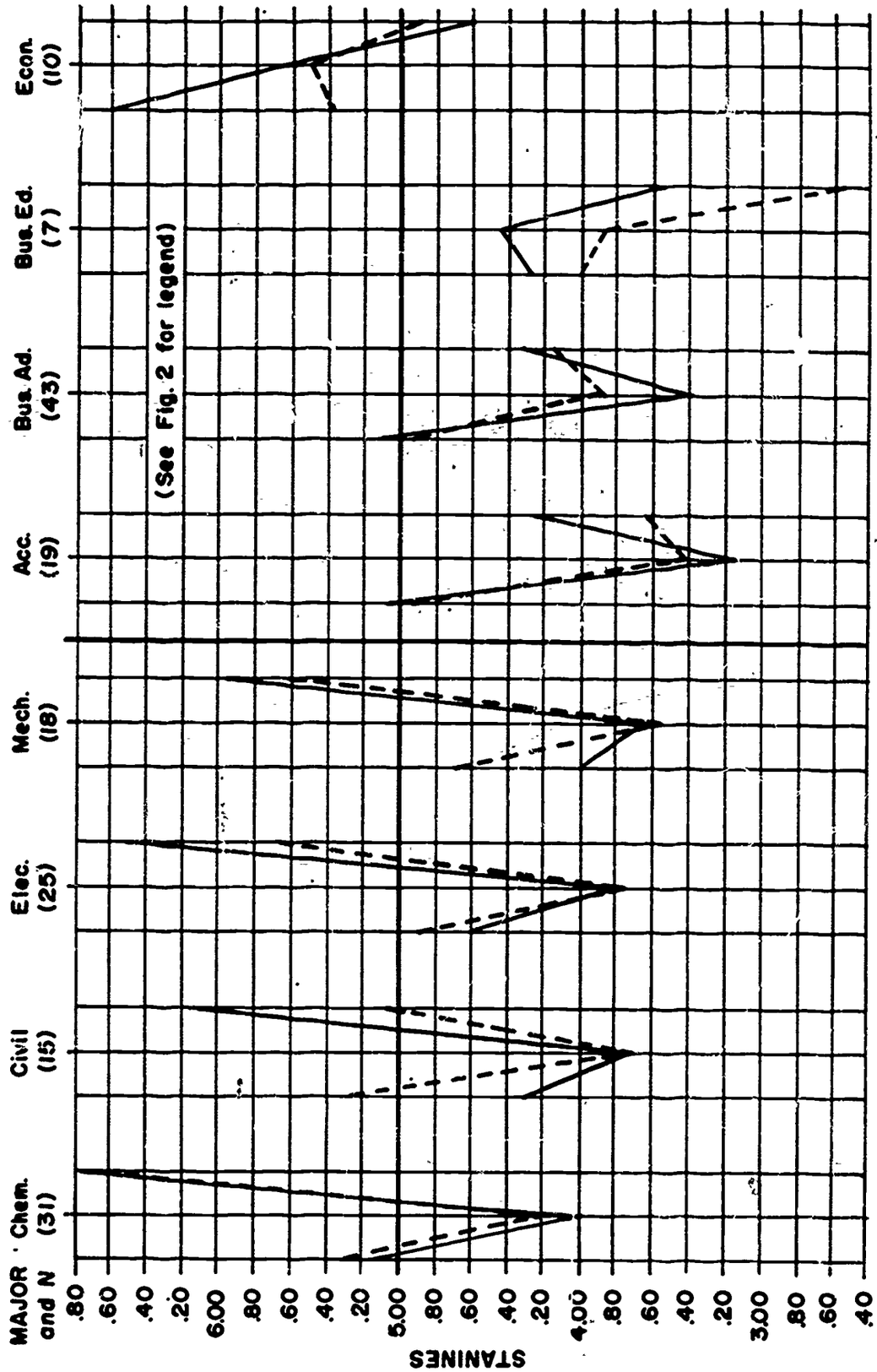

Fig. 6 CLEP AND GRE PROFILES FOR ENGINEERING, AND BUSINESS AND ECONOMICS MAJORS

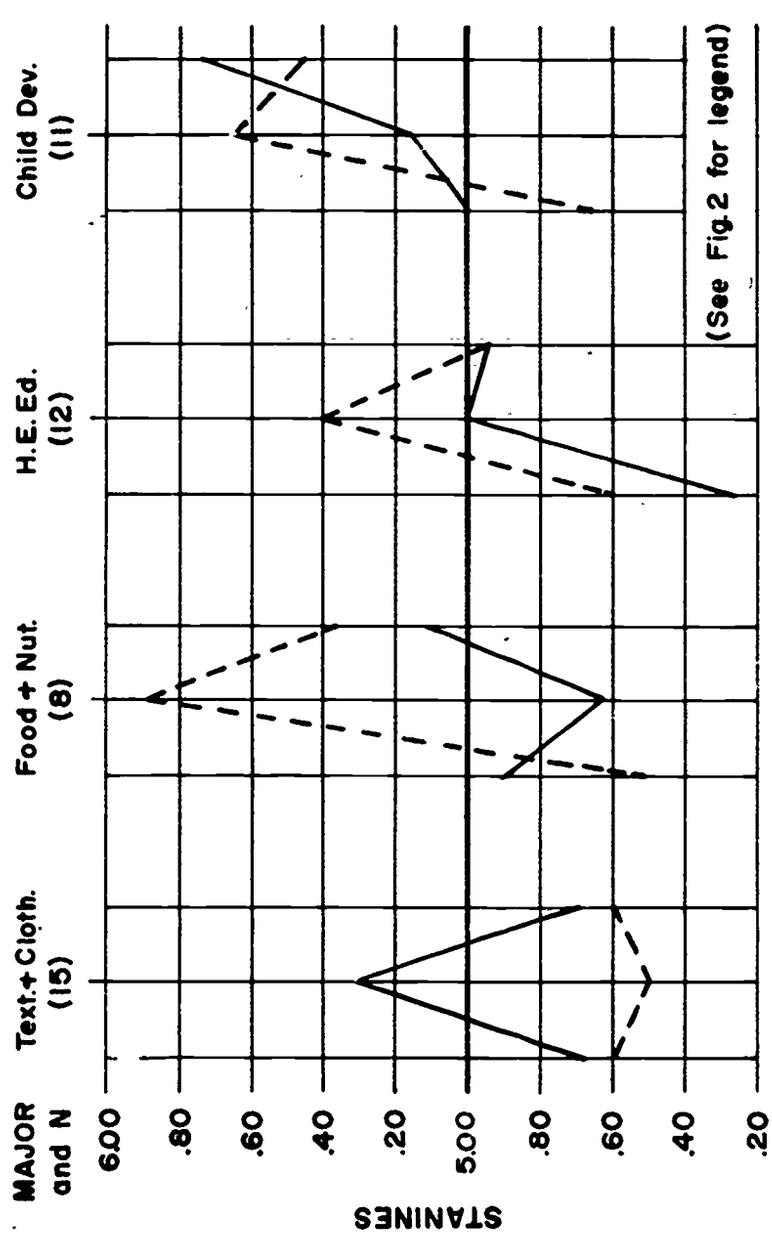

Fig. 7 CLEP AND GRE PROFILES FOR HOME ECONOMICS MAJORS

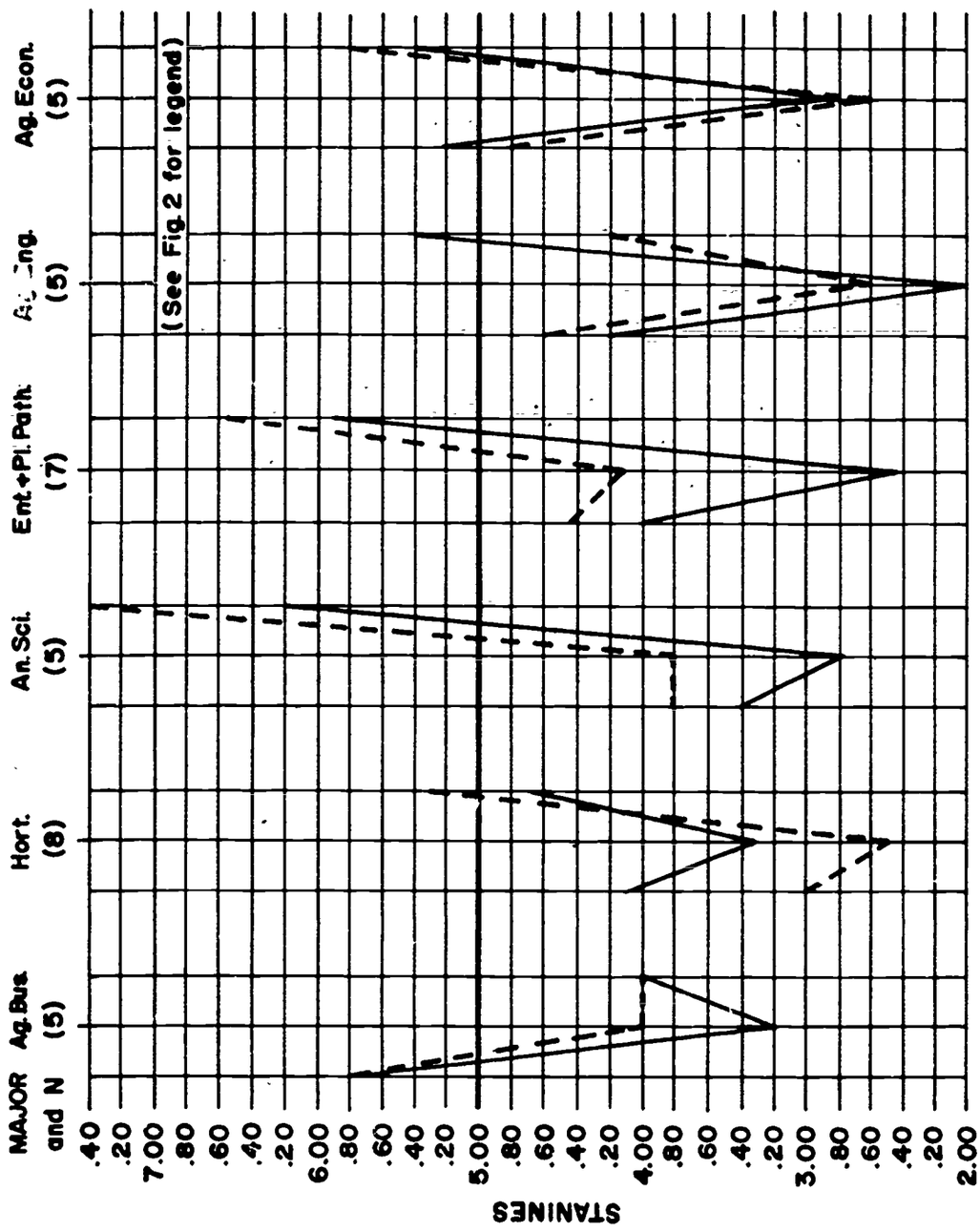

Fig.8 CLEP AND GRE PROFILES FOR AGRICULTURE MAJORS