

Abstract of Thesis

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ABSTRACT OF THESIS

DIFFERENTIAL ACADEMIC ACHIEVEMENT IN
COUNSELED AND UNCOUNSELED GROUPS
WHO CHANGE MAJOR FIELD OF STUDY

Submitted by
Louis C. Ate, Jr.

In partial fulfillment of the requirements
for the Degree of Master of Education
Colorado
Agricultural and Mechanical College
Fort Collins, Colorado

June 1949

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ABSTRACT

One of the recognized functions of Guidance as an integral part of the educational process is to aid individuals in making wise choices in the light of their capacities and the opportunities available for the exercise of those capacities. This study is an attempt to determine if that function is being fulfilled in the particular instance of students at the Colorado Agricultural and Mechanical College who seek aid in making changes in their choice of major fields.

For various reasons students find that they are unsuccessful in or dissatisfied with their chosen or imposed educational and implied vocational goals. In order to make adjustments to such situations they often transfer to other major fields. Some students make such transfers on their own initiative and rely on their own ability to choose a field in which they can be successful. Other students make use of the various organized and unorganized facilities available to them as aids in helping them to choose new majors wisely.

The Testing Bureau maintained at Colorado Agricultural and Mechanical College is vitally interested in helping such students arrive at satisfactory decisions as

to what new majors they should choose. Counseling as offered by the Testing Bureau usually consists of the following elements:

1. An initial interview, in which the counselor attempts to encourage the counselee to give information about his problems and himself.

2. Selection and administration of appropriate tests of interest, aptitude, achievement, and personality. The particular tests used are determined by the implications developed from the initial interview.

3. A final interview in which the counselee is guided toward an objective understanding of himself and his problem.

4. Additional interviews when desired by the counselee, in which he may continue to objectify his problem or obtain any additional information he might need.

The problem of this study is, What is the differential academic achievement in counseled and uncounseled groups following a change in major field of study?

Analysis of the problem.--In order to answer the major question the following were considered:

1. What are the academic aptitudes of the students in the groups?

2. What was the academic achievement of the students in the groups before and after change in major field of study?

3. Which students used the College Testing Bureau as an aid in choosing their new field?

4. What was the relationship between academic achievement and aptitude before change in major field of study in:

- a. the counseled group?
- b. the uncounseled group?

5. What was the relationship between academic achievement and aptitude after a change in major field of study in:

- a. the counseled group?
- b. the uncounseled group?

Method and design of experiment

Comparison of an experimental counseled group with an uncounseled group with respect to academic achievement before and after a change in major had been made was selected as the method of investigation to be used.

The main elements of the experimental design used in this study involved the following:

1. Selection of an experimental group of counseled students who had made changes in their

majors following the time at which they had received counseling.

2. Selection of a control group of uncounseled students who had made changes in their majors without the aid of counseling.

3. Individual matching of each member of the counseled experimental group with a member of the uncounseled control group on these characteristics: sex, age, class standing, marital status, and academic aptitude as indicated by a raw score on the American Council on Education Psychological Examination.

4. Comparison of the two groups before changes in major had been made with respect to their indicated aptitude and academic achievement.

5. Comparison of the two groups after a change in major had been made with respect to their indicated aptitude and academic achievement.

6. Investigation of the statistical significance of differences that might exist.

Selection of the sample

The names of students of Sophomore or Junior standing who had made a change of major during the academic school year 1946-1947 and the first two quarters of the academic school year 1947-1948 were

obtained from the Office of the Registrar. The total number of students identified in this manner was 783; of these 54 were found to have received counseling prior to the time at which change in major had been effected. Those cases which had received counseling following the time at which a change had been made were discarded.

Due to the limited number of counseled cases available for the establishment of an experimental group the number of cases included in the experimental and control groups to be investigated was limited to 50.

Files maintained by the Office of Student Affairs were the source from which the following information concerning each case was obtained: sex, age, class standing, marital status, raw and percentile score on the American Council on Education Psychological Examination, previous major, grades received during two-quarters preceding the change of major, time at which change of major was made, new major, grades received during the the two-quarters following the change of major.

The grade-point averages for the two two-quarter periods selected were determined by dividing the total quality points earned by a particular student in a two-quarter period by the total number of credit hours earned during that period.

Matching procedure

In order to obtain a degree of equivalence between the two groups as great as possible they were matched on those factors which might influence academic achievement and for which data were available. The characteristics selected were sex, age, class standing, marital status, and raw score on the American Council on Education Psychological Examination. The final results of the matching of the two groups indicated that a high degree of equivalence on the items selected had been obtained.

Statistical procedure

Statistical procedure which were used in analyzing the data obtained for this investigation were common to the field of educational research with the exception of one statistical device, which, for the purpose of this study, was designated as a T-Quotient. Critical ratios were computed between observed differences between statistics and the standard errors of those differences. Tables of t were referred to in order that the level of significance of a critical ratio might be determined. For this study a t value of 1.96 through 2.99 was accepted as significant. Values above this were considered highly significant.

Two other common statistical devices, the standard or Z-score, and the T-score derived from the

Z-score were used in computing what was previously referred to as a T-Quotient. The T-Quotient was computed in the following manner:

1. The raw score obtained on the American Council on Education Psychological Examination by each member of a group was translated into its equivalent T-score.

2. The grade-point averages earned by each member during a two-quarter period before and a two-quarter period following a change in major were each translated to T-scores.

3. Two T-Quotients were formed for each member of a group. First, in order to compare the placement of a particular member within the group in scholastic achievement with his placement within the same group in academic aptitude a quotient was formed in which his T-score in scholastic achievement during the two-quarter period preceding change of major was divided by his T-score in academic aptitude. The resulting numerical quantity indicated the relationship existing between scholastic achievement and measured aptitude to achieve. Over-achievement with respect to measured aptitude was thus indicated by T-Quotients greater than 1.000. Under-achievement was represented by a T-Quotient less than 1.000. A similar

T-Quotient was formed for the two-quarter period following a change of major. This quotient indicated the relationship existing between scholastic achievement and measured aptitude following a change in major.

The distributions of T-Quotients for the two groups were treated to determine if any significant differences in central tendency or variability of achievement with respect to aptitude had taken place after a change in major had been made. Comparisons were made both between and within the groups.

Summary of findings

Differences between groups and the critical ratios representing their significance are presented in Table 19. The mean grade-point averages earned and the variability of those averages were found to be not significantly different in the groups before a change of major had taken place. This was true also of the mean and deviation of T-Quotients received by the groups for the same period. These findings indicated that little difference in achievement existed between the groups during the two-quarter period preceding the time at which a change of major took place.

When a comparison was made of the groups on the same measures after changes of majors had taken place it was noted that though no significant difference in

mean achievement had occurred a significant change in the variability of grades earned had taken place. This indicated that counseling and change of majors had caused no appreciable difference in mean achievement but had caused the counseled group to decrease its variability from that mean.

Table 19.--DIFFERENCES IN ACHIEVEMENT BETWEEN CONSELED AND UNCOUNSELED GROUPS BEFORE AND AFTER CHANGE OF MAJOR

	Before Change		After Change	
	Counseled	Uncounseled	Counseled	Uncounseled
Mean grade-point average	2.233	2.431	2.423	2.578
Difference	0.198		0.155	
C.R.	1.597		1.567	
S.D. grade-point average	0.589	0.651	0.408	0.568
Difference	0.062		0.160	
C.R.	0.710		2.289	
Mean T-Quotient	1.024	1.049	1.033	1.054
Difference	0.025		0.021	
C.R.	0.492		0.403	
S.D. T-Quotient	0.239	0.268	0.233	0.285
Difference	0.029		0.052	
C.R.	0.813		1.424	

When achievement in a group before change of major was compared to achievement in the same group after change of major had occurred, Table 20, it was found that the uncounseled group had failed to achieve to any significantly higher degree. The counseled group, on the other hand, was found to have increased its mean grade-point average to a nearly significant degree, $t = 1.881$, and to have decreased the variability of those grade-point averages to a significant degree, $t = 2.528$. The decrease in the variability of grade-point averages noted in the counseled group was the only difference found between and within the groups which had significance at the 5 per cent level or above.

Table 20.--CHANGES IN ACHIEVEMENT WITHIN THE COUNSELED AND UNCOUNSELED GROUPS

	Counseled		Uncounseled	
	Before	After	Before	After
Mean grade-point average	2.333	2.423	2.431	2.578
Difference	0.190		0.147	
C.R.	1.881		1.205	
S.D. grade-point average	0.589	0.408	0.651	0.568
Difference	0.181		0.083	
C.R.	2.528		0.961	
Mean T-Quotient	1.024	1.033	1.049	1.054
Difference	0.009		0.005	
C.R.	0.188		0.091	
S.D. T-Quotient	0.239	0.233	0.268	0.285
Difference	0.006		0.017	
C.R.	0.180		0.440	

Implications

The overall results of this investigation argued for rejection of the assumption that counseling tends to increase the later achievement of counseled students. These results must not, however, be interpreted as signifying that counseling did not benefit the students counseled. Academic achievement, while admittedly important, is not the only or necessarily most

important criterion of the worth and effectiveness of the counseling process. Increased adjustments of a personal, social emotional, or motivational nature for the counseled group investigated were not considered and could not be studied by any treatment of the data secured. It may be that counseling had great benefit in these areas for the students included in this study even though scholastic achievement was not increased. Other studies employing other criteria are needed to investigate the outcomes of counseling in these important aspects of adjustment.

Suggestions for further study

The validity and worth of the various methods, techniques, and tools used in the counseling process can be established only through continual evaluation. With this thought in mind the following suggestions are offered for further studies:

1. A study should be made to determine the effect of the counseling process upon later personal and social adjustments.
2. An investigation should be carried on to determine the extent to which counselees follow the recommendations given by counselors at Colorado Agricultural and Mechanical College.
3. A study should be made to determine what

differences in achievement would exist between counseled and uncounseled groups if personality traits were held constant by matching the groups on a score given by some valid psychometric instrument.

4. A study should be conducted to determine if there is an identifiable pattern of personality traits associated with the voluntary use or non-use of counseling.

5. Intensive case studies should be made to determine effectiveness of specific techniques used in counseling.

6. An investigation should be made to determine the number of students who come to the Testing Bureau for aid in making decisions as compared to the number of those who come only for confirmation of selfmade decisions.

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T H E S I S

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June 1949

I HEREBY RECOMMEND THAT THE THESIS PREPARED UNDER MY
SUPERVISION BY LOUIS C. ATE, JR.

ENTITLED DIFFERENTIAL ACADEMIC ACHIEVEMENT IN COUNSELED
AND UNCOUNSELED GROUPS WHO CHANGE MAJOR FIELD OF
STUDY

BE ACCEPTED AS FULFILLING THIS PART OF THE REQUIREMENTS FOR THE
DEGREE OF MASTER OF EDUCATION

MAJORING IN GUIDANCE AND COUNSELING

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Permission to publish this thesis or any part of it
must be obtained from the Dean of the Graduate School.

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Chapter I

INTRODUCTION

One of the recognized functions of Guidance as an integral part of the educational process is to aid individuals in making wise choices in the light of their capacities and the opportunities available for the exercise of those capacities. This study is an attempt to determine if that function is being fulfilled in the particular instance of students at the Colorado Agricultural and Mechanical College who seek aid in making changes in their choices of major fields in which to prepare themselves.

With such a purpose in mind the study becomes one which is primarily evaluative in nature. Of how much value is Guidance? More specifically, of how much value is guidance and counseling to the student who finds it necessary or desirable to choose a new major field of endeavor?

For various reasons students find that they are unsuccessful in or dissatisfied with their chosen or imposed educational and implied vocational goals. In order to make adjustments to such situations they often transfer to other major fields. Some students make such

transfers on their own initiative and rely on their own ability to choose a field in which they can be successful. Other students make use of the various organized and unorganized facilities available to them as aids in helping them to choose new majors wisely. On the freshman level such changes are often commendable in that it gives some indication of a critical and exploratory attitude toward self and the different fields of opportunity open to them. But, when changes become necessary for students of sophomore, junior, or senior standing, and these cases are more frequent, the situation assumes an aspect of maladjustment and indicates a waste of time and effort on the part of both students and the school.

The Testing Bureau maintained at Colorado Agricultural and Mechanical College is vitally interested in helping such students arrive at satisfactory decisions as to what new fields they should choose, and offers its services to any student who desires them. The use of the Bureau is on a voluntary basis for the most part, the exception being those veterans attending college under Public Law 16 who are required to go through counseling on entry into college and who may be further required to go through advisement if and when they desire to change their major.

Organized counseling as offered by the Testing Bureau of Colorado Agricultural and Mechanical College

usually consists of the following elements:

1. An initial interview, in which the counselor attempts to encourage the counselee to give information about his problem and himself.
2. Selection of appropriate tests of interest, aptitude, achievement, and personality which are administered to the counselee. The particular tests used are determined by the implications developed from the initial interview.
3. A final interview in which the counselee is guided toward an objective understanding of himself and his problem.
4. Additional interviews when desired by the counselee, in which he may continue to objectify his problem or obtain any additional information he might need.

The problem

What is the differential academic achievement in counseled and uncounseled groups following a change in major field of study?

Problem analysis.--In order to answer the major question the following must be considered:

1. What are the academic aptitudes of the students in the groups?
2. What was the academic achievement of the

students in the groups before and after change in major field of study?

3. Which students used the College Testing Bureau as an aid in choosing their new field?

4. What was the relationship between academic achievement and aptitude before change in major field of study in:

- a. the counseled group?
- b. the uncounseled group?

5. What was the relationship between academic achievement and aptitude after a change in major field of study in:

- a. the counseled group?
- b. the uncounseled group?

Delimitations.--This study has been limited to 100 Sophomores and Juniors attending Colorado Agricultural and Mechanical College who changed their major fields of study during the academic school year 1946-1947 and the first two quarters of the academic school year 1947-1948. They were studied with respect to their indicated aptitude for college work, their academic achievement, and their use or non-use of organized guidance and counseling.

Definition of terms.--Counseled and uncounseled denote the use or non-use of the College Testing Bureau as an aid in choosing a new major field of study.

Aptitude refers to general scholastic aptitude as determined by the American Council on Education Psychological Examination.

Chapter II

REVIEW OF LITERATURE

The problem with which this study is concerned is the evaluation of the outcome of guidance in the particular case of college students who, for one reason or another transfer to a new major field of study.

Studies of an evaluative nature were infrequent in the literature reviewed. Evaluation of guidance, when mentioned, was usually mentioned in the light of the great need for it and the evident lack of it. Wrenn and Darley (34), 1942, made this very appropriate statement as an introduction to their review of studies for the three years preceding, "When one looks for studies of counseling that fall within the scope of even a liberal definition of evaluation the cupboard is found to be almost bare." (34:59-60) Again Bixler (6), 1945, made a similar statement, "Despite the rather extensive growth of high school and college guidance programs, research studies in evaluating outcomes of these programs are not numerous." (6:121) Foley and Dugan (8), 1948, reviewed the literature and concurred with previous reviewers with this statement, "Few significant studies attempting to evaluate the results of counseling have

appeared in the literature during the past three years." (8:138) They criticized studies on the ground that they were too general in nature; that they were placing too much emphasis on the evaluation of the general effects of guidance. They contended that "More research is needed on the evaluation of specific counseling techniques in more rigorously defined specific situations." (8:147)

For purposes of presentation the review of literature for this study is given in four parts.

Part one, the "Background", includes that part of the literature which pertains to certain factors found to have direct bearing upon the major problem.

Part two, "The Evaluation of Guidance", contains that part of the literature dealing with experimental designs, methodology, and criteria used in various studies in the evaluation of guidance outcomes.

Part three, "Guidance Outcomes", contains that portion of the literature which deals specifically with the values of guidance as determined by studies.

Lastly, part four, "Summary and Implications", contains the summarization of the material gained through the review and a discussion of the implications which that information has for the problem within this study.

Background

Follow-up studies.---As a means to orientation

it was felt necessary to review some of the literature concerning the incidence of the problem under consideration.

Williamson and Darley (30), 1937, in a follow-up study of 196 students conducted at the University of Minnesota, found that of a total of 784 problems indicated by the group 300 were problems of vocational nature and 227 of an educational nature. They felt that the high frequency of those two problems indicated the degree of relationship existing between these two areas of individual activity. They found also that in number of problems the student of high academic standing did not differ to any extent from the student of low academic standing.

Williamson and Bordin (26), 1941, made a study of 2,053 cases, 1,223 men and 830 women, who had been counseled by the Testing Bureau at the University of Minnesota and found a total of 5,876 problems mentioned in their case histories. Of these problems, 2,444 were designated as vocational and 1,842 as educational. Most frequent of the vocational problems were: poor aptitude for chosen vocation--270 cases; inability to decide between two or more vocational choices--756 cases; definite choice of vocation but wants confirmation or encouragement--976 cases. Educational problems considered most frequently were: selection of course in line with

occupational choice--632 cases; inferiority in academic skills such as reading, study habits, English usage--446 cases.

In reporting another follow-up study of 1,000 former students of the University of Minnesota which had been carried on by the staff of the General College, Pace (18), 1941, found that the need for vocational counseling was most apparent, that 20 per cent of the graduating and 30 per cent of the non-graduating men had not decided upon a vocational goal by the time they left college.

Types of guidance needed and desired.--Andrews (1), 1944, interviewed 279 students composed of both college freshmen and upperclassmen and found that, of the freshmen, 139 or 40.3 per cent had problems of an educational nature and 50 or 14.5 per cent had vocational problems. Of the upperclassmen 199 or 34.6 per cent were found to have educational problems and 70 or 12.2 per cent, vocational problems. He concluded from his findings that vocational problems ranked high with both groups; that this indicated that the selection of and preparation for a vocation is not a problem confined to the first year college student but is a problem also during the later years of college.

Bailey, Gilbert, and Berg (3), 1946, found, in a study of 1,617 cases, that, of the total number of

problem areas represented, 44 per cent were educational, 40.9 per cent were vocational, and 14.9 per cent were emotional.

Heston (11), 1947, in evaluating an educational guidance clinic, surveyed a pre-college group of senior high school students and found that 94 of 100 students indicated they expected vocational guidance from the school and that 97 of the 100 students expected the guidance clinic to provide curricular guidance.

Webb (22), 1949, made a study of occupational indecision as found among college students in which he asked specific questions of 241 students of all classes. The questions covered such items as: occupational choice, uncertainty or dissatisfaction in occupational choice, use or non-use of guidance in making occupational choice. He found that a relatively high percentage of the students had made no choice of a vocation or were uncertain as to choice made. Of the men, 52.6 per cent, and of the women, 61.1 per cent, were in this group. This indicated indecision was emphasized as serious in that it was noticed that of this group, 58 per cent were in their junior or senior year. Concerning the use of guidance he found that 51.3 per cent had received none whatever, either professional or non-professional.

Characteristics of students who use counseling.-

What kind of students are more likely to make use of

guidance services? Of these kinds which are more likely to benefit from such services?

Several studies were reviewed which had some bearing upon the above questions. Marshall (16), 1936, found that students who made their vocational choices before coming to college made slightly higher grade averages than those who had not; that students made higher grades on courses related to vocational choices.

Hepner (10), 1939, made a very comprehensive study of the various factors underlying unpredicted scholastic achievement of college freshmen and reported that, according to his study, a larger percentage of the more successful students of poor promise had made a vocational choice before entering college; that the percentage of students of poor promise who had made a vocational choice was far larger than the percentage of students of good promise who had made a choice; that there was some indication that a vocational decision, when once made, served as a stimulus for students of poor promise and consequently improved upon the expected quality of their work; that the early choice of a life career is more typically a characteristic of students of poor promise than of students of good promise.

Schneidler and Berdie (20), 1942, made an investigation to determine if the students who came for counseling to the University of Minnesota Testing Bureau

on a voluntary basis differed from the freshman on entrance test data and found that the two groups did not differ significantly from their classmates in respect to college aptitude, high school scholarships, or achievement in English. Later these investigators compared a group of freshmen registered in the College of Science, Literature and Arts who had been counseled with freshmen in that college who had not been served at the University Testing Bureau. A total of 577 men and 557 women were compared to other freshmen on the following variables: achievement in mathematics, natural sciences, and social sciences; rating on the Minnesota Personality Scale and the Strong Vocational Interest Blank. The result of the comparison indicated that those students who did come for counseling did not differ from those who were not counseled in respect to achievement in natural sciences, social studies, or mathematics. The two groups were also found to be alike in terms of measured interests, masculinity or femininity of interests, and occupational aspirations.

Baller (4), 1944, determined to check the findings presented by Schneidler and Berdie (20), 1942, and instigated a similar study at the University of Nebraska. In this study he compared the ability, achievement, and adjustment of 1,695 freshmen who had completed programs of testing related to vocational and

educational planning and/or problems of a personal-emotional nature in the academic year of 1942-1943 with freshmen of the same class who had not received counseling. The conclusions reached were as follows: students who were interested in counseling were not representative of the freshmen class as a whole; but were higher, as a group, in achievement, personal adjustment, and social adjustment; poorly-adjusted students with personal-emotional problems who came for counseling represented a sampling of better-than-average freshmen abilities. In comparing the results of this and the previously mentioned study, Baller further concluded that neither the manner in which guidance services are accepted nor the characteristics of students using guidance services in one institution can be assumed to be characteristic of another student body in another institution.

Evaluation of guidance

Role of evaluation.--What part does evaluation play in the development of guidance functions? Williamson (25), 1938, in a report to the fifteenth annual meeting of The American College Personnel Association, made a remark to the effect that most arguments advanced in support of guidance could be classified into two types: those arguments which insisted on the "reasonableness" of the general methodology of guidance; that

is, the methods and techniques used "looked good"; and those arguments which based the value of guidance upon the need for guidance as indicated by the seriousness and prevalence of maladjustments found among students; anything that could help in such cases was of necessity valuable. These arguments, Williamson pointed out, were useful in rallying support for guidance but possessed little validity. He believed the true worth of guidance should rest ultimately upon the findings of evaluative studies employing precise research methods.

Again, Williamson (24), 1939, indicated that he felt that there were serious gaps in knowledge concerning student problems, that too little was known and too much assumed concerning the specific tools and techniques used in guidance, that there were too many confused objectives with no adequate methodology accompanying, that personnel workers had developed very few techniques and had not adequately described or evaluated these few, and that guidance could not progress unless workers in the field became convinced that the methods and techniques of guidance must be improved through constant study and evaluation.

Later, Williamson and Bordin, (28), 1941, in a critique on methodology of experiments stated that the need for evaluative studies of guidance had become more insistent as attempts were made to systematize, organize,

and describe the processes and concepts of guidance. They felt that progress in evaluating guidance had been impeded by two types of attitudes held by personnel workers. The first was exemplified by those counselors who evaluated guidance by "arm chair" methods which established the worth of guidance as being self evident, and the second by those personnel workers who appeared to believe that counseling was so intangible as to be incapable of evaluation.

Criteria and experimental design in evaluation.---What criteria and methods have been found suitable to the evaluation of guidance? Williamson and Darley (30), 1937, presented four possible methods by which college counseling could be evaluated with four corresponding criteria. The first of these was the case-study method in which individual cases were evaluated by common-sense judgment as to the adjustments brought about. The criterion in this case was the degree of adjustment attained. The second method and corresponding criterion pertained to scholastic success. This method and its criterion were criticized on the basis that they were unsatisfactory and unsuitable for the evaluation of the outcomes of guidance in cases where low-aptitude students were counseled to leave college and gained by so doing, or in cases involving the prediction of failure rather than success in situations in which students insist on

making unwise choices, even though counseled against doing so. This second method, however, was looked upon as valid because so much of college success involved scholastic achievement that most outcomes of education could be evaluated by that single criterion even though it represented only one aspect of the values to be gained. The third method suggested involved the recording of satisfaction of students with services given them through guidance and counseling. It was pointed out that this method had much in its favor as only those students who were satisfied with the service given them would be likely to carry out the recommendations of counseling with effectiveness and enthusiasm. The fourth method mentioned and its criterion concerned changes in attitudes toward vocational problems. In regard to the selection of criteria, Williamson and Darley were of the opinion that grades offered the only objective, quantitative criterion of the effectiveness of counseling, that even though faulty in reliability and validity grades are measures of success or failure in school and as such, are acceptable as an important criterion in the evaluation of guidance outcomes. Williamson and Darley were also of the opinion that, because of the unique individuality of cases and the multiplicity of factors entering into each case, there would always be difficulty in evaluating the success of counseling. Because of this multiplicity of

factors they recommended the use of objective judgments based upon multiple criteria, objective and subjective, as the method most applicable to the evaluation of guidance.

Williamson (25), 1938, summarized a number of studies pertaining to the evaluation of guidance and cautioned against overall generalization as to the relative effectiveness of the different techniques and processes of guidance. He pointed out that no one method of evaluation could be used to evaluate guidance in general, that particular aspects of guidance could be evaluated by the same criteria only in so far as those aspects were of similar nature, and that methods used for evaluation should be applicable to the methodology of the guidance being evaluated. Regarding criteria, he pointed out that, though many studies had used grades as a criterion of effectiveness, there were many other criteria such as social, personal, and emotional adjustment that were just as important as scholastic adjustment.

Beaumont (5), 1939, differentiated academic counseling from personal counseling and suggested several measures by which the effectiveness of academic counseling could be evaluated. One criterion given was the frequency with which students withdrew from school for reasons other than financial. Another criterion suggested was the academic adjustment of the student.

Academic counseling, Beaumont maintained, involved the guidance of the individual in a direction for which his previous record, personality, and ambitions qualified him. This type of counseling entails the selection of a curriculum within the limits of available choice which best suits the student. Beaumont considered that this interpretation of adjustment gave credence to academic success as a criterion suitable for the measurement of guidance outcomes.

Williamson and Bordin (28), 1941, found that personnel workers who believed counseling could be scientifically evaluated used the following approaches: (a) traditional statistical approach, (b) non-statistical case study method, (c) ratings against various valid criteria combined with judgmental treatment rather than statistical analysis. The investigators warned against any assumptions that specific objectives would necessarily be common to all the cases in an experimental population as there was possibility that the use of what is at most only a partially applicable criterion is likely to yield only slight, or in some cases, no differences between groups. They pointed out that although a student had received counseling, that students must carry out some plan before the effects of counseling could be evaluated, that counseling may change attitudes but unless those changes are observable and measurable

evaluation becomes impossible, and that the time interval between counseling and evaluation should be short enough to limit the effects of random influences which might cause a regression toward the mean of groups evaluated. Williamson and Bordin offered the following assumptions as having some validity: that effective counseling would result in occupational and educational orientation, that orientation so gained would give favorable results in so far as the goals arrived at were suitable to the student and his situation, that students would make reasonable progress toward goals chosen, and that further motivation and satisfaction would result from recognized progress. These assumptions, it was cautioned, had meaning only in cases in which students gave full cooperation. These assumptions also indicated a number of possible criteria for the evaluation of guidance outcomes. The criteria indicated were: academic achievement, appropriateness of choice made, cooperation, satisfaction, success, quality of case work, predictive efficiency, and composite criteria. The criterion of academic achievement suggested two possible experimental designs: (a) comparison of student grade averages before and after counseling; (b) comparison of the mean grade of counseled students with that of non-counseled students who have been matched on such characteristics as age, sex, level of ability, size and type of high school,

and high school grades.

Wrenn and Darley (34), 1942, reported that most of emphasis in evaluative studies of guidance was placed on: (a) exact statement of objective or criteria for evaluation; (b) carefully formulated composite criterion in preference to specific part-criteria of adjustment, such as grades; (c) control groups; (d) longitudinal as opposed to cross-sectional studies; and (e) careful inferences from results that do not assume that other factors have been inoperative. (34:61)

Bixler and others (6), 1945, reviewed studies of an evaluative nature and listed the experimental designs that had been used. These were: (a) comparison of students grade averages before and after counseling, (b) comparison of the average scholastic, vocational, social or occupational adjustment of counseled students with that of non-counseled students matched on such characteristics as age, sex, ability, grades and size of high school, (c) control group experiments in which two comparable groups were given different kinds of counseling and then compared before and after counseling was given. Other methods reported were: clinical or follow-up studies of cases with judgments of adjustment and insight gained, the studies of student evaluation of guidance received. Of all the designs reported the control group experiment was preferred as the most applicable design.

Again, Foley and Dugan (8), 1948, made a similar review of the literature pertaining to the evaluation of guidance outcomes and reported that the design most often used in evaluation was a control group experiment in which comparable groups were compared before and after one of the groups received counseling. Other methods reported were: comparison of groups of counseled with non-counseled students matched on selected characteristics, follow-up and statistical analysis of cases, and evaluation of services received by counselees themselves. The two reviewers were of the opinion that these last three methods did not give desirable degree of experimental control.

Guidance outcomes

What are the values of guidance as determined by evaluative studies? Lemon (14), 1927, reported an experimental study of guidance and placement in which an attempt was made to evaluate the outcomes of guidance given to students in the lowest decile. The experimental design used was comparison of control groups, 53 in each. The experimental group was given special training, help, guidance, and counseling, while the control group was not. By the end of the first year Lemon found that: the grade-point average of the experimental group was significantly higher, there were fewer delinquencies in

the experimental group, there had been a smaller number of the experimental group dismissed from school, and there was a greater number in the experimental group who were eligible for registration for the following year.

Holaday (12), 1929, made a follow-up study of the group studied by Lemon (14), 1927, and found that the experimental group had higher grade-point averages than would have otherwise been earned, fewer students dropped for scholarship, and fewer students who left school because of discouragement over poor grades. There was also evident a more sincere effort on the part of students in the experimental group to adjust to University life. The criteria used in this study were: difference in the numbers of students from each group remaining in the university, average grade-point ratio of the groups, and the difference in average number of delinquencies reported to the office of the Dean.

Later Freeman and Jones (9), 1933, made a final report on students in the lowest decile of the group of 106 studied by Lemon (14), 1927, and found that the grade-point average of the two groups was practically the same, there was no significant difference between the two groups as to the number of students who had been placed on probation, there was very little difference as to the numbers of students from the two groups who were suspended from school. The investigators found that only

one more student from the experimental group graduated than did from the control group. From the results obtained Freeman and Jones were of the opinion that elaborate service for students in the lowest decile was unprofitable.

Murphy and others (17), 1936, used a questionnaire to survey the effects of counseling upon attitudes and found that counseling effected greater changes in attitudes concerning vocational activity than it did in attitudes toward social and political issues. The investigators pointed out that, in connection with control-group experiments, there was little possibility of ever securing a true "control" group, as the fact that an experimental group applied voluntarily for counseling introduced a selective factor that cannot be matched in non-counseled groups.

Williamson and Darley (30), 1937, made a follow-up study of 196 students who had been counseled one year previously. The experimental design of this study was comparison of counseled students before and after counseling with judgmental treatment of criteria. The judgments were made by "outside" reviewers who reviewed each case and made judgments concerning the two criteria which were the degree of adjustment attained and the extent to which advice was followed. In classifying students for this study according to college aptitude

and high-school scholarship the investigators found that the majority of the students were in the upper ranks in ability. They interpreted this as evidence that students of high ability needed and sought aid in solving problems as well as those of lower ability. The findings of this study were as follows: that those students who followed the recommendations given, wholly or in part, increased their average honor-point ratio, whereas the group not following advice did not; that the difference in grade-point ratio found between students following advice wholly and those who followed advice not at all was statistically significant.

Williamson (23), 1937, investigated the effectiveness of a course in occupational information and orientation. Effectiveness was determined by noting the increase made on a comprehensive standardized test given before and after one quarter of instruction. The gains noted for experimental groups were significantly greater than those of control groups who had not received instruction.

Williamson and Bordin (27), 1940, tested the hypothesis that students who were counseled would not have shown the same progress toward adjustment if they had not been counseled. The experimental method used was comparison of a counseled group with an individually matched non-counseled group. The students, 405 freshmen

in each group, were matched on the basis of: college class, age, sex, size and type of high school, high school graduation class standing, aptitude test score, and the Cooperative English Test score. Each student of both groups was interviewed one year after initial counseling by a person not connected with the original interview. Each case was evaluated with respect to the following criteria: scholastic achievement, degree to which counselee followed counselor's advice, and degree to which counselee had adjusted. The investigators reached the following conclusions: students who had been counseled were more likely to be better adjusted than were students who were not counseled, students followed plans originating from non-testing bureau sources more consistently than they did plans arrived at through testing bureau influences though those plans were less likely to be successful, students gained some assistance from counseling even when they did not follow the counselor's recommendations consistently, counseled students were more likely to receive higher grades than were non-counseled students, the effect of counseling was apparent by the end of the first quarter and the following two quarters of the freshman year contributed no significant gain.

Later Williamson and Bordin (26), 1941, made an investigation to determine the relative adjustment made by those students who cooperated with the counselor

and those who did not. Each case was evaluated with respect to two criteria: (a) degree of adjustment attained, and (b) amount of cooperation given. The workers who made the judgments concerning each case were qualified persons not involved in the original counseling process. Their evaluations were given on the basis of readings of the case histories and follow-up interviews. The results of this investigation indicated that those students who cooperated with the counselor were more likely to be adjusted.

Humphrey (13), 1941, made an evaluation of counseling by analysis of questionnaires given to freshmen from the Science, Literature and Arts College at the University of Minnesota. Four groups of students were investigated in this study: (a) students advised by faculty advisors alone, (b) students advised by trained counselors alone, (c) students advised by both faculty advisors and trained counselors, and (d) students who had received no counseling whatever. The analysis of the questionnaires given to these groups indicated that the group which had received counseling from both faculty advisors and trained counselors was better oriented to university life than was the group which had received advice from faculty advisors only. This increase in orientation was especially noticeable in such areas as: social adjustment as measured by school activity and

recreational participation, vocational and educational adjustment as evidenced by study habits, proper choices of courses, personality traits affecting occupational success, and grades. Of the three groups which received some degree of counseling the group receiving advice from both faculty advisors and counselors was found to be better oriented. All three of the groups receiving counseling were better oriented vocationally than was the group which received no counseling. Humphrey found also that counseling given in high school did not differentiate the groups studied. She was of the opinion that information about vocations was not sufficient in itself nor was the knowledge of student interests and aptitudes adequate without professional interpretation.

Williamson and Bordin (26), 1941, described several evaluative studies of student counseling and interpreted the results of these studies as indicating that students who had educational and vocational problems were more likely to be successfully counseled than were students whose problems were predominately social, personal, or emotional.

Toven, (29), 1945, appraised a college counseling program to determine what benefits systematic counseling had for students on the college level. This study covered a period of four years--one college generation. The experimental design followed was one of

comparison of individually matched groups, 188 in each. Each student in the experimental group was matched with a member of the control group on: score and percentile rank on the American Council on Education Psychological Test, sex, college class, race, religion, and curriculum chosen. The experimental group was given continuous counseling over the four year period on such matters as: health, education, finances, personal problems, spiritual issues, and vocation. The counseling given was done by faculty advisors. The 188 students in the control group were given no counseling. Following the four year period the two groups were evaluated with respect to: graduation from college, persistence in school, scholastic action by faculty, grade average, and number of quality points. The results of the appraisal indicated the following: a larger percentage of the students who had received counseling graduated, systematic counseling was effective regardless of the range and level of intelligence, males were more responsive to organized counseling than were females, counseling was useful in helping students to avoid scholastic difficulties, and the cumulative average grade of the counseled non-graduates for the first three years of college was higher than those of the non-counseled.

Blackwell (7), 1946, evaluated the immediate effectiveness of the Testing and Guidance Bureau at the

University of Texas by comparing a guidance group with a control group which had not received guidance. These groups were matched on such traits as: scholastic aptitude, length of time in college, and length of time between semesters in which grade-point average was selected as the criterion by which effectiveness of guidance was measured. The results of the study indicated that the difference between grade-points earned during the semester preceding counseling and the semester following could not be attributed to chance more than five times out of a hundred. The number of grade-points earned by the group which received guidance was reliably greater than the number earned by the non-guidance group, the difference being significant at the 1 per cent level. Blackwell did not assume that this difference was due to guidance alone but offered guidance as a definite factor entering into the improvement. She also offered a second possible causative factor, the personalities of the students included in the guidance group. These students might, she believed, have exhibited a greater degree of alertness, curiosity, and desire to improve than the non-guidance students who appeared to be content to maintain the status quo.

Assum and Levy (2), 1947, compared two groups of college students as to academic ability and achievement. One of these groups had used counseling as a means

of obtaining adjustment, the other had received no guidance. The comparison revealed no statistically significant difference between the groups in mean scholastic aptitude as measured by the American Council on Education Psychological Examination, but indicated large differences in scores on comprehensive examinations in favor of the counseled group. These differences were significant at the 1 per cent level. Assum and Levy concluded from the comparison that the American Council on Education Psychological Examination had little predictive value, that academic aptitude did not differentiate the groups, but academic achievement was higher in the adjusted students.

Summary and implications

The review made of the literature indicated that, in general, too many workers in the field of guidance have been prone to accept the worth and value of guidance, its function, processes and techniques, as being self evident. The too ready acceptance of different guidance processes has tended to perpetuate errors and obscure the truly worth while aspects of guidance. If the science and art of helping others to help themselves is to progress there must be knowledge and understanding concerning the specific techniques and methods which will produce specific results in specific situations. Continual evaluation of guidance in rigidly

controlled situations was offered as the means by which such understanding and insight might eventually be attained.

The literature, while pointing out that there was a great need for evaluative studies of guidance, had relatively few such studies to offer. Williamson, (23, 24, 25, 26, 27, 28, 29, 30, 31) was, by far, the most active contributor to the field.

Due to the unique individuality of each student, and the uniqueness of the techniques used in handling each individual's problems the evaluation of guidance is limited in its ability to indicate broad applicable generalizations. What appeared to be true for one school was not applicable to another school. Students who sought counseling were found to be of higher academic aptitude than the general student population in one school while students using counseling in another school were found to be representative of the student body as a whole.

Numerous experimental designs and accompanying criteria were tendered in the literature. The design considered most applicable by several investigators was the comparison of an experimental group with a control group which has been individually matched on various characteristics such as age, sex, class, college aptitude, high-school grades, and high-school class standing.

In this design two matched groups were compared both before and after the experimental group had received counseling in order to determine what the effects of counseling had been.

The criteria mentioned most often as being valid measures of the effects of counseling were academic achievement and degree of adjustment as judged by trained impartial judges.

Chapter III

METHODS AND MATERIALS

The general problem with which this study was concerned was as follows: Does organized counseling as offered by the Testing Bureau at Colorado Agricultural and Mechanical College help students to choose new majors, when a change becomes desirable, in such a way as to increase the academic achievement of those students with respect to their aptitude? Comparison of an experimental counseled group with an uncounseled control group with respect to academic achievement before and after a change in major had been made was selected as the method of investigation to be used.

The literature reviewed indicated that, for a study of this nature, a "control" group experiment offered an acceptable method of investigation.

Design of experiment

The main elements of the experimental design used in this study involved the following:

1. Selection of an experimental group of counseled students who had made changes in their majors following the time at which they had received counseling.

2. Selection of a control group of uncounseled students who had made changes in their majors without the aid of counseling.

3. Individual matching of each member of the counseled experimental group with a member of the uncounseled control group on these characteristics: sex, age, class standing, marital status, and academic aptitude as indicated by a raw score on the American Council on Education Psychological Examination.

4. Comparison of the two groups before changes in majors had been made with respect to their indicated aptitude and academic achievement.

5. Comparison of the two groups after a change in major had been made with respect to their indicated aptitude and academic achievement.

6. Investigation of the statistical significance of difference that might exist.

Selection of the sample

The names of students of Sophomore or Junior standing who had made a change of major during the academic school year 1946-1947 and the first two quarters of the academic school year 1947-1948 were obtained from the Office of The Registrar. The total number of students identified in this manner was 783.

Records maintained by the College Testing Bureau furnished the names of those students of the total sample who had received counseling within a time period of not more than one quarter before a change in major had been made. Of the 783 in the total sample only 83 were identified as having received counseling from the Bureau; of these only 54 had received counseling prior to the time at which change in major had been effected. Those cases which had received counseling following the time at which a change had been made were discarded.

Due to the limited number of counseled cases available for the establishment of an experimental group the number of cases included in the experimental and control groups to be investigated was limited to 50.

Files maintained by the Office of Student Affairs were the source from which the following information concerning each case was obtained.

1. Sex
2. Age
3. Class status
4. Marital status
5. Raw and percentile score on the American Council on Education Psychological Examination
6. Designation of previous major
7. Grades received during two quarters preceding the change of major

8. Time at which change of major was made
9. Designation of new major
10. Grades received during two quarters following the change of major.

In order to facilitate the matching process the above data were separately recorded for each student as it was obtained on case record cards. 1/

The grade-point average of each student was computed for the two-quarter periods before and after the change of major was made. Grade-point averages at Colorado Agricultural and Mechanical College are computed as follows:

1. Each letter grade is assigned a weight for the purpose of computing quality points.

A -- 4	F -- 0
B -- 3	E -- 0
C -- 2	WP -- 0 (Withdrawal passing)
D -- 1	WF -- 0 (Withdrawal failing)

2. The grade-point averages of the two-quarter periods selected were determined by dividing the total quality points earned by a particular student in a two-quarter period by the total number of credit hours earned during that period. For example a student who had enrolled for a total of 30 credit

1/ See Appendix B for example of case record cards used.

hours in the two-quarter period (15 quarter hours per quarter) preceding a change of major and had received a total of 60 quality points for that work would have had a grade-point average of 2.000.

It was noted that many of the students who had been indicated as having made changes of their majors had, in reality, not done so. This was evidenced by the lack of change found in their curricular programs. On further investigation it was determined that these errors were due to mistakes made by students at the time of registration. Thus, records in the Office of The Registrar indicated changes of majors where no changes had occurred. As a precaution against the possibility of including students who had made no change in the groups studied a careful check was made of the scholastic record of each student in order to determine whether changes of major actually had been made or not. After this check had been made the total number of cases for which adequate data were available was found to be, counseled 54, uncounseled 169.

Matching procedure

In order to obtain a degree of equivalence between the experimental and control groups as great as possible the two groups were matched on those factors which might influence academic achievement and for which

data were available. The characteristics selected were sex, age, class standing, marital status, and raw score on the American Council on Education Psychological Examination.

As aptitude for college work was accepted in this study as the most important criterion of academic achievement, academic aptitude, as indicated by a raw score on the American Council on Education Psychological Examination was selected as the matching item of first importance. The other items in order of their importance were as follows: sex, age, class standing, and marital status.

For ease in matching the two sets of case record cards upon which the data for the two groups had been recorded were each arranged in order of the raw score on the American Council on Education Psychological Examination which was indicated on each card. This arrangement made it possible to match the raw score on the American Council on Education Psychological Examination of each member of the group of 50 counseled students with that of a member of the group of 178 uncounseled students in a minimum of time. By this method it was also possible to locate the member of the uncounseled sample who best matched a particular member of the counseled group on characteristics other than the American Council on Educational Psychological Examination

raw score. The final results of the matching of the two groups indicated that a high degree of equivalence on the items selected had been obtained. Analysis of the degree of equivalence is presented in Chapter IV as is the statistical analysis of the differences found between the two groups.

Chapter IV

ANALYSIS OF DATA

In order to determine the differences in achievement of counseled and uncounseled groups who had changed major fields of specialization a matched control group experiment was carried on in which two matched groups of students, who had made changes in majors, one counseled and the other uncounseled, were compared both before and after changes in majors had been effected.

Data for this experiment were collected from the Office of The Registrar, the Testing Bureau, and the Office of Student Affairs, Colorado Agricultural and Mechanical College. These data were employed for two separate purposes.

1. To match the control group with the experimental group on characteristics other than counseling which might influence achievement. 1/
2. To determine the change in achievement with respect to scholastic aptitude which followed change of major, and to compare the counseled with the uncounseled group in the amount and character of such change.

1/ See Appendix A.

Statistical procedures

Statistical procedures which were used in analyzing data obtained on counseled and uncounseled groups who had made changes of majors were common to the field of educational research with the exception of one statistical device, which, for the purpose of this study, was designated as a "T-score Quotient."

The more common statistical procedures which were found necessary throughout the computation required for the analysis of the data were the determination of the means, standard deviations, differences between the means and between standard deviations, standard errors of means and of standard deviations, standard errors of obtained differences of means and of standard deviations. Critical ratios were computed between observed differences in means and the standard error of those differences. Critical ratios were also computed between the observed differences of standard deviations and the standard error of the differences. Tables of t were referred to in order that the level of significance of a critical ratio might be determined. In this study a t value of 1.96 through 2.99 was accepted as significant. Values above this were considered highly significant.

Two other common statistical devices, the standard or Z-score, and the T-score derived from the Z-score (19:534-535) were used in computing what was

previously referred to as a "T-score Quotient." The T-score Quotient was computed in the following manner:

1. The raw score obtained on the American Council on Educational Psychological Examination by each member of a group was translated into its equivalent T-score. This score indicated for each member his standing with respect to measured academic aptitude in the distribution of scores made by his group.
2. The grade-point averages earned by each member during a two-quarter period before and a two-quarter period following a change in major were each translated to T-scores. These scores indicated for each member of a group his placement with respect to academic achievement in a distribution of scores made by his group.
3. Two T-Quotients were formed for each member of a group. First, in order to compare the placement of a particular member within the group in scholastic achievement with his placement within the same group in academic aptitude a quotient was formed in which his T-score in scholastic achievement during the two-quarter period preceding change of major was divided by his T-score in academic aptitude. The resulting numerical quantity indicated the relationship existing between scholastic

achievement and measured aptitude to achieve. Over-achievement with respect to measured aptitude was indicated by a quotient greater than 1.000. Under-achievement was represented by a T-Quotient less than 1.000. A similar T-Quotient was formed for the two-quarter period following a change of major. This quotient indicated the relationship existing between scholastic achievement and measured aptitude following a change of major.

4. The distribution of T-Quotients for the two groups were then treated to determine if any significant differences in central tendency or variability of achievement with respect to aptitude had taken place after a change in major had been made. Comparisons were made both between and within the groups.

Equivalence of groups

In order to gain some degree of control over factors other than counseling which might influence academic achievement the members of the control and experimental groups were individually matched on the following characteristics: sex, age, class standing, marital status, and raw score on the American Council on Education Psychological Examination. 2/ Table 1 summarizes the equivalence obtained between the two groups on the

2/ Appendix A.

various characteristics. All members of both groups were of the male sex. This was true, not because the sample was so chosen but because the counseled cases for which adequate data were available included only males.

Equivalence of ages between the two groups was high with only a negligible difference in mean age shown, .04 years.

A moderate degree of equivalence was obtained in matching the two groups as to class standing; 38 sophomores and 12 juniors in the counseled group, 40 sophomores and 10 juniors in the uncounseled group. Results of matching with respect to marital status showed that an acceptable degree of equivalence in this factor had been obtained with 18 married and 32 single cases in the counseled group and 17 married and 33 single cases in the uncounseled group. Individual matching of raw scores on the American Council on Educational Psychological Examination resulted in a high degree of similarity between the groups as measured by this important criterion for academic success. By testing the null hypothesis it was found that no significant differences existed between the means or the standard deviations of the groups in academic aptitude. This similarity of academic aptitude was interpreted as giving validity to a comparison between the groups to the extent that the device used in measuring aptitude was valid.

Table 1.--EQUIVALENCE OBTAINED IN MATCHING COUNSELED AND UNCOUNSELED GROUPS

Matching Item	Counseled	Uncounseled
Sex: Male	50	50
Female	0	0
Age: Mean	23.20	23.24
Range	20-29	19-24
Class: Sophomore	38	40
Junior	12	10
Marital Status:		
Married	18	17
Single	32	33
Raw score on ACE*		
Mean	116.82	116.22
S.D.	21.93	22.12
S.E.M	3.101	3.128
S.E. (M ₁ -M ₂)		4.405
M ₁ -M ₂		0.600
C.R.		0.136
S.E. SD	2.193	2.212
S.E. (SD ₁ -SD ₂)		3.115
SD ₁ -SD ₂		0.190
C.R.		0.061

* American Council on Education Psychological Examination

Achievement before change in major

An analysis was made to determine what differences in achievement existed between the counseled and uncounseled groups before a change of major had taken place.

Achievement in the two groups was compared as

to both grade-point averages earned and degree of achievement with respect to academic aptitude as indicated by the T-score quotients of the groups.

It was found, Table 2, that the groups did not differ in mean grade-point average earned to a significant degree, but that there were about 80 chances in 100 that the uncounseled group achieved more than did the counseled.

The mean T-Quotients received by the two groups, Table 3, were also analyzed in order to determine if any significant difference in achievement with respect to aptitude was present between the groups. The probability that a difference in mean T-Quotient greater than zero existed between the groups was found to be small--about 30 chances in 100. This finding was interpreted to mean that the average achievement of the groups with respect to academic aptitude was about the same before a change in major had taken place.

The next step in the analysis was a comparison of the variability present in the two groups in grade-point achievement and grade-point achievement with respect to measured aptitude as represented by the T-Quotient.

Table 4, presents the analysis of the differences found in variability of the two groups in grade-point averages earned before change in major had taken

Table 2.--COMPARISON OF MEANS OF GRADE-POINT AVERAGES EARNED BY GROUPS BEFORE CHANGE OF MAJOR

Group	Mean	S.D.	S.E. _M	S.E. (M ₁ -M ₂)	Difference	C.R.	Level of Significance
Counseled	2.233	.589	.0833				
Uncounseled	2.431	.651	.0921	.1240	.198	1.597	.2

Table 3.--COMPARISON OF MEANS OF T-QUOTIENTS OF GROUPS BEFORE CHANGE OF MAJOR

Group	Mean	S.D.	S.E. _M	S.E. (M ₁ -M ₂)	Difference	C.R.	Level of Significance
Counseled	1.024	.2387	.0338				
Uncounseled	1.049	.2678	.0379	.0508	.025	0.492	.7

place. The difference was not significant. The chances in 100 that there was any true difference in the variability of the two groups were less than 10. The lack of variability in grade-point averages earned was evidence that the two groups were dispersed about the mean grade-point average in a highly comparable manner.

Table 4.--COMPARISON OF VARIABILITY IN GRADE-POINT AVERAGES OF GROUPS BEFORE CHANGE OF MAJOR

Group	S.D.	S.E. SD	S.E. $SD_1 - SD_2$	Difference	C.R.	Level of Significance
Counseled	.589	.0589				
Uncounseled	.651	.0651	.0878	.062	.710	.5

The variability of the T-Quotients received by the two groups preceding the change of major, Table 5, was analyzed to determine if the two groups varied significantly in achievement with respect to aptitude. The difference in standard deviation from the mean T-Quotient between the two groups was tested and found not significant. The chances that the true difference in this aspect was zero were about 50 in 100.

Table 5.--COMPARISON OF VARIABILITY IN T-QUOTIENTS OF GROUPS BEFORE CHANGE OF MAJOR

Group	S.D.	S.E. SD	S.E. SD ₁ -SD ₂	Differ- ence	C.R.	Level of Signifi- cance
Counseled	.239	.0239				
Uncoun- seled	.268	.0268	.037	.029	.813	.5

Achievement following
a change of major

An analysis of the achievement of the groups before a change of major has been presented. An analysis of the achievement of the two groups after a change of major had taken place must next be considered.

Table 6 shows the difference in mean grade-point average earned by the two groups during the two-quarter period following the time at which a change of major was made. The chances that this difference was significantly greater than zero were about 80 in 100. This difference was not significant.

A comparison of the means of T-Quotients received by the groups following a change of major, Table 7, revealed that there was no significant difference between the groups in average academic achievement with respect to aptitude. This finding was interpreted as an indication that the counseled group had not increased its average academic achievement with respect to aptitude

Table 6.--COMPARISON OF MEANS OF GRADE-POINT AVERAGES EARNED BY GROUPS AFTER A CHANGE OF MAJOR

Group	Mean	S.D.	S.E. _M	S.E. (M ₁ -M ₂)	Difference	C.R.	Level of Significance
Counseled	2.423	.408	.0577	.0989	.155	1.567	.2
Uncounseled	2.578	.568	.0803				

Table 7.--COMPARISON OF MEANS OF T-QUOTIENTS OF GROUPS AFTER A CHANGE OF MAJOR

Group	Mean	S.D.	S.E. _M	S.E. (M ₁ -M ₂)	Difference	C.R.	Level of Significance
Counseled	1.033	.2326	.0329	.052	.021	0.403	.7
Uncounseled	1.054	.2850	.0403				

to any degree significantly greater than had the uncounseled group.

An analysis of the variability in grade-point averages earned by the two groups after a change of major had taken place, Table 8, showed that a significant difference was present between the groups. The chances that the difference that did exist in this respect was greater than zero were about 95 in 100. This was interpreted as signifying that the two groups had varied significantly in their deviations from mean grade-point averages. These mean grade-point averages, Table 6, however, were not significantly different in the two groups.

Table 8.--COMPARISON OF VARIABILITY IN GRADE-POINT AVERAGES OF GROUPS AFTER CHANGE OF MAJOR

Group	S.D.	S.E. SD	S.E. SD ₁ -SD ₂	Difference	C.R.	Level of Significance
Counseled	.408	.0408				
			.0699	.160	2.289	.05
Uncounseled	.568	.0568				

Table 9 shows the difference in variability of T-Quotients received by the two groups for the two-quarter period following change of major. The difference found was not significantly greater than zero.

Table 9.--COMPARISON OF VARIABILITY IN T-QUOTIENTS OF GROUPS AFTER CHANGE OF MAJOR

Group	S.D.	S.E. SD	S.E. SD ₁ -SD ₂	Difference	C.R.	Level of Significance
Counseled	.233	.0233				
			.0368	.052	1.424	.2
Uncounseled	.285	.0285				

Change in achievement within the groups

The analysis which has been made concerned differences between the counseled and uncounseled groups in achievement and achievement with respect to aptitude. The groups were compared both before and after a change of major had been made.

Investigation of the changes in achievement which had occurred within the separate groups was the next step in the analysis.

A comparison was made of the mean grade-point averages earned by the counseled group before and after the time at which a change of major was made. The difference noted, Table 10, though not significantly greater than zero at the 5 per cent level, was so nearly significant that it was interpreted as an indication that a strong tendency was present for the mean grade-point average received by the counseled group for the two-quarter period following change of major to be higher

Table 10.--COMPARISON OF MEAN GRADE-POINT AVERAGES EARNED BY COUNSELED GROUP BEFORE AND AFTER CHANGE OF MAJOR

Two-Quarter Period	Mean	S.D.	S.E. _M	S.E. (M ₁ -M ₂)	Difference	C.R.	Level of Significance
Before change	2.233	.589	.0833				
After change	2.423	.408	.0577	.101	.190	1.881	.1

Table 11.--COMPARISON OF MEANS OF T-QUOTIENTS RECEIVED BY THE COUNSELED GROUP BEFORE AND AFTER CHANGE OF MAJOR

Two-Quarter Period	Mean	S.D.	S.E. _M	S.E. (M ₁ -M ₂)	Difference	C.R.	Level of Significance
Before change	1.024	.239	.0338				
After change	1.033	.233	.0379	.0408	.009	0.188	None

than the mean grade-point average for the two-quarter period preceding change of major.

Comparison of the means of T-Quotients received by the counseled group for the two periods, Table 11, yielded no difference which was of significance at the 5 per cent level. This was viewed as evidence that average achievement of the counseled group in relation to measured aptitude had not increased or decreased significantly after change of majors had taken place.

Table 12 shows the variability in grade-point averages received by the counseled group before and after majors were changed. The change in variability found present was significant at the 2 per cent level. This difference was the only truly significant finding of the study. It indicated that the individuals within the counseled group had achieved during the last two-quarter period in such a way as to give a distribution of grade-point averages more nearly grouped about the mean than was the distribution of grade-point averages received for the two-quarter period before change of major was made.

The variability in T-Quotients received by the counseled group before and after change of major, Table 13, did not change to a significant degree.

Table 12.--COMPARISON OF VARIABILITY IN GRADE-POINT AVERAGES RECEIVED BY THE COUNSELED GROUP BEFORE AND AFTER CHANGE OF MAJOR

Two-Quarter Period	S.D.	S.E. SD	S.E. SD ₁ -SD ₂	Difference	C.R.	Level of Significance
Before change	.589	.0589	.0716	.181	2.528	.02
After change	.408	.0408				

Table 13.--COMPARISON OF VARIABILITY IN T-QUOTIENTS RECEIVED BY THE COUNSELED GROUP BEFORE AND AFTER CHANGE OF MAJOR

Two-Quarter Period	S.D.	S.E. SD	S.E. SD ₁ -SD ₂	Difference	C.R.	Level of Significance
Before change	.239	.0239	.0334	.006	0.180	.9
After change	.233	.0233				

The uncounseled group presented little evidence that a change in mean grade-point average earned had taken place, Table 14. This lack of significant change was interpreted as meaning that the uncounseled group as well as the counseled group had failed to achieve to any significantly higher degree after changing majors.

A comparison of the mean T-Quotients received by the uncounseled group before and after change of major, Table 15, failed to indicate the presence of any

Table 14.--COMPARISON OF THE MEAN GRADE-POINT AVERAGES EARNED BY THE UNCOUNSELED GROUP BEFORE AND AFTER CHANGE OF MAJOR

Two-Quarter Period	Mean	S.D	S.E.M	S.E. ($M_1 - M_2$)	Difference	C.R.	Level of Significance
Before change	2.431	.651	.0921				
After change	2.578	.568	.0803	.122	.147	1.205	.3

Table 15.--COMPARISON OF THE MEAN T-QUOTIENT RECEIVED BY THE UNCOUNSELED GROUP BEFORE AND AFTER CHANGE OF MAJOR.

Two-Quarter Period	Mean	S.D.	S.E.M	S.E. ($M_1 - M_2$)	Difference	C.R.	Level of Significance
Before change	1.049	.268	.0379				
After change	1.054	.285	.0403	.055	.005	0.0910	None

significant change in this respect. This implied that the uncounseled group had not increased its average achievement with respect to aptitude by choosing new majors.

In Table 16 is presented the change in variance found between the grade-point averages received by the uncounseled group before and after change of majors. The change which took place did not vary significantly from zero.

Table 16.--COMPARISON OF VARIABILITY IN GRADE-POINT AVERAGES EARNED BY THE UNCOUNSELED GROUP BEFORE AND AFTER CHANGE OF MAJOR.

Two- Quarter Period	S.D.	S.E. SD	S.E. SD ₁ -SD ₂	Differ- ence	C.R.	Level of Signifi- cance
Before change	.651	.0651				
			.0864	.083	.961	.4
After change	.568	.0568				

The variability of the T-Quotients received by the uncounseled group for the two periods, Table 17, did not differ to any significant extent indicating that the distribution of achievement with respect to aptitude had not altered after change of major had occurred.

Table 17.--COMPARISON OF VARIABILITY IN T-QUOTIENTS
RECEIVED BY THE UNCOUNSELED GROUP BEFORE AND AFTER
CHANGE OF MAJOR

Two- Quarter Period	S.D.	S.E. SD	S.E. SD ₁ -SD ₂	Differ- ence	C.R.	Level of Signifi- cance
Before change	.268	.0268				
			.0391	.017	.440	.7
After change	.285	.0285				

An intra-group comparison was made of the individuals in the upper and lower halves of the distributions of the groups scores on the American Council on Education Psychological Examination, Table 18. The upper and lower halves of each group were compared as to mean gain or loss in T-Quotient. Gain in this measure was interpreted as an increase in achievement with respect to aptitude. A loss, in turn, indicated a decrease in achievement with respect to measured aptitude. The results of the analysis showed that those students of low aptitude tended to increase their average achievement in this respect, while those students of high aptitude tended to decrease to a slight degree. The mean increase in T-Quotient for the lower half of the counseled group was plus .044, for the uncounseled group plus .0124. The mean decrease in this measure for the upper half of the counseled group was -.029, for the uncounseled group

-.002. 3/

Table 18.--MEAN CHANGE IN T-QUOTIENTS OF UPPER AND LOWER APTITUDE GROUPS WITHIN THE COUNSELED AND UNCOUNSELED GROUPS.

Group	Mean Change in T-Quotient	
	Lower Aptitude Group	Upper Aptitude Group
Counseled	plus .044	minus .029
Uncounseled	plus .0124	minus .002

Summary

An analysis has been presented in which various differences in achievement between the counseled and uncounseled groups were tested for significance.

Differences between groups and the critical ratios representing their significance are presented in Table 19. The mean grade-point averages earned and the variability of those averages were found to be not significantly different in the groups before a change of major had taken place. This was true also of the mean and deviation of T-Quotients received by the groups for the same period. These findings indicated that little difference in achievement existed between the groups during the two-quarter period preceding the time at which a change of major took place.

When a comparison was made of the groups on

the same measures after changes of majors had taken place it was noted that though no significant difference in mean achievement had occurred a significant change in the variability of grades earned had taken place. This indicated that counseling and changes of majors had caused no appreciable difference in mean achievement but had caused the counseled group to decrease its variability from that mean.

Table 19.--DIFFERENCES IN ACHIEVEMENT BETWEEN COUNSELED AND UNCOUNSELED GROUPS BEFORE AND AFTER CHANGE OF MAJOR

	Before Change		After Change	
	Counseled	Uncounseled	Counseled	Uncounseled
Mean grade-point average	2.233	2.431	2.423	2.578
Difference	0.198		0.155	
C.R.	1.597		1.567	
S.D. grade-point average	0.589	0.651	0.408	0.568
Difference	0.062		0.160	
C.R.	0.710		2.289	
Mean T-Quotient	1.024	1.049	1.033	1.054
Difference	0.025		0.021	
C.R.	0.492		0.403	
S.D. T-Quotient	0.239	0.268	0.233	0.285

Table 19.--DIFFERENCES IN ACHIEVEMENT BETWEEN COUNSELED
AND UNCOUNSELED GROUPS BEFORE AND AFTER CHANGE OF
MAJOR--Continued

	Before Change		After Change	
	Counseled	Uncounseled	Counseled	Uncounseled
Difference	0.029		0.052	
C.R.	0.813		1.424	

When achievement in a group before change of major was compared to achievement in the same group after change of major had occurred, Table 20, it was found that the uncounseled group had failed to achieve to any significantly higher degree. The counseled group, on the other hand, was found to have increased its mean grade-point average to a nearly significant degree, $t = 1.881$, and to have decreased the variability of those grade-point averages to a significant degree, $t = 2.528$. The decrease in the variability of grade-point averages noted in the counseled group was the only difference found between and within the groups which had significance at the 5 per cent level or above.

Table 20.--CHANGES IN ACHIEVEMENT WITHIN THE COUNSELED AND UNCOUNSELED GROUPS

	Counseled		Uncounseled	
	Before	After	Before	After
Mean grade-point average	2.233	2.423	2.431	2.578
Difference	0.190		0.147	
C.R.	1.881		1.205	
S.D. grade-point average	0.589	0.408	0.651	0.568
Difference	0.181		0.083	
C.R.	2.528		0.961	
Mean T-Quotient	1.024	1.033	1.049	1.054
Difference	0.009		0.005	
C.R.	0.188		0.091	
S.D. T-Quotient	0.239	0.233	0.268	0.285
Difference	0.006		0.017	
C.R.	0.180		0.440	

Chapter V

DISCUSSION

What differences in achievement occur between and within counseled and uncounseled groups who change curricular majors? In order to answer this question a "matched" control group experiment was carried out. For this experiment data were obtained concerning two groups, one counseled the other uncounseled, who had changed majors. The achievement of these groups was compared before and after a change had taken place. An investigation was made also of the changes in achievement which had occurred within the groups.

The comparison of the control and experimental groups before a change of major had occurred indicated that no significant differences in scholastic achievement or achievement with respect to measured aptitude existed between them. It was noted that the two groups did not differ significantly from the all school population in grade-point averages earned. These findings were in accord with the findings reported by Schneidler and Berdie (20), 1942, who found that students who came for counseling were representative of the student body as a whole. There was less agreement, however, with

the conclusion reached by Baller (4), 1944, who stated that students who sought aid through counseling were higher in achievement than was the student body in general.

For the purpose of this study the similarity of achievement which was found between the two groups before a change of major was made furnished a valid basis for the assumption that any later increase in the achievement of either of the groups would give some indication of the appropriateness of the new majors chosen. As one of the recognized functions of guidance is to aid students in making appropriate choices in such situations any significant increase in the achievement of the counseled group might, with some reason, be attributed to its aid. The belief that counseling could help to increase achievement in such cases was born out by Williamson and Darley (30), 1937, who found that those students who followed the recommendations given by counselors, wholly or in part, increased their average honor-point ratio, whereas those students who did not follow recommendations did not. Williamson and Bordin (27), 1940, also found that counseled students were more likely to receive higher grades than were non-counseled students. Toven (21), 1945, likewise found that counseled students received higher grade-point averages than did uncounseled students. These studies and others gave some credence to the belief

that there would be a significant increase in the achievement of a counseled group over that of an uncounseled group in the same problem situation.

In the analysis of the data it was found that the expected increase of scholastic achievement for the counseled group had not occurred. This finding indicated that counseling had not caused any appreciable difference in mean achievement to exist between the counseled and uncounseled groups. An examination of the changes in mean achievement which had occurred within the groups resulted in a finding which was similar but for the exception of a nearly significant increase in mean grade-point average, $t = 1.881$, noted for the counseled group. This exception, though lacking in significance, indicated that the counseled group had made some increase in scholastic achievement even though not enough as to be significant when a comparison was made with the uncounseled group.

The lack of significant increase in the mean achievement of the counseled group in this experiment presented a point of conflict between this study and studies reviewed in the literature. These studies, Lemon, (14), 1927, Holaday (12), 1929, Williamson and Darley (30), 1937, Williamson and Bordin (27), 1940, Humphrey (13), 1941, Toven (21), 1945, Blackwell (7), 1946, Assum and Levy (2), 1947, all found significant

increases in achievement for the counseled groups which were studied.

Three possible explanations for the lack of agreement between this study and other studies should be considered. First, the results of this study may show just what was indicated; that counseling had not been effective in helping students to increase their mean achievement, that uncounseled students had lost nothing by not using the Testing Bureau. This explanation is probably inadequate however. The second, and more probable, explanation of the lack of significant difference noted would be that students who received counseling benefited in ways not measurable by any increase in mean scholastic achievement, that is, in the personal, social, and motivational aspects of their school adjustment. An increase in personal satisfaction with a new major would not necessarily result in an increase in achievement. Although scholastic achievement is one important criterion of academic success it is often a very invalid and unreliable one. Williamson and Darley (30), 1937, pointed this out when they criticized the use of achievement as a criterion for the evaluation of counseling because they felt that it failed to offer a means of measuring many of the desirable outcomes of counseling. By using achievement as a criterion for the effectiveness of counseling in this experiment it is probable that

many other benefits due to counseling which were present were obscured or neglected. To obtain a measure of all the possible benefits to be derived from the counseling process would require a multiplicity of criteria, objective and subjective, by which the many factors present in any counseling situation might be properly evaluated. Williamson and Darley (30), 1937, concurred in this when they pointed out that, because of the uniqueness of cases which are counseled and the multiplicity of unique factors which enter into each case the outcomes of guidance would always be difficult to evaluate.

The third possible, though less probable, reason that the counseled group in this study failed to show the expected increase of scholastic achievement might be that the group as a whole was atypical in its use and application of counseling. The result that was obtained could be attributed to a complete lack of cooperation of the counselees with the recommendations of the counselors, though this is unlikely. It might also indicate that the counseled students in this study had used counseling to gain confirmation of decisions already made rather than as an aid in making those decisions.

The statistical device, the T-Quotient, was devised to measure the achievement of the counseled and uncounseled groups with respect to the indicated

aptitudes of the individuals within the groups. The expectation was that there would be a decided change toward a mean T-Quotient of 1.000 in the counseled group as one of the functions of guidance is to aid students to secure a hygienic balance between their achievement and their ability to achieve. The findings of this study however indicated that neither of the groups had made any significant changes in this respect. This seemed to imply that counseling as offered by Colorado Agricultural and Mechanical College, while it may have aided students toward greater self realization in some aspects, did not effect a change in the achievement with respect to aptitude of the counseled group investigated.

The discussion thus far has been directed toward a consideration of the differences in mean grade-point averages earned and mean achievement with respect to aptitude of the two groups investigated. The observed differences in the central tendency of the criteria were found not significant both between the groups before or after a change of major had taken place and within the groups. In other words, neither counseling nor change of major had caused any significant change in the average achievement of either of the groups. Reliance upon differences in measures of central tendency to point out significant differences between groups can be misleading however. Changes in the variability of grades and

T-Quotients received could be extremely significant and yet go unobserved through any inspection of central tendency. An analysis of the variability of the two groups in these measures indicated that significant differences and changes had occurred that were not made observable by the analysis of the changes and differences in central tendency.

The variance in grade-point averages received by both of the groups before change of major took place was very similar. When the difference which did exist was tested it was found not significant. The same was true for the variance noted for the groups in T-Quotients received for the two-quarter period before change of major was made. This similarity in variability of grades and T-Quotients found between the groups before change of major was evidence that the range and spread of achievement with respect to aptitude within the groups were comparable.

It was expected that counseling would result in a significant decrease in the variability of T-Quotients received by the counseled group. This, because a decrease in variability of T-Quotient would give an indication that a movement toward the desired mean of 1.000 and standard deviation of zero had taken place; that the counseled students were achieving more nearly what their measured aptitude indicated they should achieve; neither

over-achieving or under-achieving. An investigation was made to determine if the expected significant decreases in variability of T-Quotients received by the counseled group had occurred. It had not. Nor had any significant change taken place in the uncounseled group in this respect. This finding was interpreted as meaning that counseling had failed to effect any significant changes in achievement with respect to aptitude in the counseled group studied. Those who were under-achieving continued to under-achieve and those who were over-achieving tended to continue over-achieving. Changes that took place, though in the desired direction, were not significant between the groups or within the groups.

When the variability of the grade-point averages earned by the groups was investigated a significant difference was found between the groups after change of major had taken place, the counseled group showing more decrease in variability than the uncounseled group. This decrease in variability was accompanied by a nearly significant increase in mean grade-point average. The increased homogeneity of the counseled group with respect to grades earned was the only significant finding of the study. The significant decrease in variability and less significant increase in mean grade-point average noted for the counseled group provided the only differences between the groups which might be attributed to the counseling

process. These changes in the counseled group were in all probability caused by increases in achievement by the students in the lower half of the distribution of aptitude in that group. A comparison of the upper and lower halves of each group as to increase in T-Quotient showed that this assumption has some basis. The lower halves in aptitude of each group evidenced some gain in achievement with respect to aptitude while the upper halves of each group showed slight losses. This seemed to imply that students of lower aptitude gained more in achievement than had students of higher aptitude. It seemed logical however to expect that this would happen as the lower aptitude group should evidence more increase in achievement than the higher aptitude group if for no other reason than that there was more room and need for improvement in the lower group.

The results of this study which showed that mean academic achievement was not increased by counseling are counter to the findings presented in other studies of the same nature. This evident lack of agreement implies that counseling as offered at Colorado Agricultural and Mechanical College is either not effective in this particular function, or that this study has been conducted in such manner as to be either more valid or less valid than the studies mentioned.

One point which argues for the validity of the

findings presented in this study is the high degree of equivalence obtained between the groups in the matching process. The significant increases in achievement noted for counseled groups by other investigators might have been less apparent had the degree of control present in this study been obtained. There was no mention made in the reports of the other studies concerning the degree of equivalence secured but it is doubtful that any greater degree was obtained than was present in this study.

There exists, however, the possibility that the counseling that was given to the groups included in other investigations was of a more intensive nature and of longer duration than was received by the counseled group of this study. It might be also that those students who sought counseling in other institutions were of lower aptitude than the counseled students investigated in this study. If either of the above possibilities were found to be the case a comparison made between the results of this study and the results of other studies would not be a valid one, as the conditions under which the effectiveness of counseling in increasing achievement were evaluated were not the same.

Implications of this study

Some useful implications may be drawn from the findings of this investigation even though their

validity must rest upon the appropriateness of academic achievement as a criterion of effectiveness and upon the efficiency of the American Council on Education Psychological Examination as a measure of academic aptitude.

The following is a summation of those implications:

1. Counseling does little to effect an equilibrium between achievement and aptitude in counseled groups as a whole although it may effect great changes in this respect in certain individual counselees.

2. Counseled students, as a group, are not likely to experience any significant increase in mean achievement.

3. Students of low aptitude tend to increase their achievement after counseling and change of major to a greater extent than they would have had they not received counseling.

4. The major benefits of the counseling offered at Colorado Agricultural and Mechanical College may lie in increased personal, social, and emotional adjustment rather than in increased academic success as measured by grades.

Suggestions for further study

The validity and worth of the various methods, techniques, and tools used in the counseling process can

be established only through continual evaluation. With this thought in mind the following suggestions are offered for further studies:

1. A study should be made to determine the effect of the counseling process upon later personal and social adjustments.

2. An investigation should be carried on to determine the extent to which counselees follow the recommendations given by counselors at Colorado Agricultural and Mechanical College.

3. A study should be made to determine what differences in achievement would exist between counseled and uncounseled groups if personality traits were held constant by matching the groups on a score given by some valid psychometric instrument.

4. A study should be conducted to determine if there is an identifiable pattern of personality traits associated with the voluntary use or non-use of counseling.

5. Intensive case studies should be made to determine effectiveness of specific techniques used in counseling.

6. An investigation should be made to determine the number of students who come to the Testing Bureau for aid in making decisions as compared to the number of those who come only for confirmation

of selfmade decisions.

Chapter VI

SUMMARY

For various reasons students are often faced with the necessity for making changes in their curricular majors. It is generally assumed that counseling can be of assistance in such cases, and that the aid given will result in increased adjustment and achievement for the students counseled. The undertaking of this study was motivated by a desire to investigate the validity of the last assumption: that counseling affects the later achievement of students who use its service in selecting a new major field of study.

In order to determine the effect that counseling had upon the scholastic achievement of students who changed majors a matched-control-group experiment was conducted. The scholastic achievement of two groups, one counseled and the other uncounseled, was compared both before and after change of major had been made. These groups had been individually matched so as to secure a high degree of equivalence between them on the following characteristics: sex, age, class standing, marital status, and raw score on the American Council on Education Psychological Examination. The data necessary for

the matching of the groups and the carrying out of the study were secured from various files maintained on the campus at Colorado Agricultural and Mechanical College. These data were treated statistically to determine the character and significance of any differential achievement which might be present within or between the groups.

The analysis of the data showed that neither counseling nor change of major had effected any significant change in the mean scholastic achievement of the counseled group nor in average scholastic achievement with respect to aptitude. There was, however, a significant decrease found in the variability of grades received by the counseled group which indicated that counseling had tended to increase the homogeneity of the group in respect to achievement.

The overall results of this investigation argued for rejection of the assumption that counseling tends to increase the later achievement of counseled students. These results must not, however, be interpreted as signifying that counseling did not benefit the students counseled. Academic achievement, while admittedly important, is not the only or necessarily most important criterion of the worth and effectiveness of the counseling process. Increased adjustments of a personal, social, emotional, or motivational nature for the counseled group investigated were not considered and could

not be studied by any treatment of the data secured. It may be that counseling had great benefit in these areas for the students included in this study even though scholastic achievement was not increased.

APPENDIX

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Appendix A.--MASTER DATA SHEET

MASTER DATA SHEET

COUNSELED GROUP

CASE NO.	SEX	AGE	CLASS	MARITAL STATUS	AGE	G.P.A. ₁	G.P.A. ₂
1	M	22	2	M	100	2.324	2.861
2	"	24	2	M	113	1.394	1.333
3	"	23	3	S	152	1.800	2.333
4	"	20	2	S	130	2.967	2.000
5	"	25	2	M	99	3.069	3.172
6	"	20	2	S	137	3.172	2.515
7	"	24	3	M	95	1.719	2.467
8	"	25	2	S	170	1.469	2.132
9	"	22	3	M	101	2.423	2.030
10	"	26	2	S	106	2.258	2.889
11	"	21	3	S	121	2.866	2.125
12	"	25	3	M	122	2.233	2.938
13	"	22	2	S	126	1.106	2.636
14	"	23	2	S	103	2.152	2.676
15	"	28	3	M	121	1.379	2.306
16	"	26	2	M	144	1.687	2.625
17	"	29	2	S	106	2.143	2.360
18	"	21	2	S	121	2.571	2.733
19	"	24	2	M	121	2.387	2.457
20	"	26	3	S	111	1.181	1.914
21	"	20	2	S	130	2.167	2.310
22	"	20	2	S	84	2.113	2.097
23	"	20	2	S	140	2.387	2.742
24	"	20	2	S	121	1.750	2.273
25	"	21	3	M	111	2.633	2.944
26	"	23	3	S	147	3.129	2.393
27	"	22	2	M	101	1.929	2.441
28	"	28	2	S	85	1.968	2.000
29	"	24	2	M	103	2.233	2.606
30	"	22	2	S	79	.613	1.857
31	"	21	2	S	125	2.586	2.091
32	"	24	2	M	108	3.219	3.697
33	"	23	3	S	79	2.633	1.941
34	"	21	2	S	90	2.400	2.088
35	"	21	2	S	142	3.182	2.718
36	"	25	2	S	94	2.037	2.000
37	"	21	2	M	167	3.119	3.243
38	"	25	2	S	78	1.963	2.091
39	"	25	2	M	101	1.419	1.697
40	"	22	2	S	121	1.467	2.673
41	"	25	2	M	119	2.032	2.591
42	"	23	3	S	99	2.067	2.516
43	"	24	2	S	130	2.178	2.216
44	"	24	2	S	95	1.508	2.750
45	"	21	3	S	118	2.788	1.824
46	"	22	2	S	126	2.857	3.000
47	"	24	2	S	159	2.767	2.551
48	"	21	2	M	116	2.138	2.057
49	"	22	2	S	149	2.988	2.828
50	"	26	2	M	106	2.148	2.000

UN-COUNSELED GROUP

CASE NO.	SEX	AGE	CLASS	MARITAL STATUS	AGE	G.P.A. ₁	G.P.A. ₂
1	M	28	2	M	101	2.667	2.568
2	"	24	2	S	113	2.966	3.156
3	"	25	3	M	150	2.895	3.233
4	"	23	2	S	130	2.677	2.696
5	"	25	2	M	99	2.964	2.763
6	"	19	2	S	140	1.758	1.797
7	"	23	2	M	93	1.846	2.172
8	"	23	2	S	161	2.452	1.867
9	"	22	3	S	103	2.500	2.636
10	"	23	2	S	106	3.072	2.919
11	"	22	3	S	125	1.517	2.100
12	"	24	2	M	122	1.967	3.081
13	"	22	2	S	125	2.767	2.844
14	"	19	2	S	103	1.868	2.593
15	"	25	3	M	129	2.172	2.387
16	"	28	2	M	145	2.152	2.342
17	"	26	2	S	105	2.636	2.700
18	"	21	2	S	123	3.323	3.229
19	"	26	2	M	120	3.727	3.265
20	"	24	3	S	137	2.821	1.781
21	"	21	2	S	132	1.935	2.100
22	"	24	2	S	82	1.663	2.161
23	"	24	2	S	139	2.419	1.643
24	"	24	2	S	121	1.176	2.314
25	"	26	3	M	111	2.000	1.176
26	"	20	3	S	141	1.946	1.863
27	"	20	2	M	105	2.429	3.423
28	"	26	2	S	85	2.138	2.875
29	"	22	2	M	100	2.324	2.861
30	"	22	2	S	80	2.576	2.459
31	"	22	2	S	128	1.969	2.000
32	"	24	2	M	107	2.385	2.222
33	"	27	3	M	87	3.067	2.559
34	"	21	2	S	89	1.759	2.543
35	"	22	2	S	141	2.444	2.890
36	"	23	2	S	93	1.758	2.786
37	"	24	2	S	157	3.548	3.289
38	"	26	2	S	71	2.281	2.118
39	"	22	2	M	96	3.407	3.433
40	"	24	2	S	121	0.750	1.800
41	"	25	2	M	120	2.313	2.852
42	"	23	3	M	98	1.857	1.667
43	"	24	2	S	130	2.065	2.344
44	"	22	2	S	96	1.625	2.600
45	"	21	3	S	119	3.778	3.100
46	"	22	2	S	125	2.717	2.882
47	"	20	2	S	135	3.757	3.828
48	"	21	2	M	117	2.724	2.757
49	"	22	2	S	147	2.848	2.583
50	"	26	2	S	108	2.818	2.639

Appendix B.--SAMPLE OF CASE
RECORD CARDS

		Non-Vet	Vet
Name.....	Class.....	Age.....	Sex.....
	Raw	%	
A.C.E. Score.....			Additional Information:
Prev. Major.....			Course Load:
G.P.A.....			No. of Changes:
New Major.....			Guidance Findings:
G.P.A. '.....			
G.P.A. ' - G.P.A.			
.....			
.....			

Appendix C.--T-SCORES AND T-QUOTIENTS
RECEIVED BY GROUPS

Computed T-scores and T-Quotients of Counseled Group

	T _{ACE}	₁ T _{GPA}	T _{Q1}	T _{GPA2}	T _{Q2}	T _{Q2} -T _{Q1}
1	42.34	51.54	1.217	60.74	1.435	+ .218
2	48.27	35.76	0.741	47.33	0.981	+ .240
3	66.05	42.65	0.660	47.79	0.724	+ .064
4	56.02	62.46	1.115	39.63	0.707	- .408
5	45.13	64.19	1.422	68.36	1.515	+ .023
6	59.21	65.94	1.114	53.25	0.882	- .232
7	40.06	41.25	1.030	51.08	1.275	+ .245
8	74.26	37.03	0.499	50.22	0.676	+ .177
9	42.80	53.23	1.244	40.37	0.943	- .301
10	45.08	50.42	1.118	60.93	1.352	+ .234
11	54.65	60.75	1.102	42.70	0.781	- .321
12	52.37	50.00	0.955	62.62	1.196	+ .241
13	54.20	35.96	0.663	55.22	1.019	+ .356
14	43.71	48.62	1.112	56.20	1.286	+ .174
15	39.60	35.51	0.897	47.13	1.190	+ .293
16	62.40	40.39	0.647	54.95	0.881	+ .234
17	45.08	48.47	1.075	47.13	1.045	- .030
18	51.92	55.74	1.074	57.60	1.109	+ .035
19	51.92	52.67	1.014	50.83	0.979	- .035
20	61.04	42.33	0.693	37.52	0.615	- .078
21	56.02	48.88	0.873	47.23	0.843	- .030
22	51.92	48.47	0.934	42.50	0.819	- .115

	T_{ACE}	T_{GPA_1}	T_{Q_1}	T_{GPA_2}	T_{Q_2}	$T_{Q_2}-T_{Q_1}$
23	60.58	52.61	0.868	57.82	0.954	+ .086
24	51.92	41.80	0.805	46.32	0.892	+ .087
25	47.36	56.79	1.199	62.77	1.325	+ .126
26	63.77	65.21	1.023	49.26	0.772	- .251
27	44.16	44.84	1.015	50.44	1.142	+ .127
28	35.50	45.50	1.282	39.63	1.116	- .166
29	43.71	50.00	1.144	54.49	1.247	+ .103
30	32.76	23.01	0.702	36.13	1.103	+ .401
31	53.74	55.99	1.042	41.94	0.780	- .262
32	45.99	66.74	1.451	81.23	1.766	+ .315
33	32.76	56.79	1.734	38.19	1.166	- .568
34	37.78	52.84	1.399	41.79	1.106	- .293
35	61.49	66.11	1.075	58.21	0.947	- .128
36	39.60	46.67	1.179	39.63	1.001	- .178
37	72.89	70.14	0.962	70.10	0.962	.000
38	32.31	45.42	1.406	41.86	1.296	- .110
39	42.80	36.18	0.845	32.21	0.753	- .092
40	51.92	36.99	0.712	56.13	1.081	+ .369
41	51.00	46.59	0.914	54.12	1.061	+ .147
42	41.88	47.18	1.127	52.28	1.248	+ .121
43	56.02	49.03	0.875	46.40	0.828	- .047
44	40.06	37.69	0.941	58.01	1.448	+ .507
45	50.55	59.42	1.175	35.32	0.689	- .476
46	54.20	60.59	1.118	64.14	1.183	+ .065

	T_{ACE}	T_{GPA_1}	TQ_1	T_{GPA_2}	TQ_2	$TQ_2 - TQ_1$
47	60.12	59.07	0.983	52.65	0.876	-.107
48	49.63	48.39	0.975	41.03	0.827	-.148
49	64.68	62.48	0.966	59.93	0.927	-.039
50	45.08	48.56	1.077	39.63	0.879	-.198

Computed T-scores and T-Quotients of Uncounseled Group

1	43.03	53.63	1.246	49.82	1.158	-.088
2	48.55	58.22	1.199	60.18	1.240	+.041
3	65.28	57.13	0.875	61.53	0.943	+.068
4	56.24	53.78	0.936	52.08	0.927	-.029
5	42.22	58.19	1.378	53.26	1.261	-.117
6	60.76	39.66	0.653	35.25	0.599	-.056
7	39.51	41.01	1.038	42.85	1.085	+.047
8	70.25	50.32	0.716	37.48	0.534	-.182
9	42.68	51.06	1.196	51.02	1.195	-.001
10	45.39	59.85	1.319	56.00	1.234	-.085
11	53.98	35.96	0.666	41.58	0.770	+.104
12	52.62	42.87	0.815	58.86	1.119	+.304
13	53.98	55.16	1.022	54.68	1.013	-.009
14	44.03	41.04	0.932	50.26	1.141	+.209
15	44.21	46.02	1.041	46.64	1.055	+.014
16	63.02	50.32	0.798	45.85	0.728	-.070
17	44.94	53.15	1.183	52.15	1.160	-.023
18	53.07	63.70	1.200	61.46	1.158	-.065
19	51.72	61.99	1.199	62.10	1.201	+.002

	T_{ACE}	T_{GPA_1}	T_{Q_1}	T_{GPA_2}	T_{Q_2}	$T_{Q_2}-T_{Q_1}$
20	59.40	55.99	0.943	35.97	0.606	-.337
21	57.14	42.38	0.742	41.58	0.728	-.014
22	34.54	38.20	1.106	42.66	1.235	+1.129
23	60.31	49.82	0.826	33.54	0.556	-.270
24	52.17	30.72	0.589	45.35	0.869	+1.280
25	48.00	43.38	0.904	26.32	0.528	-.376
26	61.21	42.55	0.695	37.24	0.608	-.087
27	44.94	49.97	1.112	64.88	1.444	+1.332
28	35.90	45.50	1.267	55.23	1.538	+1.271
29	42.68	48.36	1.133	54.98	1.288	+1.155
30	33.63	52.23	1.553	47.90	1.424	-.129
31	55.33	42.90	0.775	39.82	0.720	-.055
32	45.84	49.29	1.075	43.73	0.954	-.121
33	36.80	59.77	1.624	49.67	1.350	-.274
34	37.70	39.68	1.053	49.38	1.310	+1.257
35	38.79	49.80	1.284	55.49	1.431	+1.147
36	39.51	39.66	1.004	53.66	1.358	+1.354
37	68.44	67.16	0.981	62.52	0.914	-.067
38	29.57	47.70	1.613	41.90	1.417	-.196
39	40.87	64.99	1.590	65.05	1.592	+1.002
40	52.17	24.18	0.463	36.30	0.696	+1.233
41	51.72	48.19	0.932	54.82	1.060	+1.128
42	41.77	41.18	0.986	33.96	0.813	-.173
43	56.24	44.38	0.789	45.88	0.816	+1.027
44	40.87	48.76	1.193	50.39	1.233	+1.040

	T _{ACE}	T _{GPA₁}	T _{Q₁}	T _{GPA₂}	T _{Q₂}	T _{Q₂} -T _{Q₁}
45	51.27	70.69	1.379	59.19	1.154	-.225
46	53.98	54.39	1.008	55.35	1.025	+ .017
47	58.50	70.37	1.203	72.01	1.231	+ .028
48	50.36	54.50	1.082	70.79	1.406	+ .324
49	63.92	56.41	0.883	50.09	0.784	-.099
50	46.29	55.94	0.208	51.07	1.103	-.105

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T_{ACE} T-score equivalents of individual raw scores on American Council on Education Psychological Examination.

T_{GPA₁} T-score equivalent of grade-point averages earned during two-quarter periods preceding a change of major.

T_{Q₁} T-Quotient formed by dividing T_{GPA₁} by T_{ACE}

T_{GPA₂} T-score equivalents of grade-point averages earned during two-quarter period following change of major.

T_{Q₂} T-Quotient formed by dividing T_{GPA₂} by T_{ACE}

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