FACTORS AFFECTING THE VOCATIONAL CHOICE OF SCIENCE TEACHING AS A CAREER

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Submitted to the Faculty of the Graduate School of
the Oklahoma State University
in partial fulfillment of the requirements
for the degree of
DOCTOR OF EDUCATION
July, 1958

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ACKNOWLEDGEMENTS

The writer wishes to express his sincere appreciation for the helpful guidance received from Dr. Millard Scheric Chairman of the Advisory Committee, and to Dr. Helmer E. Sorenson, Dr. Roy Jones, and Dr. J. Andrew Holley for thei assistance and encouragement.

Acknowledgement is also due Dr. Harry K. Brobst and Miss Effie Prynne for their guidance and assistance both i the administration of the standardized tests and in the statistical treatment of the test data. To Mr. Alton J. Juhlin for his help in securing material not available in the library; and to Dr. James H. Zant for his cooperation making available records of the National Science Foundatio students. To the heads of departments who gave names of potential prospects and useful suggestions; and to the man friends and colleagues whose suggestions and encouragement were freely given, the writer wishes to express his thanks

For his wife, Susan, a thesis widow in good standing, the writer reserves a special acknowledgement. Her patien endurance, assistance, and encouragement made this study possible.

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CHAPTER I

INTRODUCTION

The Problem

Modern society continues to become more dependent upon scientific developments. In days past, the household patriarch found it expedient to make most of his possessions from available materials. He gave little thought to submitting his possessions to a shop for repair. At the present time, the head of the household commonly specializes in some line of work and finds it increasingly difficult to repair such items as self-winding watches, television sets, and automobiles. Industry is making increasing use of mechanization and automation with the result that one scientist may control processes formerly performed manually by several persons untrained in science. Because of these and many other developments, science is assuming a more important role in American society.

The expansion of science in American society requires that more persons be trained in scientific concepts and techniques. In recent years, however, there actually has been a decrease in the percentage of students entering fields of science. Several agencies, such as the National

Science Foundation and the Oklahoma Frontiers of Science Foundation, actively have been seeking means of encouraging able students to enter fields of science, partly because of the common belief that the "cold war" is largely a struggle for scientific leadership in modern weapons development and other areas of science. There is general agreement that more and better science teachers are needed in order to produce more and better scientists. Much of the effort to induce young people to enter the science field has been through the expedient of attempting to increase the competency of science teachers and to increase the number of persons interested in science teaching as a career. In order to know how interest in science teaching as a career may best be encouraged, the factors which influence the choice of science teaching need to be known. The primary question posed by this study is, therefore, "what are some of the factors that affect the choice of science teaching as a vocation?"

Need for the Study

The need for more science teachers has been recognized by educators for many years. The following quotations are typical of those describing this need:

> The 1954 report from all institutions training teachers shows a drop of 56.3 per cent from the number of eligible science teaching candidates in the 1950 class. . . . Just

over one-third (38.2 per cent) of those prepared to teach science courses accept employment as high school teachers.[1]

In 1950 some 9,096 were trained to teach secondary school science, but the figure dropped to 7,507 in 1951, to 5,246 in 1952, to 4,381 in 1953, and to 3,978 in 1955--a total decrease of 56.3 per cent in this short span of years.[2]

But one conclusion is inescapable: if we need about 5,000 new secondary school science teachers per year, as apparently we do to maintain the present program alone, we must train a considerably larger number for such a career, recognizing that in a free society a large proportion of individuals will adopt careers unrelated to their training.[3]

If the need for more science teachers is to be met, means must be found to encourage more superior students to enter science teaching as a profession. An important kind of information useful in providing such means is that pertaining to the factors which influence persons to enter this field.

The Objective

The objective of the study is to determine whether differences in the psychological development and patterns of experience among the subjects affecting choice of the following vocations can be identified: (1) nonteaching

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[1]Ray C. Maul, "The Science Teacher Supply--Another Look," The Science Teacher, XXI (September, 1954), p. 172.

[2]F. L. Fitzpatrick, "Scientific Manpower: The Problem and Its Solution," Science Education, XXXIX (March, 1955), p. 99.

[3]Ibid., p. 100.

science, (2) science teaching, and (3) nonscience teaching. The definitions of these terms assumed in this study are presented in the scope, which follows.

The Scope

The study was limited to a sample of graduate students of Oklahoma State University in the fields of science and teacher education. Ten persons were included in each of the three following categories:

Nonteaching Science. The term "nonteaching scientists" is used to refer to persons engaged in, or preparing for, careers in science other than that of teaching. The term "science" is used to embrace the fields of biology, chemistry, and physics, since courses in these fields are generally taught as laboratory courses involving experimentation with the tools of scientific measurement.

Science Teaching. The term "science teachers" is used to refer to persons teaching one-half time or more in a field of science in an educational institution or undertaking education specifically for the purpose of teaching in a field of science.

Nonscience Teaching. The term "nonscience teachers" is used to refer to persons enrolled in the field of teacher education who have taught one-half time or more in a field other than science in an educational institution or who plan

to teach in a field other than science upon completing their formal education.

The Procedure

The heads of departments of the several science areas and the dean of the College of Education were consulted for recommendations of graduates to be included in the study. The distribution of the populations of "nonteaching scientists" and "science teachers" was apportioned among the various areas of science on the basis of the relative number of graduate students in each area. When more names were supplied than could be included in the apportionment, selections were made alphabetically. The nonscience teacher population was apportioned according to the relative number of graduate students in each of the major areas, excluding science.

The students selected by the procedure described were asked to participate. The objectives and design of the study were explained to each subject. If he did not agree to participate, the person whose name appeared next in alphabetical order was asked to do so.

Upon consenting to participate, each person was given a form (Appendix A) which outlined the procedure for completing a psychological autobiography. A date was set for an interview. He was asked to complete the autobiography by

interview time so that he could have it before him during the interview for reference.

The interviews were conducted as follows: At the beginning of the interview the autobiography was checked for completeness, and any item in question was discussed with the interviewee. The interviewee was assured that his contributions would be kept in strict confidence. He then was asked to develop his story of the factors which influenced him at ascending levels of his education and experience. His psychological autobiography was before him for reference, along with an interview outline of suggested factors of influence (Appendix B). The entire interview was recorded by means of a conventional office dictating machine or tape recorder.

Provision was made for administering to each participant the Kuder Preference Record, the Guilford-Zimmerman Temperament Survey, and the Minnesota Multiphasic Personality Inventory. The purpose of administering these tests was explained to the subject, and a date was set for their administration. The tests were administered either by the testing bureau of Oklahoma State University or by the researcher personally.

The data were treated as follows: First, objective items from the psychological autobiography questionnaire were tabulated to show the response of the nonteaching scientists, science teachers, and nonscience teachers.

Second, the scores on each scale of the Kuder Preference Record, Guilford-Zimmerman Temperament Survey, and the Minnesota Multiphasic Personality Inventory were computed into standard T scores. The T scores were statistically treated to determine significance of differences among the three populations. Graphic profiles were constructed using mean T scores for each group, showing the relationship among the three populations for the Guilford-Zimmerman Temperament Survey, the Minnesota Multiphasic Personality Inventory, and the Kuder Preference Record. Third, the interviews were analyzed according to a method modified from that of Ginzberg.[4] The analysis is expressed and significant patterns in the three populations indicated in a later chapter. Fourth, a composite biographical profile for each of the three populations of the study appears in the summary.

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[4]Eli Ginzberg, et al., Occupational Choice (New York, 1951).

CHAPTER II

REVIEW OF THE LITERATURE

Most of the work on problems relating to the development of science teaching as a career has been done in recent years. Relatively little interest was shown in this problem in the years preceding the "cold war" between Russia and the United States, and the interest which was shown rarely dealt with the compound problem of science teaching. Whereas recruitment of scientists now is recognized as of national concern, in the pre-World War II years teacher recruitment studies were given more emphasis than science recruitment. Since most of the literature relating to this study is concerned with vocational choice in general, or with the choice of either science or teaching, these areas are reviewed separately and in chronological order.

The Choice of Vocation

Sparling found that, "in the average the students choose their vocations at the age of sixteen . . . only one person in three retained his original choice of vocation."[1]

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[1]Edward J. Sparling, Do College Students Choose Vocations Wisely? Contributions to Education, No. 561, Teachers College, Columbia University (New York, 1937), p. 39.

Forty-four per cent of the students included in this study admitted that they were influenced by at least one member of their immediate family. Sparling also found that expected earnings and social acceptability were important factors, whereas work experiences were not closely related to the vocation chosen.

Asking students to report their choice of "most important factors influencing vocational choices," Peters found that parents, other relatives, and friends ranked first. From this he concluded that the family is the greatest single agency affecting vocational choices of youth.[2]

Ginzberg, et al., reported that occupational decision-making could be analyzed in terms of three periods--fantasy, tentative, and realistic choices.[3] Four variables were chosen for investigation. The first was designated the "reality factors," representing those social and economic forces which determine the individual's environment. The second variable was the influence of the educational process. The third factor was the emotional determinants, since vocational choices always were made by people who were under the influences of powerful emotional needs and desires. Since some persons were known to forego important

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[2]E. F. Peters, "Factors Which Contribute to Youth's Vocational Choice," Journal of Applied Psychology, XXV (August, 1941), p. 430.

[3]Eli Ginzberg, et al., Occupational Choice (New York, 1951).

opportunities to make money in favor of pursuing another preferred type of work, the fourth variable became the role of values in the decision-making process. Upon reviewing their rather extensive research, they concluded that any segmented approach in which individual factors were studied one at a time was doomed to failure.

In his study on the correlates of vocational preferences, Bradley found on the high school level a "disposition to select the occupations enjoying higher social or economic status."[4] The boys in his study were found to be influenced by love of adventure and the lure of danger and excitement, but they tended to become more realistic as they progressed to higher grade levels.

Korner stated that "it is a well established fact that vocational choice often is made in answer to a basic personal need within the individual or is imposed by others and incorporated by the individual."[5]

Super noted that interest often is claimed as the reason for vocational choice when some other motive is actually the fundamental reason. He emphasized the necessity for vocational choice to satisfy an individual's needs for achievement, prestige, and status. Super also noted that

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[4]W. A. Bradley, Jr., "Correlates of Vocational Preferences," Genetic Psychology Monographs, XXVIII (November, 1943), pp. 99-169.

[5]Anneliese F. Korner, "Origin of Impractical or Unrealistic Goals," Journal of Counseling Psychology, X (October, 1946), p. 329.

vocational development was a more accurate term than vocational choice, since an individual seldom makes a definite choice before exploring and rejecting others.[6]

The social factors which operated as an individual moved from fantasy to realism in his choices of vocation were studied by Youmans. He concluded that "social stratification is more important in the formulation of youths' occupational choices than are the type of community, the school, work experience, or certain factors in the home situation."[7] The youths in his study were found to have a tendency to assimilate the values of the adults with whom they worked.

Bordin wrote a most enlightening article on factors which influence vocational choice. This summation appears to be representative of the best recent thought in this field and justifies more extensive quotation.

> As we have been developing our understanding of individual development and personality development, we have been moving to a conviction that in looking at personality and looking at the effective life of the individual, we cannot think of it as simply a series of discrete experiences. But rather that these feelings, these experiences, are all interwoven; that they are organized around certain basic impulses--the impulses for love, for aggression, if you will. They are all a part of the need to survive and to realize one's self. Around these basic impulses comes the development of standards and prohibitions.

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[6]Donald E. Super, "Experience, Emotion, and Vocational Choice," Occupations, XXVII (October, 1948), pp. 26-27.

[7]E. Grant Youmans, "Occupational Expectations of Twelfth Grade Michigan Boys," Journal of Experimental Education, XXIV (June, 1956), pp. 259-271.

Here, we certainly have to think of the influence of others. We have to think of the influence of others at the familiar level. We have to think of the influences of others in the form of larger groups as the experiences of the individual widen and move beyond the family, beyond the community, beyond even his local civic group. All of these feelings are either indirectly or in most cases directly related to people. They get organized around relationships to people.

One of the other points here that is a critical point as far as the development of vocational choice is concerned, is the adolescent period. This is the period when the individual begins to shift from just using models taken as a whole to developing some composite which represents his unique accumulation and organization of experience.

The younger group was more likely to select either parents or teachers as ideals . . . As they move into the schools, the teachers begin to partake of these ideals. Then as you get them at the adolescent stage, these ideals now begin to represent composites--there is no one person.

This leads to the looking at two kinds of factors in this developing process of vocational choice. One of them is very clear. That is the reaction to one's models--identification to one's models--as a source of the values, as a source of choosing the place in the world that one is going to fulfill.

Now another direction to which the discussion leads is perhaps not so clear. That is that the ways the individual develops and works out the models in which he is going to express his feelings, the ways in which he is going to express his impulses, the ways in which he has to control them, the ways in which he has to curb them correspond to the kinds of activities that are demanded in various kinds of occupations. Our assumption would be that the individual seeks to find occupations whose activities would facilitate his ways of expressing and controlling his feelings.

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[8]Edward S. Bordin, "Factors Influencing Vocational Choice," The Teachers College Journal, XXVIII (December, 1956), pp. 33-37.

The Choice of Teaching

Reinhardt investigated the motivation for teaching among four hundred freshmen at Eastern Illinois State Teachers College.[9] She concluded that students decided to teach principally because of interest in the subjects they expect to teach, desire to earn money to prepare for other occupations, liking for children, and necessity of earning a living.

Seagoe made a study to discover experiences, attitudes, and personal relationships which reliably differentiate upper division college students who were interested in teaching from students of equivalent status who did not wish to teach. One hundred and twenty-two education majors and an equal number of controls constituted the subjects for the study. A questionnaire was used which contained two sections, one involving pre-teaching experience and the other personal motivation. His conclusions follow:

1. It is doubtful whether the specific pre-teaching experiences analyzed are found in the histories of potential teachers more often than in the histories of college students in general.

2. When such experiences do occur, the potential teacher tends to like them and the general college student to dislike or be indifferent to them. Particularly significant items are playing school and taking charge of a class in the absence of the teachers.

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[9] E. Reinhardt, "Probable Future Occupations of Freshmen in a Teacher's College," Elementary School Journal, XXX (November, 1929), p. 206.

3. Personal motivation on the part of a teacher, either through direct advice or through acting as the personal ideal at the elementary school level, is a significant factor differentiating potential teachers from college students in general.[10]

The views of college students on the teacher's obligations to the community differ greatly from the opinions held by many school boards, according to Harris.[11] The students in his study regarded teachers' personal behavior as private matters which should not be subject to regulations by the employer. Their views on salary schedules, sick leave, and retirement plans also ran counter to the general practice in the smaller school systems, and this disparity was partly responsible, Harris felt, for the small numbers planning to teach.

Jantzen used a check list of sixteen statements of possible factors which might have influenced choice of teaching and reported the five following factors, listed in the order of the frequency of their response, as most important:

1. Interest in children and young people.
2. Summer for study, travel, relaxation.
3. Reasonable assurance of adequate income.

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[10]M. V. Seagoe, "Some Origins of Interest in Teaching," Journal of Educational Research, XXXV (May, 1942), pp. 678-683.

[11]Raymond P. Harris, "Students' Reactions to the Educational Profession," Educational Administration and Supervision, XXXII (December, 1946), p. 519.

4. Lifelong opportunity to learn.

5. Opportunity for individual initiative.[12]

In his study of factors underlying the choice of teaching as a profession, Best found that women ranked higher than men on the Henmon-Nelson Test of Mental Ability and the American Council on Education Psychological Examination and also outranked the men in scholarship.[13] This may be partly explained by the fact that a large percentage of male college students in 1948 consisted of veterans of World War II. Industrial jobs in geology and engineering must have proved more attractive than did the teaching profession to many of the more highly ranked males. Best also found that three out of four teacher candidates had been advised at some time that they would make a good teacher. A senior high school teacher was mentioned most often as offering the advice. About one-half of these students had been advised against the choice of teaching as a career. The first three reasons which he found to be most important for the selection of teaching were: (1) interest in working with children, (2) opportunity to work in the field of major interest, and (3) opportunity to learn. The four features

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[12]J. M. Jantzen, "Why College Students Choose to Teach," Phi Delta Kappan, XXVIII (April, 1947), pp. 333-335.

[13]John W. Best, "A Study of Certain Selected Factors Underlying the Choice of Teaching as a Profession," Journal of Ex
259.

about teaching which were found to be least attractive were: (1) low salaries, (2) petty restrictions on the personal life of the teacher, (3) little opportunity for advancement, and (4) lack of prestige.

In his study to determine "Why Two Hundred Chose Teaching," Hartford reported the following reasons, given in order: "teaching is important work, interest in and liking for children, and teaching is interesting work, etc."[14]

Frances Dillon studied twenty-five undergraduate students to determine if there was a relationship between their choice of teaching and their basic motivations. Her case study consisted of a Rorschach Test, Thematic Apperception Test, a check list of "statements about teachers and teaching," a check list of "reasons for wanting to teach," and two interviews. One of her conclusions follows:

> The profession an individual selects is the one that, according to his concept of it as he sees himself in it, seems to him to satisfy most adequately the needs that he feels the strongest pressure to fulfill. There is no implication that this is a conscious process, for the pressure the individual feels to satisfy his needs may be conscious or unconscious or both, he may or may not be aware of the needs he feels pressure to satisfy. Furthermore, the individual's concept of the profession and of himself in it may or may not be realistic, and his concept of himself in the profession may be only vaguely formulated.[15]

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[14]Ellis F. Hartford, "Why Two Hundred Chose Teaching," Phi Delta Kappan, XXX (April, 1949), pp. 126-127.

[15]Frances H. Dillon, "The Relationship Between Basic Motivation and Choice of Teaching as a Profession" (Unpublished doctor's dissertation, University of Chicago, 1949), pp. 6-7.

Fulmer confirmed the results of Best by finding that among prospective teachers the females outranked the males in their high school graduating class.[16] The same study showed that two prospective teachers out of three chose the profession relatively early (before the sophomore year in college). The females in this study attended church more than males, the median of all prospective teachers being approximately four times per month.

In his study of the social and economical background of students entering seventeen teachers colleges in ten states, Scott reported the following percentage responses to the factors listed:[17]

Desire to work with children	29.8
Belief that aptitudes and abilities fit them for the work	15.6
Security for a person in teaching	11.0
Use teaching as a stepping stone to their ultimate vocation	9.5
Desire to improve the schools	8.8
Dignity and social status of the profession	6.1
Satisfactory financial compensation	5.6
Recommendation and influence of a teacher	5.5

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[16]L. L. Fulmer, "A Study of Selected Factors Concerning Prospective White Teachers in Louisiana" (Unpublished doctor's dissertation, Louisiana State University, 1950), pp. 1-36.

[17]Ralph A. Scott, "A Comparative Study of the Social and Economical Background of Students Entering Seventeen Selected State Teachers Colleges in Ten States" (Unpublished doctor's dissertation, University of Pittsburg, 1951), p. 133.

Regarding the factors which motivated students in their selection of teaching as a career, Conrad summarized:

> A large percentage had worked with children either for pay or voluntarily during the last six years--baby sitting, Sunday School teaching, scouting, playground programs, camp counseling, tutoring and substitute teaching as activities in which they dealt with children.
>
> On the basis of the data gathered it can be said that previous successful and enjoyable experiences with children, the security offered by the profession, the opportunity for a tuition-free college education, the influence of a former high school teacher and the influence of parents ranked in the order given as most important factors in motivating the students.[18]

Faulk reported on a study similar to Scott's. Whereas Scott used students from seventeen colleges in ten states, Faulk restricted his population to students actually enrolled in the teacher education curriculum in Pennsylvania colleges. The five most important reasons for choosing teaching as a career were shown by this study to be as follows:[19]

Desire to work with children	30.0%
Aptitudes and abilities	18.3
Security	11.9
Stepping stone to ultimate vocation	10.6
Desire to improve schools	10.2

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[18]Raye Conrad, "A Study of the Kind and Quality of Students Attending the State University of New York State Teachers Colleges 1950-1951" (Unpublished doctor's dissertation, Pennsylvania State College, 1952), p. 173.

[19]Harry R. Faulk, "A Comparative Study of the Social and Economic Status of Students Enrolled in the Teacher Education Curricula of Selected Colleges in Pennsylvania" (Unpublished doctor's dissertation, University of Pittsburg, 1953), p. 46.

Faulk also reported on the reasons for selection of the college attended. Of the twelve reasons he listed, the following six received the highest response:[20]

Reputation for scholarship in chosen field	32.5%
Proximity to home	21.3
Received a scholarship	13.7
Recommendation of a friend	10.1
Recommendation of a teacher	6.8
Low tuition rates	4.9

The Choice of Science and Science Teaching

The emphasis given to recruitment of scientists in the post-Sputnik era is not altogether novel. J. McKeen Cattell in 1925 stated in his address as retiring president of the American Association for the Advancement of Science:

> We need scientific knowledge concerning scientific men and the conditions favorable to scientific work and to scientific career . . . It is the business of psychology to secure such knowledge, to determine how those fit for scientific research can be selected, what training should be given to them, what positions, opportunities, and rewards are most effective.[21]

Yates reported on the call of science to youth, stating that:

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[20]Ibid., p. 25.

[21]J. McKeen Cattell, "Some Psychological Experiments" (Address of the retiring president of the American Association for the Advancement of Science, given at Kansas City on December 28, 1925), Science (January, 1926).

> There must be an element of altruism in the scientist, a peculiar yearning. Nowhere else is the tendency to translate action into terms of dollars and cents so destructive or so indicative of people who are seeking the wrong profession.[22]

Although the last part of his statement appears to be not entirely defensible, the indication that altruism and yearning (a need to satisfy a strong curiosity) relate to the call of science is confirmed by Yulish. Upon winning a national science talent search, Yulish analyzed his own motivations for science as follows: "For some reason . . . I became dissatisfied with myself. I began to look for something which would both occupy my mind and satisfy my ego."[23]

The statements of Maul and Fitzpatrick (reported in Chapter I) concerning the decrease in the supply of science teachers relate to the statement of Kelly[24] that high school science enrollment is becoming proportionately smaller.

Ann Roe is considered to be one of the leading analysts of the personality and related characteristics of scientists. She reported that scientists are generally serious individuals who read extensively (mostly "highbrow" nonfiction material), have an affinity for classical music, and

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[22]Raymond F. Yates, Science Calls to Youth (New York, 1942).

[23]Charles Yulish, "Exploring and Developing a Science Interest" (A student report), The Science Teacher, XXI (November, 1954), p. 277.

[24]W. C. Kelly, "Physics in the Public High Schools," Physics Today, III (March, 1955), p. 12.

exhibit considerable curiosity.[25] In all of her extensive work, however, she never reported on factors affecting the vocational choice of the scientists under scrutiny.

A subjective report on recruitment of science teachers in England by Best appears to be representative of the situation in this country. Best stated:

> In speaking to industrial research workers I have often sounded their feelings toward teaching as an alternative career, but without exception they show no wish to leave what they hold to be interesting jobs for the routine of science in a grammar school. Some will amplify their reasons by adding that the teacher is never fully accepted by the sort of people they meet in industry and whose company they frankly prefer. Others will modestly confess that they lack the talent to do the many odd jobs: collecting sums of money, supervising meals, organizing scouts and helping generally in the frolics of small boys which have grown unchecked round the fringe of education during the past thirty-five years.[26]

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[25]Ann Roe, "A Psychologist Examines 64 Scientists," Scientific American, CLXXXVII (November, 1952), pp. 21-25.

[26]Edward Best, "Recruiting Science Teachers," The Journal of Education (London), LXXXVII (June, 1955), p. 258.

CHAPTER III

METHOD AND PROCEDURE

The approach to the solution of the problem which was considered first was the development of questionnaires to determine the factors influencing the vocational choice of individuals at academic levels varying from junior high school to professional employment. Although this approach appeared to have certain merits, it was felt that personal interviews would yield much information not obtainable with other methods. Almost all of the studies on vocational choice reported in the literature used questionnaires as the sole or primary data-gathering device, and many conflicting results were reported. For this reason it was decided that the questionnaires used in previous studies often were not validated sufficiently and that statistical precision was not possible at the present germinal level of conceptual development in this area.

Because reliable information on the specific problem undertaken was not available and because a valid statistical study of this problem could develop only from a background of such information, it was decided that fundamental information must be obtained by a case study approach as suggested by Barr, Davis, and Johnson:

The case study is potentially the most valuable method known for obtaining a true and comprehensive picture of individuality. It makes possible a synthesis of many different types of data and may include the effects of many elusive personal factors in drawing educational inferences. It seeks to reveal processes and the interrelationships among factors that condition these processes.[1]

Since this study is concerned with the vocational choices of individuals in a society, it must of necessity deal with human relationships and adjustments. Good, Barr, and Scates considered the case study method to be appropriate for this type of research:

It is becoming generally recognized that in dealing in any practical way with human relationships and adjustments there is considerable advantage in developing a case-study technique. Desirable characteristics of a satisfactory case study are: completeness of data, validity of data, continuity, confidential recording, and scientific synthesis.

When the case-study method is to be employed to analyze the common antecedents of conditions . . . one must first make a number of individual case studies of the phenomena under investigation. Then, if the data have been collected in a manner to make them comparable, one may employ either of two methods in studying their common factors. If the principle of agreement . . . is employed, one chooses for special analysis merely those instances of the phenomenon in which the effect under investigation is observed to be present, either not at all or in some marked degree. The analysis of the data, as has been pointed out, consists of comparing the instances in which the observed effect does and does not appear, for common likenesses and differences in their antecedents.[2]

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[1]Arvil S. Barr, Robert A. Davis, and Palmer O. Johnson, Educational Research and Appraisal (New York, 1953), pp. 188-189.

[2]Carter V. Good, A. S. Barr, and Douglas E. Scates, The Methodology of Educational Research (New York, 1941), pp. 566-568.

A pilot study was undertaken during February and March, 1957, comprising students of Central State College, Edmond, Oklahoma, who had been accepted as candidates for science teaching. This study consisted of personal interviews with fourteen students. Each interview required from forty-five minutes to an hour for completion. The interview was structured by means of specific questions which the interviewer asked the interviewee orally. The questions were formulated from information obtained from a comprehensive search of pertinent literature. Information and insights obtained from this preliminary study were utilized in the formulation of the psychological autobiography questionnaire and the interview method reported in Chapter I.

In addition to the persons interviewed in the pilot study reported above, five college teachers of science and a nurse who was accepted for study in medical school were interviewed by a method modified from that of Eli Ginzberg.[3] These interviews were conducted in the offices of the interviewees, or other suitable places, and each lasted about one hour. The interviews were not structured, thus giving the interviewee full opportunity to relate the development of his/her vocational interest. Information concerning the religious orientation of the interviewees was included in this series. The information gained from these

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[3]Eli Ginzberg, et al., Occupational Choice (New York, 1951), pp. 15-86.

interviews was dictated by the interviewer into a dictating machine immediately following the interview. The interviews were transcribed later and analyzed. The analyses indicated that, although very valuable information was obtained, the various patterns of vocational choice lacked sufficient common antecedents for the development of valid generalizations.

It became increasingly evident that additional information was needed, and the following standardized tests were selected for inclusion in the study: Kuder Preference Record, Guilford-Zimmerman Temperament Survey, and Minnesota Multiphasic Personality Inventory. It was also apparent that neither the questionnaire alone nor the interview alone would furnish data on unique vocational patterns while still allowing for comparison of common antecedents. The final plan of study then came to involve three basic devices: (1) psychological autobiography questionnaire, (2) a recorded interview, and (3) a series of three standardized psychological tests, selected to determine personality patterns, temperament, and interests. The development of these three devices is reported on the following pages.

The Interview

The interview technique used in this study was patterned after a method which was developed by Eli

Ginzberg.[4] Ginzberg believed that interviews for determining vocational interest must be relatively unstructured, with the interviewer participating only insofar as necessary to keep the discussion along pertinent lines. He often opened his interviews by asking the subject, "How did you happen to choose the college you attended?" Most of his interviews were recorded mechanically. Tabulation of the interviews was performed by recording in abbreviated form the essential statements from the interview around the following categories: (1) choice of an occupation, (2) values, (3) the work area, (4) key persons, and (5) time perspective.

The essential categories in the analysis of the tabulation were similar to those listed in Appendix B. He organized these categories into three broad categories: (1) the aspects of self, (2) the aspects of reality, and (3) the role of key persons.

In his book on interviewing techniques, Hyman has made some useful suggestions concerning methods of conducting an interview.[5] He proposed that the purpose of the interview should first be explained, after which the discussion might open with some item relating to the interviewee's interest. He explained that the interviewer should agree with the

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[4]Ibid., pp. 1-205.

[5]Herbert H. Hyman, Interviewing in Social Research (Chicago, 1954), pp. 27-28.

interviewee whenever possible and should assure the subject that his contributions will be held in confidence. Hyman indicated that leading questions should be avoided and that flattery should be used whenever possible.

The series of six preliminary interviews in this study were recorded, after the interview, by a dictating machine, while the interviews of the first ten participants in the final study were recorded directly, using a dictating machine with a pre-amplifier and a conference microphone. The additional sensitivity conferred by these accessories made possible a more informal interview procedure without risking a loss of any part of the interview. The last twenty interviews were recorded with a tape recorder and conventional microphone. The tape recorder proved to be most satisfactory for this task, but transcribing was laborious and time-consuming. To keep the transcribing time down to tolerance limits, remarks that were obviously irrelevant or repetitious were eliminated.

The Questionnaire

The structured interview used in the first pilot study involving fourteen candidates for science teaching consisted largely of a subjective questionnaire presented orally. The items included in this questionnaire were derived from literature or from suggestions of interested colleagues. The items which showed the most merit were changed, where

possible, into objective items and were included in the final questionnaire. Additional suggestions were obtained from a further search of the literature and a review of a number of theses. The doctoral theses were made available by inter-library loan at Oklahoma State University and Central State College. The questionnaire was revised on the basis of ideas acquired from this further study.

The questionnaire then was submitted to interested colleagues for criticism. Additional changes were made, and the items were arranged into four sections. The first group of items were general background items, which were not adapted to objective treatment (comparison). The second section consisted of items which applied to all three of the populations used in the study. The third section consisted of items to be answered by prospective teachers only, while the fourth consisted of items to be answered by prospective scientists only. In addition to the objective items of the questionnaire, a chronological autobiography of vocational interests was requested. The autobiography made possible a comparison with the interview transcription as a check for corresponsence of responses.

The Standardized Tests

The standardized tests were included as a part of the study as a means of obtaining psychological information

about the participants and to determine if any of the scales had discriminatory value for the three populations used. The three tests were selected to provide information regarding traits of personality adjustment, personal temperament, and vocational interests.

The Minnesota Multiphasic Personality Inventory consists of four hundred ninety-five questions to be judged "true," "false," or "cannot say." The items used in this test were administered to diagnosed psychiatric patients and to normal adults. Responses were compared, and answers given more often by one of the psychiatric groups than by normals were placed in the appropriate scoring key. "The higher a subject's score in a classification, the more his answers resemble those given by that type of patient. Any standard score greater than seventy is taken as an indicator of significant abnormality."[6]

The Kuder Preference Record consists of ten interest scales. The profiles of the responses are interpreted on their face value. A person showing a high interest in the clerical and computational scales would be expected to enjoy positions demanding such activities. "The Guilford-Zimmerman Temperament Survey includes the ten personality traits identified through factor analysis by Guilford and

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[6]Lee J. Cronback, Essentials of Psychological Testing (New York, 1949), p. 319.

his co-workers."[7] The items are expressed in the form of affirmative statements rather than questions. The scales should be considered in combinations as well as singly. For example, a person scoring high on both the general activity and emotional stability scales may be regarded as a productive individual. The same high score on the emotional stability combined with a low score on the general activity might mean that the individual is lethargic or lazy.

Only T scores were used in the analysis of the scores. The T scores were used because they have general applicability and because they are comparable from one test to another. The T scores used in this study are standard scores with a mean of fifty and a standard deviation of ten. Computation of T scores was by means of the following formula:

$$\frac{10\ (X-M)}{SD} \pm 50$$

with X representing the individual score made by a person on one scale of a test, M representing the mean of the score, and SD representing the standard deviation. The standard deviations were computed by squaring the difference between each score and the mean, summing the squares, dividing by the number of scores, and determining the square root of the resulting figure.

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[7]Anne Anastasi, Psychological Testing (New York, 1954), p. 535.

For comparisons among the three groups used in this study, each scale of the test was analyzed by an analysis of variance technique. Because of the difficulty and the space required to explain this technique in detail, the reader is referred to a standard statistics textbook.

Selection of the Population

In the early stages of the designing of this study, it was planned to include approximately one hundred each of five populations. The five populations and the reasons for their inclusion follow:

1. Junior high school students (first contact with a science course)
2. High school seniors (necessity for planning the next year's work)
3. College freshmen (response to first college science course)
4. College seniors (plans for future work and reasons for vocational choice)
5. Professional persons (recollections of vocational decisions)

Each group would have been subdivided into prospective scientists and prospective teachers. The professional group would have been analyzed for differences in the professionally employed nonteaching scientist population and the college teacher population. Questionnaires were planned for

this study. For reasons given in the first part of this chapter, it was decided that the questionnaire approach was inadequate for a study dealing, not with independent factors, but with a group of continuously changing and complexly interrelated factors.

It finally was decided to restrict the population to male graduate students enrolled at Oklahoma State University. This allowed for a more homogenous group and may have eliminated some bias. To ascertain why scientists choose to teach, it was decided to compare populations of "science teachers" and "nonteaching scientists." To ascertain the factors influencing the choice of science as a career (teaching and nonteaching), the populations selected for comparison were "science teachers" and "nonscience teachers."

The "science teacher" population was selected from the National Science Foundation students (all high school science teachers) attending Oklahoma State University during the summer of 1957. One student scheduled for an interview cancelled his interview because he lacked time. In order to keep the population as homogenous as possible, a National Science Foundation student attending Oklahoma State University during the academic year 1957-1958 was selected to complete the population. The students were selected on the basis of their subject-matter concentration and teaching interest from information supplied by the National Science

Foundation office at Oklahoma State University. An effort was made to apportion the population in a ratio corresponding to the major fields of candidates for the Bachelor of Science degree in the College of Arts and Sciences in May, 1957. An analysis of records in the registrar's office showed the following percentage of candidates in the fields listed.

Chemistry	35%
Zoology	35%
Physics	13%
Natural Science	7%
Bacteriology	4%
Pre-Medical Science	4%
Medical Technology	2%

The combined chemistry and physics condidates totaled 48 per cent or approximately one-half of the entire group; so for sub-dividing this population of ten, it was decided to seek five physical science teachers and five biological science teachers. Because the National Science Foundation program stressed preparation in areas of weakness and because many of these high school science teachers taught equally in the biological and physical science areas, absolute adherence to the proposed ratio was impossible.

The "nonteaching scientist" population was selected from graduate students in the following departments:

Bacteriology	1
Botany	2
Chemistry	3
Entomology	1
Physics	1
Zoology	2

The apportionment was made to correspond as nearly as practicable to the "science teacher" population. Only the graduate students who had no teaching experience, no teacher education courses, and no particular desire to teach were included in this group. This selection was made difficult by the fact that an apparent majority of science graduate students do not plan to teach at the beginning of their graduate work but eventually find themselves in teaching positions after earning their degrees. This tendency was pointed out by several of the department chairmen who were consulted for names of nonteaching scientists.

The "nonscience teacher" population proved to be the most difficult to obtain. Only graduate students in the College of Education who were majoring in fields other than science were eligible for inclusion in this group. Using the same type of analysis on this group as used in the "science teacher" group, the following fields were found to be represented in the frequency listed:

Social Studies	30%
Natural Science	12%
Health, Physical Education and Recreation	12%
Mathematics	12%
Music	9%
Language Arts	9%
Science	5%
Speech	3%
Industrial Arts	2%
Business Education	2%
Art	2%
Agriculture	2%

Approximately sixty per cent of the graduate students in the College of Education were found to commute. After deleting commuters, females, and students in science or border areas of science (such as agriculture), the remaining students were listed with their addresses and phone numbers. For each student who qualified and expressed willingness to participate in the study, at least five were excluded. Because of the small number of participants, a true representation of the major fields as listed above was unobtainable. Seven had taught or planned to teach in some area of the social studies, with history specified in three cases. Philosophy, administration, and business completed the areas represented. Four of this group planned to teach in college.

Most of the persons selected for this study were cooperative and enthusiastic, despite the fact that participation in the study involved sacrificing more than six hours from their schedules. The science teachers were particularly enthusiastic, perhaps because of their experiences with young aspiring scientists in high school.

CHAPTER IV

RESULTS

The results obtained from the psychological autobiography questionnaires and standardized tests will be treated separately, since these are different instruments for gathering different kinds of information. After the results of the use of these instruments are presented, a case study synthesis involving the interview and the distinctive or otherwise pertinent information from the questionnaires and interviews will be presented for each person. In order to facilitate the presentation, the term "teachers" will be used to indicate both science teachers and nonscience teachers. The term "scientists" will be used to designate both science teachers and nonteaching scientists.

The Questionnaires

The following discussion will involve the responses to questionnaire items of the three populations. It will be assumed that the responses to questionnaire items were accurate and representative of the group of individuals from which the population for this study was selected. The

abbreviations used in Table I will be used for Tables I through XXII. The abbreviation "NTS" refers to nonteaching scientists; the abbreviation "ST" refers to science teachers; and the abbreviation "NST" refers to nonscience teachers.

There was an appreciable difference in the average age of the science teachers and the other two groups. The science teachers averaged thirty-six years of age, the non-science teachers twenty-nine, and the nonteaching scientists twenty-six years of age. It should be noted that the science teacher population was selected from National Science Foundation students, many of whom had considerable teaching experience. Although none of this group expressed an intention of leaving the teaching profession, it was evident that some of them entered teaching at a time when industrial positions were less available and less appealing than in more recent years.

The average number of students in the senior classes of the three groups showed little correspondence. In Table I it may be seen that this number was almost three times larger for the nonteaching scientists than for the science teachers and almost twice as large as for the nonscience teachers. There appears to be a correspondence between the average age of the population and the average number of science courses offered in the high schools of the group. Since most of the science teachers were graduated before

World War II, this may reflect an increasing realization of the importance of science during and after World War II.

TABLE I

THE SIZE OF SENIOR CLASSES AND NUMBER OF SCIENCE COURSES IN HIGH SCHOOL

	NTS*	ST*	NST*
Average number of students in high school senior class	123	45	80
Average number of science courses offered each year in high school from which subject graduated	4	2	3.5

*NTS = nonteaching scientists
ST = science teachers
NST = nonscience teachers

In Table II it may be seen that more science teachers attended small elementary schools than did persons in either of the other groups. From the age of the science teachers it may be inferred that they attended elementary school mostly during the beginnings of the post-World War I depression when many school children were expected to attend small schools near their farms. Consolidation later eliminated many of the small schools.

More of the teachers indicated that they participated in varsity sports than did the nonteaching scientists. More teachers were also officers in organizations, as may be seen in Table III.

TABLE II

THE TYPE OF SCHOOL ATTENDED FOR MOST OF ELEMENTARY SCHOOLING

	NTS*	ST*	NST*
What type of school did you attend for most of your elementary school?			
a. one room		2	1
b. two or three room	1	3	
c. more than three room	9	5	9

TABLE III

EXTRACURRICULAR ACTIVITIES IN HIGH SCHOOL

	NTS*	ST*	NST*
Did you letter in sports in high school?			
a. yes	3	7	6
b. no	7	3	4
Were you an officer of any high school organizations?			
a. yes	4	5	7
b. no	6	5	3

The nonscience teachers indicated that a majority of them were in the upper one-fourth of their high school graduating class, whereas only one-half of the scientists so indicated. The responses are shown in Table IV.

TABLE IV

ACADEMIC RANK IN HIGH SCHOOL GRADUATING CLASS

	NTS*	ST*	NST*
How did you rank academically in your high school graduating class?			
a. in the upper one-fourth	5	5	7
b. in the second one-fourth	4	4	2
c. in the third one-fourth		1	1
d. in the lower one-fourth			

The three groups indicated that their choices of vocation were influenced very little by vocational guidance received in either high school or college, with the exception that the nonteaching scientists indicated some influence in college. The responses are recorded in Table V.

TABLE V

INFLUENCE OF VOCATIONAL GUIDANCE IN HIGH SCHOOL AND COLLEGE

	NTS*	ST*	NST*
Were you influenced in choosing a career by vocational guidance received in high school?			
a. yes	1		1
b. no	9	10	9
Were you influenced in choosing a career by vocational guidance received in college?			
a. yes	4	1	
b. no	6	9	10

A majority of the three populations indicated that they entered college to prepare for a vocation. There was little difference in the responses of the separate groups to this item, as shown in Table VI. In this table it also may be noted that most of the nonscience teachers chose Oklahoma State University for study because of the proximity of this school to their homes. More of the nonteaching scientists chose Oklahoma State University for study because of a recommendation of a friend or teacher.

TABLE VI

OBJECTIVES FOR ATTENDING COLLEGE

	NTS*	ST*	NST*
What was your primary objective for entering college?			
a. to prepare for a vocation	5	6	7
b. to increase social and economic standing	2		
c. to help decide on a career	1	3	2
d. it was taken for granted by parents			1
e. other	3		
Why did you decide to enter Oklahoma State University?			
a. reputation for scholarship in chosen field	1	3	
b. proximity to home		1	6
c. recommendation of a friend or teacher	6	1	1
d. low tuition rates	2		1
e. other	4	5	3

The first academic exposure to science in college of most of the nonscience teachers was in a required science course. Most of the scientists, however, reacted to this first required science course quite differently than did most of the nonscience teachers. A majority of the scientists taking this course experienced an increased interest in science, whereas most of the nonscience teachers did not react in this way. These data are presented in Table VII.

TABLE VII

REASONS FOR TAKING AND REACTIONS TO THE FIRST SCIENCE COURSE

	NTS*	ST*	NST*
Why did you take your first college science course?			
a. required	4	3	10
b. curiosity		1	
c. it was a challenge			
d. to begin a major in science	6	5	1
e. other		1	
Did this first science course increase your interest in science?			
a. yes	7	8	4
b. no	2	2	6

To the question on the college courses liked best in college, all but one of both groups of scientists indicated

science, whereas all but one of the nonscience teachers indicated social science. Three science teachers and three nonscience teachers indicated that they liked education courses least in college, but the responses to this item were rather evenly distributed among the five possible choices. The indications of the best and least liked courses are shown in Table VIII.

TABLE VIII

COURSES LIKED BEST AND LEAST IN COLLEGE

	NTS*	ST*	NST*
Which college courses did you like <u>best</u> in college?			
a. education			1
b. humanities			
c. science	9	9	1
d. social science		1	9
e. other	1		
Which college courses did you like <u>least</u> in college?			
a. education		3	3
b. humanities	3	3	2
c. science			2
d. social science	2	2	
e. other	5	2	3

In Table IX the responses indicate that a majority of the nonteaching scientists earned most of their college expenses. Only one of this group earned less than one-fourth of his expenses. The nonteaching scientists earned most of their money while attending college or during the summer months. The "G. I. Bill" was the chief source of funds for the teachers.

It may be seen in Table X that all of the science teachers and seven of the nonscience teachers planned to begin teaching at the first opportunity after completing their college program. The science teachers were obligated to return to their teaching positions.

A majority of the nonteaching scientists indicated that they were better satisfied when they were completely occupied, while most of the nonscience teachers indicated a preference for free time for social activities. The non-science teachers also rated high on the social interest scales of the standardized tests, as may be seen later in this chapter. The teachers differed as to the quality of their work when performed under pressure. A majority of the science teachers did better work leisurely, but most of the nonscience teachers worked better when under pressure. These responses are presented in Table XI.

TABLE IX

METHOD OF FINANCING COLLEGE EDUCATION

	NTS*	ST*	NST*
What percentage of your college expenses did you earn?			
a. most	7	4	3
b. about one-half	2	1	4
c. about one-fourth	1	4	
d. little or none		1	
What was the chief source of funds used to meet your college expenses?			
a. personal savings	1		
b. parents or guardian			3
c. earnings while attending college	6	4	3
d. earnings during summer	4	2	1
e. G. I. Bill	3	5	6
f. other	2		1

TABLE X

VOCATIONAL PLANS AFTER COMPLETION OF THE COLLEGE PROGRAM

	NTS*	ST*	NST*
What do you plan to do after completing your college program?			
a. begin teaching at first opportunity		10	7
b. enter other civilian employment	3		
c. continue study toward an advanced degree or other occupation	4		1
d. enter military service	1		
e. other	3		3

TABLE XI

EFFECT OF LEISURE TIME ON ATTITUDES AND QUALITY OF WORK

	NTS*	ST*	NST*
Are you better satisfied when you are completely occupied with a project or when you have free time for social activities?			
a. completely occupied	6	4	3
b. free time	4	5	7
Do you do better work when you are under pressure or when you have time to pursue your work leisurely?			
a. when under pressure	4	4	6
b. when done leisurely	4	6	4

Table XII presents data on the preference for social function, the importance of academic achievement, and religious orientation. A majority of all three groups preferred small group activities as opposed to large soci functions. More of the teachers than the nonteaching scientists believed that academic achievement is not a better index to a person's worth to society than group leadership ability. Three of the nonteaching scientists left this item blank. The science teachers indicated the were more active in church activities, although a majorit of all three groups indicated a positive religious orient tion.

Table XIII presents data which suggested that the majority of the nonteaching scientists believed scientist acquired high prestige, while only one-half of the other groups indicated that average prestige was accorded scien tists; however, the same number of nonteaching scientists also indicated that teachers received high prestige. A majority of the teachers indicated that teachers were accorded only average prestige. It would appear that the teachers expect less reward for their ego than do the non teaching scientists in the pursuit of their respective professions.

TABLE XII

SOCIAL AND RELIGIOUS ORIENTATION

	NTS*	ST*	NST*
Do you prefer large social functions (such as dances) or small group activities (such as cards)?			
a. large social functions	1	1	1
b. small group activities	9	9	8
Do you believe academic achievement is a better index to a person's worth to society than group leadership ability?			
a. yes	3	3	1
b. no	4	7	9
What is the extent of your interests or affiliation in religious work?			
a. actively participate in many church activities	2	6	4
b. financial support and attendance	5	1	3
c. financial support only			
d. inactive, but interested	1	2	
e. inactive, no affiliation	1	1	2

TABLE XIII

IMPRESSIONS OF THE PRESTIGE OF SCIENTISTS AND TEACHERS

	NTS*	ST*	NST*
What is your impression of scientists as a group of people?			
a. high prestige	7	4	5
b. average prestige	2	5	5
c. low prestige		1	
What is your impression of teachers as a group of people?			
a. high prestige	7	1	3
b. average prestige	2	8	7
c. low prestige		1	

Business was the occupation of the fathers of four nonteaching scientists, while the only professional representation was the father of one nonscience teacher. One each of the two groups of teachers had fathers who were also teachers. These responses are shown in Table XIV.

Opinions concerning the social status and earning capacity of scientists and teachers are tabulated in Table XV. A certain degree of altruism is indicated by the majority responses of the nonteaching scientists to the question, "Do you think you would earn more or less as a scientist than you would earn in another position?" On the contrary, most of the nonscience teachers thought they would

earn more money had they entered science. There was general agreement among the three populations that they would earn less as a teacher than in another position.

The responses in Table XVI reveal that more of the scientists indicated a strong feeling of curiosity than did the nonscience teachers.

TABLE XIV

FATHER'S OCCUPATION

	NTS*	ST*	NST*
What was your father's occupation when you left home?			
a. profession, other than teaching			1
b. teacher		1	1
c. business	4	2	3
d. skilled labor, supervisor	2		2
e. farmer	1	2	2
f. other	3	5	1

TABLE XV

OPINIONS OF SOCIAL STATUS AND EARNING CAPACITY OF SCIENTISTS AND TEACHERS

	NTS*	ST*	NST*
Do you think your social status would be lower or higher as a scientist?			
a. lower		1	
b. higher	7	6	4
Do you think your social status would be lower or higher as a teacher?			
a. lower		1	
b. higher	7	4	5
Do you think you would earn more or less as a scientist than you would earn in another position?			
a. more	2	5	8
b. less	5	4	2
Do you think you would earn more or less as a teacher than you would earn in another position?			
a. more			
b. less	7	8	10

TABLE XVI

CURIOSITY

	NTS*	ST*	NST*
Do you feel a strong need to find answers to unsolved problems?			
a. very strong	2	3	4
b. strong	5	5	3
c. moderate	1	2	2
d. not applicable			1
Do you believe you are more curious than most people?			
a. yes	5	9	4
b. no	5	1	6

Table XVII presents the responses to items dealing with certain factors which were related to vocational choice of teaching. Association with youth groups influenced only two of each teacher population to become interested in teaching. One-half of the nonscience teachers indicated that their teachers influenced them more than other persons to enter the profession of teaching. Only one nonscience teacher indicated major influence by parents. Of the various factors influencing the choice of teaching, aptitude and interest appeared to be most important for the two teacher groups. The responses of the two populations were largely consistent for these factors.

TABLE XVII

FACTORS INFLUENCING THE CHOICE OF TEACHING

	ST*	NST*
What experiences or activities first influenced you to become interested in teaching?		
a. association with youth groups	2	2
b. helped teacher in teaching or grading papers	3	1
c. part-time employment		2
d. other	5	5
Which persons influenced you the most to teach?		
a. parents		1
b. other relatives	1	1
c. friends	3	3
d. teacher	3	5
e. other	2	1
Which of the following factors influenced your choice of teaching the most?		
a. aptitude, interest	5	7
b. research and study opportunity	1	2
c. preference for the "way of life" of academic community		1
d. financial and economic opportunities	2	
e. influence of family, friends	1	1

A majority of the teachers made definite vocational decisions while in college and before marriage. The responses of the two groups were similar, as may be seen Table XVIII.

TABLE XVIII

EDUCATIONAL LEVEL AND MARITAL STATUS WHEN DECIDING TO TEACH

	ST*
When did you first decide definitely to prepare for a teaching career?	
a. in junior high school or before	
b. in high school	
c. in college	8
d. other	1
What was your marital status when you first decided definitely to prepare for a teaching career?	
a. single	7
b. married, no children	1
c. married, one or more children	1

Most of the nonscience teachers began their college study for an occupation other than teaching and experien a change in attitude toward the teaching profession, whe a majority of the science teachers entered college for t purpose of preparing for a teaching career and experienc

little change in attitude toward the teaching profession. Data supporting these statements are found in Table XIX.

TABLE XIX

CHANGES IN VOCATIONAL CHOICE OF TEACHING

	ST*	NST*
Did you begin college study for another occupation before changing to teacher education?		
a. yes	3	7
b. no	6	2
Which of the following factors influenced your choice of teaching the most?		
a. aptitude, interest	5	7
b. research and study opportunity	1	2
c. preference for the "way of life" of academic community		1
d. financial and economic opportunities	2	
e. influence of family, friends	1	1

Table XX shows little difference in the types of experiences or activities which first stimulated interest in science. Only one of the nonteaching scientists indicated that a teacher influenced him to enter science. One indicated that a book about Einstein which he read influenced him to want to become a scientist.

TABLE XX

FACTORS INFLUENCING THE CHOICE OF SCIENCE

	NTS*	ST*
What experiences or activities first influenced you to become interested in science?		
a. part-time employment	1	1
b. leisure-time activity	2	3
c. school activity	2	3
d. other	3	1
Which persons influenced you the most to enter science?		
a. parents		1
b. other relatives		
c. friends		1
d. teacher	5	1
e. other	1	5

Table XXI reveals that most of the nonteaching scientists decided on science as a career while in college. One-half of the science teachers chose science while in high school. A majority of both groups of scientists were single when they made their vocational decisions.

Neither of the two populations of scientists entered college with the goal of pursuing a career other than that of science. The nonteaching scientists and science teachers indicated little change in attitude toward the scientific

profession after entering college. Table XXII shows that three of each group did, however, change their attitudes toward science.

TABLE XXI

EDUCATIONAL LEVEL AND MARITAL STATUS WHEN CHOOSING SCIENCE

	NTS*	ST*
When did you first decide definitely to major in science or to pursue science as a career?		
a. in junior high school or before		1
b. in high school		5
c. in college	7	2
d. other		
What was your marital status when you first decided definitely to major in science or pursue science as a career?		
a. single	6	7
b. married, no children	1	
c. married, one or more children		1

TABLE XXII

CHANGES IN VOCATIONAL CHOICE OF SCIENCE

	NTS*	ST*
Did you begin college study for another occupation before changing to science?		
a. yes	1	1
b. no	6	7
Has your attitude toward the scientific profession changed since you entered college?		
a. yes	3	3
b. no	4	5

The Standardized Tests

The Minnesota Multiphasic Personality Inventory

The Minnesota Multiphasic Personality Inventory was taken by eight of the nonteaching scientists, nine of the science teachers, and seven of the nonscience teachers. The scores made on each scale were used to construct individual profiles for each person. The profile sheets used contained a standard score (T score) scale. For each scale the mean standard scores of the three groups were compared to determine whether significant differences were present. An analysis of variance technique was used for this purpose. The data for this computation were tabulated only for the scales in which the among sums of squares exceeded the

computed error, since a positive F score was thus obtained. If the F score reached the level of significance of .05 or .01, this also was indicated in the table.

The hypochondriasis and depression scales showed no significant differences among the three groups of persons tested. Significant differences were also lacking for the hysteria and psychopathic deviate scales. These four scales are tabulated in Tables XXIII and XXIV.

TABLE XXIII

THE T SCORES OF THREE POPULATIONS ON THE HYPOCHONDRIASIS SCALE OF THE MINNESOTA MULTIPHASIC PERSONALITY INVENTORY

Population											Mean T Score
Nonteaching Scientists	Case No.	14	15	17	18	19	20	21	22		
	T Score	52	53	49	54	52	55	56	53		53
Science Teachers	Case No.	4	5	6	7	9	11	12	13	31	
	T Score	52	59	52	57	45	58	67	49	70	57
Nonscience Teachers	Case No.	8	23	25	27	29	32	33			
	T Score	57	49	49	65	44	59	65			55

TABLE XXIV

THE T SCORES OF THREE POPULATIONS ON THE DEPRESSION SCALE OF THE MINNESOTA MULTIPHASIC PERSONALITY INVENTORY

Population											Mean T Score
Nonteaching Scientists	Case No.	14	15	17	18	19	20	21	22		
	T Score	60	60	56	60	62	58	60	65		60
Science Teachers	Case No.	4	5	6	7	9	11	12	13	31	
	T Score	48	56	41	45	72	45	58	48	63	53
Nonscience Teachers	Case No.	8	23	25	27	29	32	33			
	T Score	48	53	41	56	53	51	65			52

When the F test was applied to the femininity scale data for the three groups, the difference was no more than would be expected to arise by chance. A positive F value was obtained, however; so the F data are tabulated.

The standard scores made by the three groups on the femininity scale are not significantly different. Because the among sums of squares exceeds the computed error, yielding a positive F value, the data are tabulated following Table XXVII, which presents the individual scores and the group means.

TABLE XXV

THE T SCORES OF THREE POPULATIONS ON THE HYSTERIA SCALE OF THE MINNESOTA MULTIPHASIC PERSONALITY INVENTORY

Population										Mean T Score
Nonteaching Scientists	Case No.	14	15	17	18	19	20	21	22	
	T Score	60	60	56	60	62	58	60	65	60
Science Teachers	Case No.	4	5	6	7	9	11	12	13	31
	T Score	55	57	56	65	45	65	73	58	60	59
Nonscience Teachers	Case No.	8	23	25	27	29	32	33		
	T Score	63	53	53	65	49	63	58			58

TABLE XXVI

THE T SCORES OF THREE POPULATIONS ON THE PSYCHOPATHIC DEVIATE SCALE OF THE MINNESOTA MULTIPHASIC PERSONALITY INVENTORY

Population										Mean T Score
Nonteaching Scientists	Case No.	14	15	17	18	19	20	21	22	
	T Score	42	41	36	64	55	45	68	66	53
Science Teachers	Case No.	4	5	6	7	9	11	12	13	31
	T Score	45	60	46	62	41	56	71	47	57	54
Nonscience Teachers	Case No.	8	23	25	27	29	32	33		
	T Score	67	57	57	60	48	62	53			58

TABLE XXVII

THE T SCORES OF THREE POPULATIONS ON THE FEMININITY SCALE OF THE MINNESOTA MULTIPHASIC PERSONALITY INVENTORY

Population										Mean T Score
Nonteaching Scientists	Case No.	14	15	17	18	19	20	21	22	
	T Score	65	56	63	47	55	55	52	52	55
Science Teachers	Case No.	4	5	6	7	9	11	12	13	31
	T Score	57	51	55	51	58	56	65	76	48	57
Nonscience Teachers	Case No.	8	23	25	27	29	32	33		
	T Score	58	45	58	88	55	63	71		63

TABLE XXVIII

THE SIGNIFICANCE OF DIFFERENCE OF THE SCORES ON THE FEMININITY SCALE OF THE MINNESOTA MULTIPHASIC PERSONALITY INVENTORY

Source	df	SS	MS	F	P
Total (SS)	23	2143.			
Among (SS)	2	191.	95.50		
Error	21	1952.	92.95	1.03	not sig.

Tables XXIX through XXXI contain the scores and group means of the three groups on the scales measuring paranoia, psychasthenia, and schizophrenia. Analysis of variance failed to reveal significant differences among the three groups on these scales.

TABLE XXIX

THE T SCORES OF THREE POPULATIONS ON THE PARANOIA SCALE OF THE MINNESOTA MULTIPHASIC PERSONALITY INVENTORY

Population										Mean T Score
Nonteaching Scientists	Case No.	14	15	17	18	19	20	21	22	
	T Score	50	53	47	50	50	53	56	70	53
Science Teachers	Case No.	4	5	6	7	9	11	12	13	31
	T Score	53	55	41	62	59	55	62	56	56	55
Nonscience Teachers	Case No.	8	23	25	27	29	32	33		
	T Score	50	58	62	50	45	56	60		53

TABLE XXX

THE T SCORES OF THREE POPULATIONS ON THE PSYCHASTHENIA SCALE OF THE MINNESOTA MULTIPHASIC PERSONALITY INVENTORY

Population										Mean T Score
Nonteaching Scientists	Case No.	14	15	17	18	19	20	21	22	
	T Score	55	54	50	58	48	48	54	62	54
Science Teachers	Case No.	4	5	6	7	9	11	12	13	31
	T Score	48	45	45	58	73	60	58	50	64	56
Nonscience Teachers	Case No.	8	23	25	27	29	32	33		
	T Score	55	50	42	58	40	58	71		53

TABLE XXXI

THE T SCORES OF THREE POPULATIONS ON THE SCHIZOPHRENIA SCALE OF THE MINNESOTA MULTIPHASIC PERSONALITY INVENTORY

Population										Mean T Score
Nonteaching Scientists	Case No.	14	15	17	18	19	20	21	22	
	T Score	54	55	47	55	50	59	43	63	53
Science Teachers	Case No.	4	5	6	7	9	11	12	13	31
	T Score	50	50	46	59	62	58	59	50	57	55
Nonscience Teachers	Case No.	8	23	25	27	29	32	33		
	T Score	55	53	44	55	38	61	67		53

The individual and mean scores on the hypomania scale are represented by Table XXXII. The F score, as shown in Table XXXIII, indicates that the differences among the three groups were no more than that expected to arise by chance.

TABLE XXXII

THE T SCORES OF THREE POPULATIONS ON THE HYPOMANIA SCALE OF THE MINNESOTA MULTIPHASIC PERSONALITY INVENTORY

Population										Mean T Score
Nonteaching Scientists	Case No.	14	15	17	18	19	20	21	22	
	T Score	63	57	73	58	45	45	75	60	60
Science Teachers	Case No.	4	5	6	7	9	11	12	13	31
	T Score	53	48	55	68	40	58	63	44	58	54
Nonscience Teachers	Case No.	8	23	25	27	29	32	33		
	T Score	55	53	65	58	43	45	48		52

TABLE XXXIII

THE SIGNIFICANCE OF DIFFERENCE OF THE SCORES ON THE HYPOMANIA SCALE OF THE MINNESOTA MULTIPHASIC PERSONALITY INVENTORY

Source	df	SS	MS	F	P
Total (SS)	23	2077.84			
Among (SS)	2	211.23	105.61		
Error	21	1866.61	88.89	1.18	not sig.

The nonteaching scientists, science teachers, and nonscience teachers did not differ significantly in their scores on the social introversion scale. The scores are presented in Table XXXIV.

TABLE XXXIV

THE T SCORES OF THREE POPULATIONS ON THE SOCIAL SCALE OF THE MINNESOTA MULTIPHASIC PERSONALITY INVENTORY

Population											Mean T Score
Nonteaching Scientists	Case No.	14	15	17	18	19	20	21	22		
	T Score	53	43	40	42	38	48	49	35		44
Science Teachers	Case No.	4	5	6	7	9	11	12	13	31	
	T Score	48	46	45	33	76	41	44	48	53	48
Nonscience Teachers	Case No.	8	23	25	27	29	32	33			
	T Score	--	--	--	45	52	--	64			54

The Guilford-Zimmerman Temperament Survey

This instrument proved to be somewhat more effective in discriminating the three populations, especially the two groups of scientists and the nonscience teachers, as may be seen in the following tables and discussion. The T scores for the scales of the Guilford-Zimmerman Temperament Survey were obtained from the individual profile sheets which were constructed for each person tested. The scores were

tabulated as were the scores on the Minnesota Multiphasic Personality Inventory, and the computations of F values were also similarly treated. An F value above 5.93 is required for a .01 level of significance, while an F value above 3.52 indicates a .05 level of significance.

The individual and mean scores on the general activity scale of the Guilford-Zimmerman Temperament Survey are presented in Table XXXV. When the F test was applied to the data of the three groups, the difference was no more than that expected to arise by chance.

TABLE XXXV

THE T SCORES OF THREE POPULATIONS ON THE GENERAL ACTIVITY SCALE OF THE GUILFORD-ZIMMERMAN TEMPERAMENT SURVEY

Population										Mean T Score
Nonteaching Scientists	Case No.	14	15	17	18	19	20	21	22	
	T Score	48	54	67	54	45	33	52	37	49
Science Teachers	Case No.	4	5	6	7	9	11	12	13	31
	T Score	33	33	58	35	33	--	52	38	45	41
Nonscience Teachers	Case No.	8	23	25	27	32	33			
	T Score	28	68	60	50	32	32			45

Table XXXVI presents the standard scores of the three groups on the restraint (seriousness) scale. The F test revealed no significant differences among the three groups, as shown in Table XXXVII.

TABLE XXXVI

THE T SCORES OF THREE POPULATIONS ON THE RESTRAINT SCALE OF THE GUILFORD-ZIMMERMAN TEMPERAMENT SURVEY

Population										Mean T Score
Nonteaching Scientists	Case No.	14	15	17	18	19	20	21	22	
	T Score	42	54	63	63	50	50	37	55	52
Science Teachers	Case No.	4	5	6	7	9	12	13	31	
	T Score	55	60	54	52	63	60	52	57	57
Nonscience Teachers	Case No.	8	23	25	27	32	33			
	T Score	62	58	67	46	67	55			59

TABLE XXXVII

THE SIGNIFICANCE OF DIFFERENCE OF THE SCORES ON THE RESTRAINT SCALE OF THE GUILFORD-ZIMMERMAN TEMPERAMENT SURVEY

Source	df	SS	MS	F	P
Total (SS)	21	1229.46			
Among (SS)	2	203.24	101.62		
Error	19	1026.22	54.01	1.88	not sig.

The individual and group mean scores on the social boldness, sociability, and emotional stability scales showed no significant differences among the three groups of persons tested. The scores are presented in Tables XXXVIII through XL.

TABLE XXXVIII

THE T SCORES OF THREE POPULATIONS ON THE SOCIAL BOLDNESS SCALE OF THE GUILFORD-ZIMMERMAN TEMPERAMENT SURVEY

Population									Mean T Score
Nonteaching Scientists	Case No.	14	15	17	18	19	20	21	22	
	T Score	47	58	60	50	57	43	60	54	54
Science Teachers	Case No.	4	5	6	7	9	12	13	31	
	T Score	54	46	52	62	27	60	33	49	48
Nonscience Teachers	Case No.	8	23	25	27	32	33			
	T Score	55	52	67	45	55	30			51

TABLE XXXIX

THE T SCORES OF THREE POPULATIONS ON THE SOCIABILITY SCALE OF THE GUILFORD-ZIMMERMAN TEMPERAMENT SURVEY

Population									Mean T Score
Nonteaching Scientists	Case No.	14	15	17	18	19	20	21	22	
	T Score	42	60	58	45	63	37	54	48	51
Science Teachers	Case No.	4	5	6	7	9	12	13	31	
	T Score	50	42	55	67	27	70	43	50	50
Nonscience Teachers	Case No.	8	23	25	27	32	33			
	T Score	45	70	63	62	48	38			54

TABLE XL

THE T SCORES OF THREE POPULATIONS ON THE EMOTIONAL STABILITY SCALE OF THE GUILFORD-ZIMMERMAN TEMPERAMENT SURVEY

Population									Mean T Score
Nonteaching Scientists	Case No.	14	15	17	18	19	20	21	22	
	T Score	54	70	70	62	63	67	42	52	60
Science Teachers	Case No.	4	5	6	7	9	12	13	31	
	T Score	62	55	60	70	38	62	74	57	60
Nonscience Teachers	Case No.	8	23	25	27	32	33			
	T Score	63	60	52	63	55	33			54

The F test reveals that the differences among the three groups on the objectivity scale are no more than would be expected to occur by chance. The scores and analysis of variance are tabulated in Tables XLI and XLII.

TABLE XLI

THE T SCORES OF THREE POPULATIONS ON THE OBJECTIVITY SCALE OF THE GUILFORD-ZIMMERMAN TEMPERAMENT SURVEY

Population									Mean T Score
Nonteaching Scientists	Case No.	14	15	17	18	19	20	21	22	
	T Score	55	67	55	63	67	60	50	52	50
Science Teachers	Case No.	4	5	6	7	9	12	13	31	
	T Score	67	60	67	70	38	63	70	59	62
Nonscience Teachers	Case No.	8	23	25	27	32	33			
	T Score	55	66	50	58	50	50			55

TABLE XLII

THE SIGNIFICANCE OF DIFFERENCE OF THE SCORES ON THE OBJECTIVITY SCALE OF THE GUILFORD-ZIMMERMAN TEMPERAMENT SURVEY

Source	df	SS	MS	F	P
Total (SS)	21	1442.37			
Among (SS)	2	164.15	82.07		
Error	19	1278.22	67.27	1.22	not sig.

Table XLIII presents the data for the agreeableness scale, while reference to Table XLIV will reveal that the differences among the groups are not significant according to the F test.

TABLE XLIII

THE T SCORES OF THREE POPULATIONS ON THE AGREEABLENESS SCALE OF THE GUILFORD-ZIMMERMAN TEMPERAMENT SURVEY

Population									Mean T Score
Nonteaching Scientists	Case No.	14	15	17	18	19	20	21	22	
	T Score	58	66	55	63	55	63	42	63	58
Science Teachers	Case No.	4	5	6	7	9	12	13	31	
	T Score	60	60	47	67	54	74	74	60	62
Nonscience Teachers	Case No.	8	23	25	27	32	33			
	T Score	60	48	55	48	52	55			53

TABLE XLIV

THE SIGNIFICANCE OF DIFFERENCE OF THE SCORES ON THE AGREEABLENESS SCALE OF THE GUILFORD-ZIMMERMAN TEMPERAMENT SURVEY

Source	df	SS	MS	F	P
Total (SS)	21	1412.60			
Among (SS)	2	277.72	138.86		
Error	19	1134.88	59.73	2.32	not sig.

Neither the reflectiveness scale (Table XLV) nor the cooperativeness scale (Table XLVI) revealed significant difference among the three groups tested. Although a positive F value was obtained on the data for the cooperativeness scale, the .05 level of significance was not reached.

TABLE XLV

THE T SCORES OF THREE POPULATIONS ON THE REFLECTIVENESS SCALE OF THE GUILFORD-ZIMMERMAN TEMPERAMENT SURVEY

Population									Mean T Score
Nonteaching Scientists	Case No.	14	15	17	18	19	20	21	22	
	T Score	50	42	72	54	60	43	55	69	56
Science Teachers	Case No.	4	5	6	7	9	12	13	31	
	T Score	60	52	50	52	67	52	52	53	55
Nonscience Teachers	Case No.	8	23	25	27	32	33			
	T Score	46	52	60	50	43	54			51

The masculinity scale of the Guilford-Zimmerman Temperament Survey yielded scores which indicate no significant differences among the three groups. The individual and group mean standard scores are presented in Table XLVIII. The analysis of variance computation is represented in Table XLIX and produces an F value that falls short of the .05 level of significance.

TABLE XLVI

THE T SCORES OF THREE POPULATIONS ON THE COOPERATIVENESS SCALE OF THE GUILFORD-ZIMMERMAN TEMPERAMENT SURVEY

Population									Mean T Score
Nonteaching Scientists	Case No.	14	15	17	18	19	20	21	22	
	T Score	54	67	45	55	42	54	45	60	53
Science Teachers	Case No.	4	5	6	7	9	12	13	31	
	T Score	62	60	52	53	57	72	55	60	61
Nonscience Teachers	Case No.	8	23	25	27	32	33			
	T Score	47	67	52	58	45	52			54

TABLE XLVII

THE SIGNIFICANCE OF DIFFERENCE OF THE SCORES ON THE COOPERATIVENESS SCALE OF THE GUILFORD-ZIMMERMAN TEMPERAMENT SURVEY

Source	df	SS	MS	F	P
Total (SS)	21	1453.82			
Among (SS)	2	352.94	176.47		
Error	19	1100.88	57.94	3.05	not sig.

TABLE XLVIII

THE T SCORES OF THREE POPULATIONS ON THE MASCULINITY SCALE OF THE GUILFORD-ZIMMERMAN TEMPERAMENT SURVEY

Population									Mea T Sc
Nonteaching Scientists	Case No.	14	15	17	18	19	20	21	22	
	T Score	55	52	63	75	42	54	42	63	56
Science Teachers	Case No.	4	5	6	7	9	12	13	31	
	T Score	63	67	49	60	47	52	52	53	55
Nonscience Teachers	Case No.	8	23	25	27	32	33			
	T Score	47	48	46	47	38	54			47

TABLE XLIX

THE SIGNIFICANCE OF DIFFERENCE OF THE SCORES ON THE MASCULINITY SCALE OF THE GUILFORD-ZIMMERMAN TEMPERAMENT SURVEY

Source	df	SS	MS	F	P
Total (SS)	21	1614.37			
Among (SS)	2	312.03	156.01		
Error	19	1302.34	68.54	2.28	n s

The Kuder Preference Record

The interest patterns of the three populations are measured by this test. The scores used in the standard profile sheets constructed for each person were percentil

ranks. Each of the two hundred twenty percentile scores was computed into standard scores with a mean of fifty and a standard deviation of ten, as outlined in Chapter III. For this computation the scores of the three groups were considered both separately and together for determining the means and standard deviations of each scale. Only the means and standard deviations of the combined groups were used, however, in the T score determinations.

The procedure followed for the two previous tests regarding tabulation of the F score computations will be followed here. It will be noted that considerably more significant differences were found in the scales of the Kuder Preference Record than on the other two tests.

The individual and group mean scores for the nonteaching scientists, science teachers, and nonscience teachers on the outdoor scale of the Kuder Preference Record are presented in Table L. Computations for the analysis of variance are found in Table LI and indicate an F value equivalent to a .01 level of significance. Reference to the group means shows that both groups of scientists indicated far greater interest in outdoor activities than did the nonscience teachers.

TABLE L

THE T SCORES OF THREE POPULATIONS ON THE OUTDOOR SCALE OF THE KUDER PREFERENCE RECORD

Population									Mean T Score
Nonteaching Scientists	Case No.	14	15	17	18	19	20	21	22	
	T Score	60	65	66	66	44	64	44	61	59
Science Teachers	Case No.	4	5	6	7	9	12	13	31	
	T Score	63	65	59	33	50	52	62	50	54
Nonscience Teachers	Case No.	8	23	25	27	32	33			
	T Score	39	40	57	24	28	38			38

TABLE LI

THE SIGNIFICANCE OF DIFFERENCE OF THE SCORES ON THE OUTDOOR SCALE OF THE KUDER PREFERENCE RECORD

Source	df	SS	MS	F	P
Total (SS)	21	3671.10			
Among (SS)	2	1628.76	814.38		
Error	19	2042.34	107.49	7.58	.01

Table LII reveals the data for the mechanical scale. There was a significant (.05 level, Table LIII) difference in the mechanical interest of the nonscience teachers as compared to the two scientist groups. The group mean T scores indicate that the difference existed not so much in

the high interest of the scientists as in the rather low interests of the nonscience teachers.

TABLE LII

THE T SCORES OF THREE POPULATIONS ON THE MECHANICAL SCALE OF THE KUDER PREFERENCE RECORD

Population									Mean T Score
Nonteaching Scientists	Case No.	14	15	17	18	19	20	21	22	
	T Score	73	40	39	54	47	55	54	74	55
Science Teachers	Case No.	4	5	6	7	9	12	13	31	
	T Score	66	73	64	54	54	40	50	46	56
Nonscience Teachers	Case No.	8	23	25	27	32	33			
	T Score	29	41	49	30	37	49			39

TABLE LIII

THE SIGNIFICANCE OF DIFFERENCE OF THE SCORES ON THE MECHANICAL SCALE OF THE KUDER PREFERENCE RECORD

Source	df	SS	MS	F	P
Total (SS)	21	3599.28			
Among (SS)	2	1127.56	563.78		
Error	19	2471.72	130.09	4.33	.05

The computational scale revealed no significant difference among the three groups tested. The scores are shown in Table LIV.

TABLE LIV

THE T SCORES OF THREE POPULATIONS ON THE COMPUTATIONAL SCALE OF THE KUDER PREFERENCE RECORD

Population									Mean T Score
Nonteaching Scientists	Case No.	14	15	17	18	19	20	21	22	
	T Score	36	34	59	59	47	50	59	39	48
Science Teachers	Case No.	4	5	6	7	9	12	13	31	
	T Score	68	33	61	36	57	67	46	54	53
Nonscience Teachers	Case No.	8	23	25	27	32	33			
	T Score	41	51	53	36	64	53			50

The greatest difference between groups on any of the test scales was revealed by the scientific interest scale of the Kuder Preference Record. Both of the scientist groups ranked quite high on this scale, as seen in Table LV, while the nonscience teachers ranked extremely low, despite the childhood desires of several to become physicians.

Table LVI indicates a level of significance of .01. The high F value indicates that considerably less than once

in one hundred times would this degree of difference be expected from random sampling.

TABLE LV

THE T SCORES OF THREE POPULATIONS ON THE SCIENTIFIC SCALE OF THE KUDER PREFERENCE RECORD

Population									Mean T Score
Nonteaching Scientists	Case No.	14	15	17	18	19	20	21	22	
	T Score	40	59	63	65	53	65	65	59	59
Science Teachers	Case No.	4	5	6	7	9	12	13	31	
	T Score	60	66	64	58	66	65	65	63	64
Nonscience Teachers	Case No.	8	23	25	27	32	33			
	T Score	4	16	64	13	36	31			27

TABLE LVI

THE SIGNIFICANCE OF DIFFERENCE OF THE SCORES ON THE SCIENTIFIC SCALE OF THE KUDER PREFERENCE RECORD

Source	df	SS	MS	F	P
Total (SS)	21	7979.82			
Among (SS)	2	5082.72	2541.36		
Error	19	2897.10	152.48	16.67	.01

Neither the persuasive nor the artistic interest sca revealed significant differences among the three groups tested. The scores are presented in Tables LVII and LVI

TABLE LVII

THE T SCORES OF THREE POPULATIONS ON THE PERSUASIVE SCALE OF THE KUDER PREFERENCE RECORD

Population									Mea T Sc
Nonteaching Scientists	Case No.	14	15	17	18	19	20	21	22	
	T Score	58	58	37	40	50	47	42	44	47
Science Teachers	Case No.	4	5	6	7	9	12	13	31	
	T Score	42	50	59	73	47	65	46	42	53
Nonscience Teachers	Case No.	8	23	25	27	32	33			
	T Score	66	57	63	42	41	38			51

Table LIX presents the individual and group mean standard scores of the three groups on the literary inter scale. The analysis of variance (Table LX) reveals no significant differences among the three groups.

TABLE LVIII

THE T SCORES OF THREE POPULATIONS ON THE ARTISTIC SCALE OF THE KUDER PREFERENCE RECORD

Population									Mean T Score
Nonteaching Scientists	Case No.	14	15	17	18	19	20	21	22	
	T Score	59	53	63	68	40	35	47	43	51
Science Teachers	Case No.	4	5	6	7	9	12	13	31	
	T Score	44	50	39	55	51	33	58	58	49
Nonscience Teachers	Case No.	8	23	25	27	32	33			
	T Score	51	30	42	67	66	49			51

TABLE LIX

THE T SCORES OF THREE POPULATIONS ON THE LITERARY SCALE OF THE KUDER PREFERENCE RECORD

Population									Mean T Score
Nonteaching Scientists	Case No.	14	15	17	18	19	20	21	22	
	T Score	35	33	47	38	60	59	55	60	48
Science Teachers	Case No.	4	5	6	7	9	12	13	31	
	T Score	48	57	43	33	37	32	62	60	46
Nonscience Teachers	Case No.	8	23	25	27	32	33			
	T Score	63	62	48	53	59	41			54

TABLE LX

HE SIGNIFICANCE OF DIFFERENCE OF THE SCORES ON THE LITERARY SCALE OF THE KUDER PREFERENCE RECORD

Source	df	SS	MS	F	P
Total (SS)	21	2578.78			
Among (SS)	2	421.56	210.78		
Error	19	2157.22	113.54	1.86	not sig.

There were no significant differences in the musical interests of the three groups as shown by the F value in Table LXII which was computed from the standard scores presented in Table LXI.

TABLE LXI

THE T SCORES OF THREE POPULATIONS ON THE MUSICAL SCALE OF THE KUDER PREFERENCE RECORD

Population									Mean T Score
Nonteaching Scientists	Case No.	14	15	17	18	19	20	21	22	
	T Score	43	45	49	42	67	63	37	42	50
Science Teachers	Case No.	4	5	6	7	9	12	13	31	
	T Score	36	34	42	58	56	32	56	42	44
Nonscience Teachers	Case No.	8	23	25	27	32	33			
	T Score	54	44	54	64	47	69			55

TABLE LXII

THE SIGNIFICANCE OF DIFFERENCE OF THE SCORES ON THE MUSICAL SCALE OF THE KUDER PREFERENCE RECORD

Source	df	SS	MS	F	I
Total (SS)	21	2575.10			
Among (SS)	2	404.26	202.13		
Error	19	2170.84	114.25	1.77	r s

The scores on the social service scale are presented Table LXIII. The analysis of variance produced an F valu of 1.41 which was short of a .05 level of significance, a may be seen in Table LXIV.

TABLE LXIII

THE T SCORES OF THREE POPULATIONS ON THE SOCIAL SERVICE SCALE OF THE KUDER PREFERENCE RECORD

Population									Mea T Sc
Nonteaching Scientists	Case No.	14	15	17	18	19	20	21	22	
	T Score	47	69	54	40	51	28	40	36	46
Science Teachers	Case No.	4	5	6	7	9	12	13	31	
	T Score	33	60	44	69	40	55	44	38	48
Nonscience Teachers	Case No.	8	23	25	27	32	33			
	T Score	51	59	46	69	55	54			56

TABLE LXIV

THE SIGNIFICANCE OF DIFFERENCE OF THE SCORES ON THE SOCIAL SERVICE SCALE OF THE KUDER PREFERENCE RECORD

Source	df	SS	MS	F
Total (SS)	21	2843.28		
Among (SS)	2	367.18	183.59	
Error	19	2476.10	130.32	1.41

There were no significant differences among the non teaching scientists, science teachers, and nonscience teachers on the clerical interest scale of the Kuder Preference Record. The two scientist groups made identi mean scores on this scale, as may be seen in Table LXV. analysis of variance computation is presented in Table L and shows an F value of 1.99, which is short of the 3.52 necessary for a .05 level of significance.

TABLE LXV

THE T SCORES OF THREE POPULATIONS ON THE CLERICAL SCALE OF THE KUDER PREFERENCE RECORD

Population									Mean T Score
Nonteaching Scientists	Case No.	14	15	17	18	19	20	21	22	
	T Score	55	42	43	42	41	42	65	42	46
Science Teachers	Case No.	4	5	6	7	9	12	13	31	
	T Score	62	36	42	38	51	65	36	39	46
Nonscience Teachers	Case No.	8	23	25	27	32	33			
	T Score	58	58	36	60	67	67			58

TABLE LXVI

THE SIGNIFICANCE OF DIFFERENCE OF THE SCORES ON THE CLERICAL SCALE OF THE KUDER PREFERENCE RECORD

Source	df	SS	MS	F	P
Total (SS)	21	2721.32			
Among (SS)	2	470.35	235.17		
Error	19	2250.97	118.47	1.99	not sig.

The Interviews and Case Study Syntheses

The results of each interview are presented separately. The results of the interviews with the nonteaching

scientists are presented first, the science teachers second, and the nonscience teachers last. Within each of these groups the order of presentation corresponds to the order in which the interviews took place. Each interviewee will be identified by the case number assigned at the time the interview was scheduled. A case study synthesis will be developed with the use of pertinent information from the questionnaires and standardized tests completed by the individual.

The Nonteaching Scientists

Case Number Fourteen.--This nonteaching scientist was twenty-six years of age and was graduated in a class of forty-five from a high school offering only two science courses. A statement made by his eighth grade teacher to the effect that matter was neither created nor destroyed influenced him considerably. In his high school biology course he made an insect collection which won a prize and also caused him to be endeared to science. The teacher of this biology course and an insect collecting fellow student were the key persons influencing his vocational choice. Living on a dairy helped to reinforce his interest in science. He entered a college of agriculture and decided to major in entomology in his sophomore year. He did not plan to teach because he thought he could not teach well and because industrial jobs were more attractive.

His outdoor and mechanical interests were moderately high. He had some tendency in the direction of femininity, hypomania, and hysteria.

Case Number Fifteen.--This nonteaching scientist was twenty-five years of age. He was graduated in a class of eighty-five students from a high school which offered four courses in science. He was interested in the natural sciences. In his high school biology class he made insect collections. While he was in high school, he was certain that he would be a biologist. His mother's interest in a garden club and the family camping trips reinforced his interest in science. He was active in the Boy Scouts.

He was influenced by his mother, by his brother, and by his science teachers. He never considered teaching very seriously because his aim had long been to work in wildlife out in the field. He had very strong interests in the outdoors, in social service, and in scientific pursuits. He was very emotionally stable, cooperative, and agreeable but tended toward hysteria.

Case Number Sixteen.--This individual was twenty-eight years of age. He was graduated, along with nineteen others, from a high school which offered three science courses. He lived on an acreage near a large city and found general science in junior high school to be interesting. He read a great deal about biology while in high school.

He entered college to major in zoology but changed t engineering because it paid more money. After doing poo work during two years of engineering study, he changed b to zoology. He considered teaching, but his major inter is field work.

His father was a scout master, and they went huntin and fishing together. Both of his parents and a high sc chemistry teacher were the key persons influencing his choice of science.

This subject failed to keep his appointment to take standardized tests and did not respond to inquiries concerning his failure to keep his agreement.

Case Number Seventeen.--This nonteaching scientist v twenty-four years of age and was graduated in the upper fourth of a class of ninety-eight students from a high school which offered ten science courses. His father wa stone-quarry operator. When the subject was a child, he wanted to become a physician in order to help people. A later time, however, he realized he was financially unab to pursue medicine, and his primary goal was "to be something besides a stone-cutter." He earned most of his college expenses.

His high school geometry and chemistry teachers were the key persons influencing his choice of science. He always had been interested in hunting and fishing. He pr ferred research but expressed willingness to teach if a

sufficient need existed. He had very high interests in science and the outdoors but had low clerical and persuasive interests. He was exceedingly thoughtful and emotionally stable, as well as quite masculine and serious. He had a tendency in the direction of hypomania.

Case Number Eighteen.--This nonteaching scientist was twenty-eight years of age. He was graduated in a class of eight students from a high school offering eight science courses. His father was a rancher, and he first wanted to be a rancher like his father. He was interested in agriculture in high school and later entered an agricultural college. He majored in agronomy and plant pathology.

He wanted to work in the field doing research and stated that he did not know enough yet to teach. He thought he should do field work while he was still young.

His scientific and outdoor interests were extremely high. He also had high literary interests and low persuasive inclinations. He was quite serious, objective, and friendly, and exceedingly masculine. He had a slight tendency toward psychopathic deviation.

Case Number Nineteen.--This nonteaching scientist was twenty-nine years of age. He was graduated in a high school class composed of forty-one students. At an early age he wanted to be an F. B. I. man, due to the influence of his uncle who was a police chief. A few years later, he wanted to be an electrician like his father. Helping his father on

many jobs convinced him that he did not like this type of work. After high school graduation he joined the marine corps. Upon leaving the service he helped his grandfather in some horticultural work.

He entered college to major in horticulture and earned his degree in this field. A friend of his procured a job for him in industrial bacteriology. His experience in this job convinced him that he needed more bacteriology, so he changed his major to bacteriology in graduate school. He had higher interests in music and literature than he did in science. He was quite objective, sociable, and emotionally mature, with a slight tendency toward hysteria.

Case Number Twenty.--This nonteaching scientist was twenty-five years of age. He was graduated in the upper one-fourth of a class numbering sixty-five from a high school which offered only two science courses. As a senior in high school he planned to be a farmer, and his pursuit of farming later financed him through college. He entered college partly to help him decide on a career and partly as a means of draft deferment. This individual was skeptical and sarcastic and considered himself to be an agnostic. He was quite low in sociability and extremely low in social service interests and lacked the general activity to modify his general bearing. His scientific and outdoor interests were quite high, however, and during the course of the interview he proved to be very friendly.

He entered college for lack of anything else to do and enjoyed his mathematics and chemistry courses. He liked his first chemistry and decided to major in this field. Chemistry was easier for him than nonscience courses such as humanities. He would like to teach, but money meant more to him. Salary appears to be his basic motivation.

Case Number Twenty-One.--This individual was twenty-one years of age. He was graduated in the upper one-fourth of a class composed of six hundred students. Four science courses were offered by his high school. He lettered in sports and was president of his junior class in high school. Scientific experiments which he conducted outside of class heightened his science interest, so he knew he wanted to be a scientist in his senior year in high school.

He was not adverse to teaching but would resent having his time for doing research reduced. He was not influenced by his parents or friends to pursue science. His scientific interest was exceedingly high, and he was socially bold. He had a strong tendency in the direction of hypomania and psychopathic deviation. He also had some tendencies toward depression and hysteria.

Case Number Twenty-Two.--This nonteaching scientist was twenty-six years of age. His high school graduating class consisted of one hundred and seventy-five students. While in grade school he enjoyed hunting and fishing and later developed hobbies of photography and magical shows. He enjoyed both chemistry and physics in high school, but the

physics was too easy; so he decided to major in chemistry in college.

He enjoyed his teaching experience as a graduate assistant but regretted the time it took from his research. He likes people, but money appeals to him even more. He would only consider teaching in college and only if the salary were high enough. He had rather strong interests in scientific, mechanical, and outdoor activities. He was very agreeable and masculine, with some tendencies in the direction of hysteria, psychopathic deviation, psychasthenia, and schizophrenia. His tendency toward paranoia was stronger.

Case Number Twenty-Four.--This man was twenty-five years of age. He was graduated in a class of ninety students from a high school offering four science courses. He was in the upper one-fourth of his senior class and served as captain of his basketball team. In the eighth grade he became interested in science under the guidance of a "particularly good teacher." This interest was heightened by reading a book entitled Mathematics for Fun and Imagination. After reading a book by Einstein on the theory of relativity in his sophomore year in high school, he knew that he wanted to pursue physics as a career.

He would enjoy teaching in a college where he could continue with at least one-half time research. He would not consider teaching without a Ph.D. degree. He preferred to

have free time for social activities but thought he did better work when under pressure.

The Science Teachers

Case Number Three.--This science teacher was thirty-three years of age. He attended a one-room elementary school, and his high school graduating class consisted of twenty-eight students, among which he ranked in the upper one-fourth. At the age of twenty, while in the military service, he decided to become a physician. This interest was largely due to his contact with wounded men in need of medical care. After entering college to prepare for a career in medicine, he noticed that many students had difficulty with mathematics and science courses, so in his sophomore year in college he decided to become a teacher in order to help such students in their understanding of these courses.

The science interest of this science teacher can be traced back to his childhood experiences which involved experimentation with animals and mechanical apparatus. His parents helped him in his efforts but did not attempt to guide his interests. World War II was underway when he was graduated from high school, which may explain why he made his first definite vocational commitment in the army.

Case Number Four.--This man was thirty-six years of age. His subject area of concentration was mathematics and science. He was graduated in a class of thirty-three from a

high school offering two science courses. His elementary school consisted of two or three rooms. He entered college to decide on a career and reacted unfavorably to his first science course, which was required. He was offered a teaching position after being graduated, so he took education courses the first and second summers after being graduated to earn a teaching certificate. He did not plan to make teaching a final career when he began, but he found that teaching was not boring since each day presented new challenges. He believed also that teaching offered more security than did industry and that it also provided longer vocations.

His interest in science is indirect. He prefers mathematics and likes physics mostly because it enables him to use his mathematics. His mathematics interest developed mostly in a high school geometry course. One of his reasons for liking mathematics and science is that they are easy for him.

He rated very low on the general activity scale and very high on the objectivity and masculinity scales of the Guilford-Zimmerman Temperament Survey. He had strong interests in outdoor, mechanical, and scientific pursuits, but his musical and persuasive interests were very weak.

Case Number Five.--This science teacher was thirty-six years of age. He was graduated in the second one-fourth of a high school class consisting of twenty-seven students.

Only two science courses were offered in his high school. His vocational interests in high school varied from cowboy to radio work. One of his teachers was a radio "ham." After serving in the military forces, he decided to enter college to study chemistry. His study was interrupted for one year, after which he changed his major to biology. He had long been interested in wildlife, and his poor mathematics background made chemistry difficult.

His widowed mother sacrificed a great deal in order to make possible his college attendance. This was a strong motivation for him to do well. His clerical, computational, and musical interests were very low, while his scientific and outdoor interests were extremely strong. He was friendly, cooperative, objective, and restrained but low in general activity and sociability. He had some tendency in the direction of hypochondriasis and psychopathic deviation.

Case Number Six.--This person was thirty-three years of age and attended a high school which offered only one science course. He was in the upper one-fourth of a high school graduating class consisting of twenty students. His vocational plans were not clear; but since he had some work experience in dairy and automobile businesses after his discharge from the navy, he chose industrial arts for a major in college. He planned to teach industrial arts after being graduated, but his contact with science courses

changed his interest and his major to science. His scientific interest was extremely strong, and his outdoor interest was also high. These interests, combined with a high degree of objectivity, probably caused him to respond favorably to science.

His teaching interest may be linked to his desire to help young people, and his feeling that he can lead and direct lives in the classroom.

Case Number Seven.--This science teacher was twenty-four years of age and was graduated in a class of seventy-five from a high school which offered four science courses. Academically, he was a little above average. His father died when he was in grade school, and this caused him to desire to succeed in order to please his mother. He was first interested in the ministry because his father was a Lutheran minister. Not having felt a call to the ministry, he entered college with the objective of preparing for a business career. Because he did rather poorly in business courses and his first science course stimulated his interest in science, he changed his major to biology. His roommate and biology teacher also influenced his decision.

He served as a laboratory assistant in biology; and because teaching appealed to him and industrial jobs lacked this appeal, he decided to teach biology.

He was very objective, emotionally stable, sociable, and cooperative but had a rather strong tendency toward hysteria, paranoia, and hypomania.

Case Number Nine.--This man was thirty-five years of age. He ranked academically in the upper one-fourth of a high school graduating class of ninety. Four science courses were offered each year by his high school. He earned about one-half of his college expenses.

At the age of fourteen he wanted to be a physician. Through the guidance of his high school mathematics teacher, who stimulated his interest in mathematics, he completed a course in chemistry. He planned to major in mathematics in college; but after beginning his college work, he learned of an opening for a chemistry laboratory assistant and succeeded in obtaining the position. After working in chemistry, he decided to major in chemistry and minor in mathematics. When he was in college, he believed teaching was about the only opportunity open to him in chemistry, so he decided to teach. His choice was influenced also by his belief that he could obtain the prestige which he needed in teaching.

He had very strong tendencies in the direction of depression and psychopathic deviation, but his tendency to withdraw from social contact was even greater. His tendency toward schizophrenia was relatively high. He was extremely thoughtful, cooperative, and quite serious but extremely low in social boldness and sociability. This unusually low social interest may account for his belief that academic

achievement is a better index to a person's value to society than is group leadership ability.

Case Number Eleven.--The science teacher described here was forty-five years of age. He was graduated in the second one-fourth of a high school graduating class composed of one hundred and three students. He attended a one-room elementary school. At the age of ten he wanted to be a dentist because a good friend of his was a dentist. After his father died, he could not afford to attend dental school, so he decided he would go to college and then teach with the idea of saving money for financing his dental training.

He did not have clear vocational interests other than dentistry, but he took mathematics and science courses in college because he liked them and because he would need them in case he attended dental school. His earlier work experiences on the farm and in the oil fields convinced him he wanted to do something different. Teaching was the best position open to him during the depression years. His first experiences in teaching influenced him to make a permanent career helping children make discoveries in science. The more he teaches, the more he likes to teach; and he also appreciates his working conditions and colleagues. He had moderate tendencies in the direction of hysteria and psychostenia.

Case Number Twelve.--This science teacher was forty-three years of age; and although the high school from which

he was graduated offered three science courses, there were only six students in his graduating class. He lettered in sports and served as president of both his senior class and the student body. He operated a service station and farmed before he entered college for the purpose of becoming a teacher. His choice of teaching was influenced by his desire to work with young people, his belief that teachers have prestige, and the fact that vocational opportunities were considerably limited during the depression years.

His choice of teaching may be partly explained by his extremely high interest in science and his friendship with a biology teacher. He was unusually friendly and cooperative but had strong tendencies toward hysteria and psychopathic deviation, as well as more moderate traits of hypochondriasis, femininity, paranoia, and hypomania. He had very low musical and high computational interests. He worked better and felt more satisfaction when he was completely occupied in a project and under pressure.

Case Number Thirteen.--The person described here was forty-four years of age and was graduated in the upper one-fourth of a high school graduating class of forty students. Only two science courses were offered each year in his high school. As a high school senior he was an officer on the school paper and aspired to become a journalist. Despite some interest in teaching which was developed by an eighth grade teacher, he entered a junior college to major in

journalism. Social science courses were his favorites in college. After teaching two years he returned to a senior college and decided to major in science. He felt that science, as well as writing, provided an outlet for his active imagination, and writing jobs were scarce during the depression. He had always had a natural interest in science because his family lived in the "woods." Although his family influenced his decision to go to college, they did not guide his vocational choice. He had very high scientific, outdoor, and literary interests but an extremely low clerical interest. His degrees of objectivity, agreeableness, and emotional stability were far above the average. He was quite effeminate and lacked social boldness.

Case Number Thirty-One.--This science teacher was thirty-one years of age. His high school offered only one course in science. He was graduated in a class of thirty and entered the army a short time later. Because of the war and his impending service, he had no definite thoughts of a vocation in high school; however, as a child he enjoyed writing poetry about natural science and the outdoors.

After release from the army he entered college and "happened to take chemistry." He liked chemistry and the other sciences because they were easier for him than non-science courses and because he made better grades in science. He chose physics as his final major because there was more industrial opportunity and fewer teachers than in

biology. His interest in teaching began during his first years in a teachers college.

His scientific and literary interests were very high, but he was low in clerical and persuasive interests. He was more agreeable, cooperative, and objective than average. He was characterized by a tendency toward hypochondriasis and tended somewhat toward hysteria and psychasthenia.

The Nonscience Teachers

Case Number Eight.--This nonscience teacher was thirty-six years of age. He was graduated in a class of fifteen, ranking in the upper one-fourth academically, from a high school which offered four science courses. He was editor of his school paper. He took his first college science course because it was required, and he did not react to this course with increased interest. Science and mathematics were the subjects he liked least in school.

In high school he wanted to be a physician, but his lack of interest in college chemistry convinced him that another career would be more suitable. His real interest, he found, was in the humanities. After serving in the air force for five years, during which time he had some enjoyable teaching experience, he returned to college and earned his bachelor's degree in psychology. His interest in philosophy developed at this time, under the influence of an outstanding philosophy teacher, and he knew he would teach.

His literary interest was exceptionally high, but his scientific interest was very low. He was emotionally stable and serious with a tendency toward psychopathic deviation and hysteria.

Case Number Twenty-Three.--This nonscience teacher was thirty-four years of age and ranked academically in the upper one-fourth of his high school graduating class of fifteen students. Three science courses were offered in his high school. He lettered in sports and served as class president. He attended a one-room elementary school. He was interested in science as a youngster. The first college course which he took increased his interest in science, but he gave little thought to a vocation in science.

He enrolled in a college of business and completed his degree, after which he worked for an oil company. He started teaching mainly because a teacher was needed, and he wanted to help. He found that he liked teaching and has made this his vocation. He had very high literary interests and low scientific interests. He was characterized by inclinations for general activity, sociability, objectivity, and cooperativeness.

Case Number Twenty-Five.--This nonscience teacher was forty-one years of age. He ranked academically in the upper one-fourth of his graduating class which was composed of twenty students. His high school offered four science courses. He was active in sports and high school

organizations. When he entered college he wanted to be a biologist. He thought the biology course was poor, so he changed to a major in business and mathematics. Upon being graduated he entered graduate school to work in agricultural economics and business education. After earning his master's degree he worked for "a company." It was during this experience that he decided to teach.

He believed teaching was a natural outcome of the teachings of his family, church, and schools. He had a very high scientific interest, and he appeared to attempt to relate his work to science. He was quite high in traits of seriousness, social boldness, and sociability. He had some tendency toward paranoia.

Case Number Twenty-Six.--This subject was twenty-three years of age. He graduated in a class of one hundred and seventeen from a high school offering four courses in science. He was active in sports and high school organizations. He liked mathematics less than his other courses. When he was a junior in high school, he began to consider teaching; but after entering college he decided to major in business so he could make more money. Because of lack of interest in business, he returned to plans for teaching. He liked people and particularly liked to work with young people because he understood them better. This man failed to complete his standardized tests for this study.

Case Number Twenty-Seven.--This man was twenty-seven years of age. He was below average academically in his graduating class. Although there were four hundred students in his senior class, only three science courses were offered by his high school. He reacted unfavorably to his first science course and rated mathematics as the least liked course. He entered college to become a minister but soon became disillusioned concerning the "type of people" with whom he would have to work. He then applied to a school of social work. When his application was turned down, he decided to teach. His teaching field was sociology because of his natural interest along this line. He always wanted to help people.

His social service and artistic interests were very high, and he was quite emotionally stable. He tended toward hypochondriasis and hysteria and was extremely effeminate.

Case Number Twenty-Eight.--This nonscience teacher was twenty-two years of age. He was graduated in a class of forty from a high school which offered only three courses in science. He lettered in sports and served as president of the band and vice-president of the junior class in high school. His widowed mother was determined that he would go to college.

He first wanted to be a physician, but his interest waned as he discovered the course requirements. He then wanted to be a geologist because it would be exciting and

pay a high salary. He found that he did not have the background for geology. Under the influence of his fiancee, who was preparing to become a teacher, he decided on a teaching vocation. He chose history as a teaching field because he always had been interested in history. He failed to take the standardized tests due to his wife's illness but promised to take them later.

Case Number Twenty-Nine.--This nonscience teacher was twenty-six years of age. He was graduated in a class of eighty-four from a high school which offered only two courses in science. His first interest was in medicine, but he later decided on pharmacy. His second Latin course in high school convinced him that pharmacy was not his field.

His interest in teaching began when a junior high school shop teacher encouraged him to teach. He helped this shop teacher and enjoyed working with students. Instructional experience in the navy reinforced his desire to teach. His personality appeared to be entirely normal.

Case Number Thirty.--This nonscience teacher was twenty-four years of age. He was graduated in the upper one-fourth of a class of eighteen from a high school which offered six courses in science. He lettered in sports and was president of the student assembly of his high school. A physician who was a close friend of the family influenced him to become interested in medicine. His first biology courses convinced him that medicine was not his field. He

decided to major in mathematics, but after the first three courses he changed to history because mathematics was too easy and did not offer enough challenge. A history teacher served as a model for him at this point. After deciding on history, he decided to teach because there were few other opportunities for a historian. He also preferred teaching because of the type of associates he would have. This subject failed to take the standardized tests which were scheduled.

Case Number Thirty-Two.--This nonscience teacher was thirty-one years of age. He was graduated in the upper one-fourth in a class of fifty from a high school offering four science courses. He lettered in sports and served as president of his junior class. He earned most of his college expenses. His first vocational interest was to be a high school coach, possibly because of his proficiency and success in athletics. In the military service he received training and experience as a teacher, and this experience influenced him to aspire to college teaching. One year of high school teaching experience reinforced his desire to teach more mature students.

He had a government teacher whom he regarded as an intellectual giant, and under the influence of this teacher he changed his major to political science. He suddenly found that the intellectual world appealed to him more than the physical.

He had rather high literary and artistic interests and was quite serious and restrained. He had some tendency in the direction of hysteria and schizophrenia.

Case Number Thirty-Three.--This nonscience teacher was twenty-eight years of age. He was graduated in the upper one-fourth of a class of thirty-six from a high school offering only two science courses. His first interest in a vocation was in aviation. Eye trouble ended this aspiration. He entered college to major in accounting and found that this work also was too exacting for his eyes. Since history was his favorite subject in high school and he enjoyed his college history courses more than others, he changed his major to history. He never considered majoring in science.

He attended a teachers college because it was close to his home, and education courses were required. His advisor told him that teaching was a good field to go into with a history major, so he decided to prepare for a teaching career in history.

He had extremely high musical interests, but his social boldness and emotional stability were quite low. He had strong tendencies toward femininity and psychasthenia and some tendency in the direction of hypochondriasis, depression, and schizophrenia. He had a tendency to withdraw from social contact and had no religious affiliation.

CHAPTER V

INTERPRETATION OF RESULTS

Composite Autobiographical Profiles

Information from (1) the questionnaire and the chronological autobiography portions of the psychological questionnaire autobiography, (2) the three standardized tests, and (3) the interviews is used to develop composite profiles for the nonteaching scientists, science teachers, and non-science teachers. In order to facilitate the construction of the profiles, it will be assumed that the predominant characteristics of each group are representative of that group. It is not assumed that these characteristics are necessarily representative of the total populations from which the participants in this study were selected.

The Typical Nonteaching Scientist

The typical nonteaching scientist was twenty-six years of age. He was graduated in a class of one hundred and twenty-three from a high school offering four science courses. He did not letter in high school sports or participate very much in school organizations, but he ranked in the upper one-half of his senior class.

He did not receive any effective vocational guidance, but he was influenced by a good science teacher in high school to choose science as a vocation. He was curious about things and enjoyed making science collections and engaging in outdoor activities. His interest in science began before entering college, and he attended college to prepare for a vocation in science. In his opinion both scientists and teachers enjoyed high prestige, but he thought he would earn less as a teacher than as a scientist.

The nonteaching scientist had a normal personality except for some tendency in the direction of hysteria and hypomania. He had a very low tendency to withdraw from others, and he was quite objective, emotionally stable, and slightly above average in social boldness. His major interests were concerned with scientific and outdoor activities. His clerical and persuasive interests were far below the average of persons other than nonteaching scientists.

The Typical Science Teacher

The science teacher was thirty-six years of age and attended high school during the depression years. He was graduated in a class of forty-five from a school offering only two courses in science. He lettered in high school sports and was graduated in the upper one-half of his class.

As a child he wanted to become a physician but changed his mind because of lack of interest and the realization that medical schools require financial resources. The young

science teacher was curious about his environment, parti
larly animals of various kinds. He read during much of h
spare time. His mother was widowed, and although she wa
pleased with his ultimate choice of career, she did not
openly influence his choice. He had no formal vocationa
guidance in high school, but his science teacher influen
his vocational plans to a considerable extent. Although
entered college for the purpose of preparing for a teachi
career, he became more definite about his choice of scie
teaching while being a single college student.

He responded to his first college science course wit
increased interest and liked his science courses better t
any others. He earned about one-half of his college
expenses by working while attending college or by the "G.
Bill." Industrial positions were not readily available w
the science teacher was graduated from college, and teach
positions appeared relatively more attractive than at the
present time; so he planned to begin teaching after gradu
tion. He was not influenced by vocational guidance in
college, but he felt that teaching would give him an oppo
tunity to help others and work with young people. Both
scientists and teachers were thought to enjoy high social
status, but scientists rated higher than teachers. He fe
that he would earn a higher salary in a nonteaching profe
sion.

The science teacher was cooperative and agreeable, although tending to be rather serious. He was highly objective and rather emotionally stable. He was extremely interested in science and liked the outdoors, but his clerical and musical interests were quite low. He was not very persuasive.

The Typical Nonscience Teacher

The typical nonscience teacher was twenty-nine years of age and was graduated in a class of eighty students from a high school offering less than four science courses. He was active in high school organizations and served in some office in one or more of them. He lettered in sports. He was in the upper one-fourth of his senior class. His first vocational interests were not influenced by formal guidance, but he was considerably influenced by one of his teachers whom he considered to be outstanding. This outstanding teacher served as a model and increased his desire to prepare for a teaching career.

He had some interest in science, but he took his first science course in college because it was required. This course failed to increase his science interest. Of all the courses taken in college, he liked social science best, but he had no special dislike for any other specific course. He believed that scientists have more prestige than teachers and that if he had chosen science instead of nonscience teaching he would earn more money. He was moderately

religious and believed that group leadership was at least as good an index to a person's worth to society as academic achievement.

The nonscience teacher liked to work with people, both youths and adults, and was influenced by a feeling of altruism. He entered college to begin study for another occupation, but, after experiencing a change in attitude toward the teaching profession during his second year, he decided to pursue teacher education.

The personality of the nonscience teacher was characterized by a high degree of femininity and a tendency toward hysteria and psychopathic deviation. His literary and social service interests were rather strong. He was not very persuasive, however, and indicated a very low mechanical interest.

The Standardized Tests

The Minnesota Multiphasic Personality Inventory

The Minnesota Multiphasic Personality Inventory was taken by eight of the nonteaching scientists, nine of the science teachers, and seven of the nonscience teachers. The only scales showing a positive F value for the differences among the three groups of persons tested were the femininity and hypomania scales. The F tests did not, however, reach the .05 level of significance.

The Guilford-Zimmerman Temperament Survey

The mean T scores on this test are shown in Figure 2. The scores in Figure 2 represent the means of scores of eight nonteaching scientists, eight science teachers, and six nonscience teachers.

The following scales yielded a positive F value for the differences among the three groups: restraint, objectivity, agreeableness, cooperativeness, and masculinity. Reference to the F table indicates, however, that the differences among the three groups of persons tested were no greater than would be expected to occur by chance.

The Kuder Preference Record

Figure 3 represents the profiles of the mean T scores on the Kuder Preference Record of eight nonteaching scientists, eight science teachers, and six nonscience teachers. This test revealed significant differences among the groups on several scales. The outdoor scale distinguished the groups quite well, with a .01 level of significance of difference. This result reflects the interest of the scientists in outdoor activities related to science, such as insect collecting and field research. The mechanical scale yielded scores for the three groups which proved to be significantly different at the .05 level. The nonscience teachers indicated very little mechanical interest.

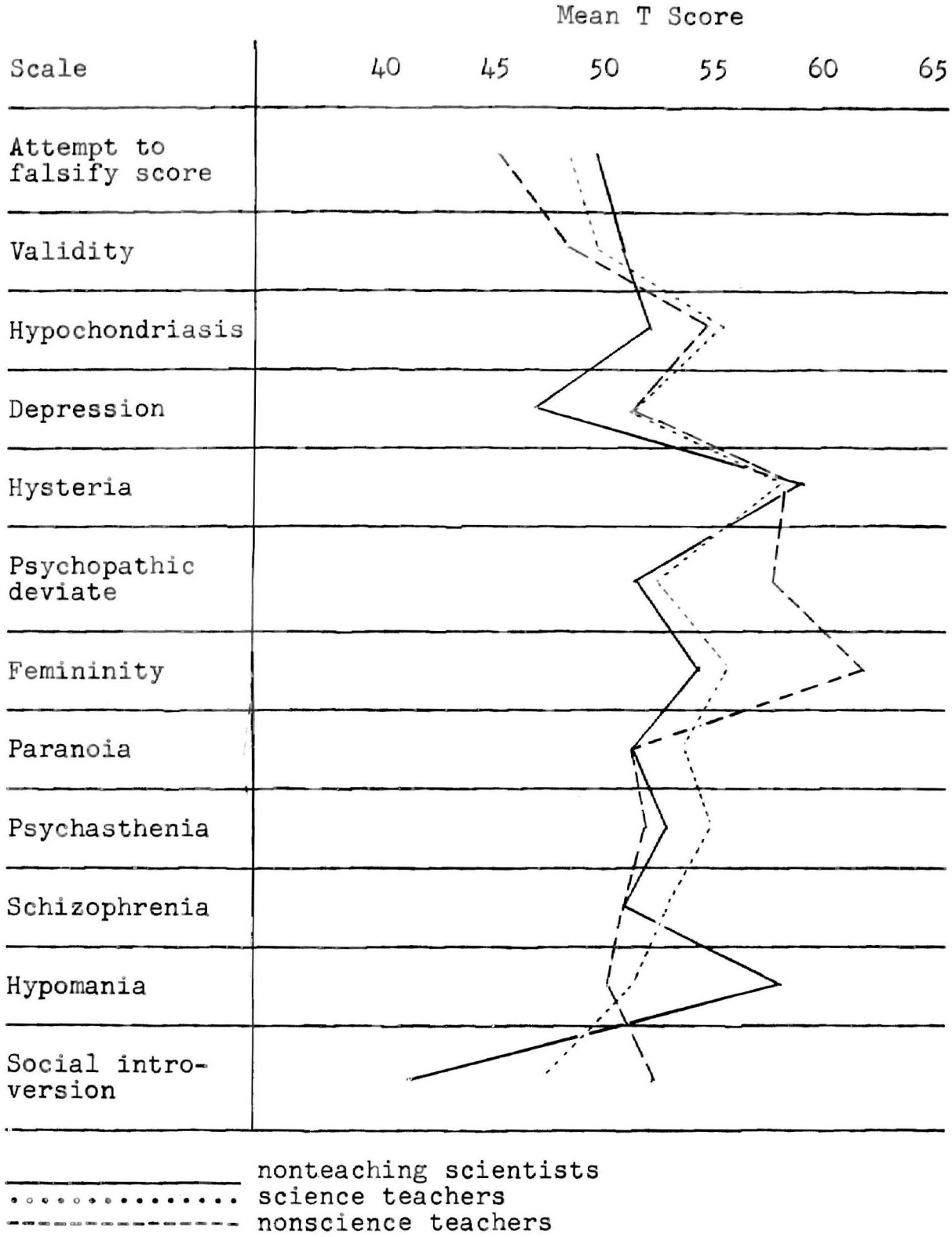

Figure 1. Profiles of Mean Scores Made by Three Populations on the Minnesota Multiphasic Personality Inventory

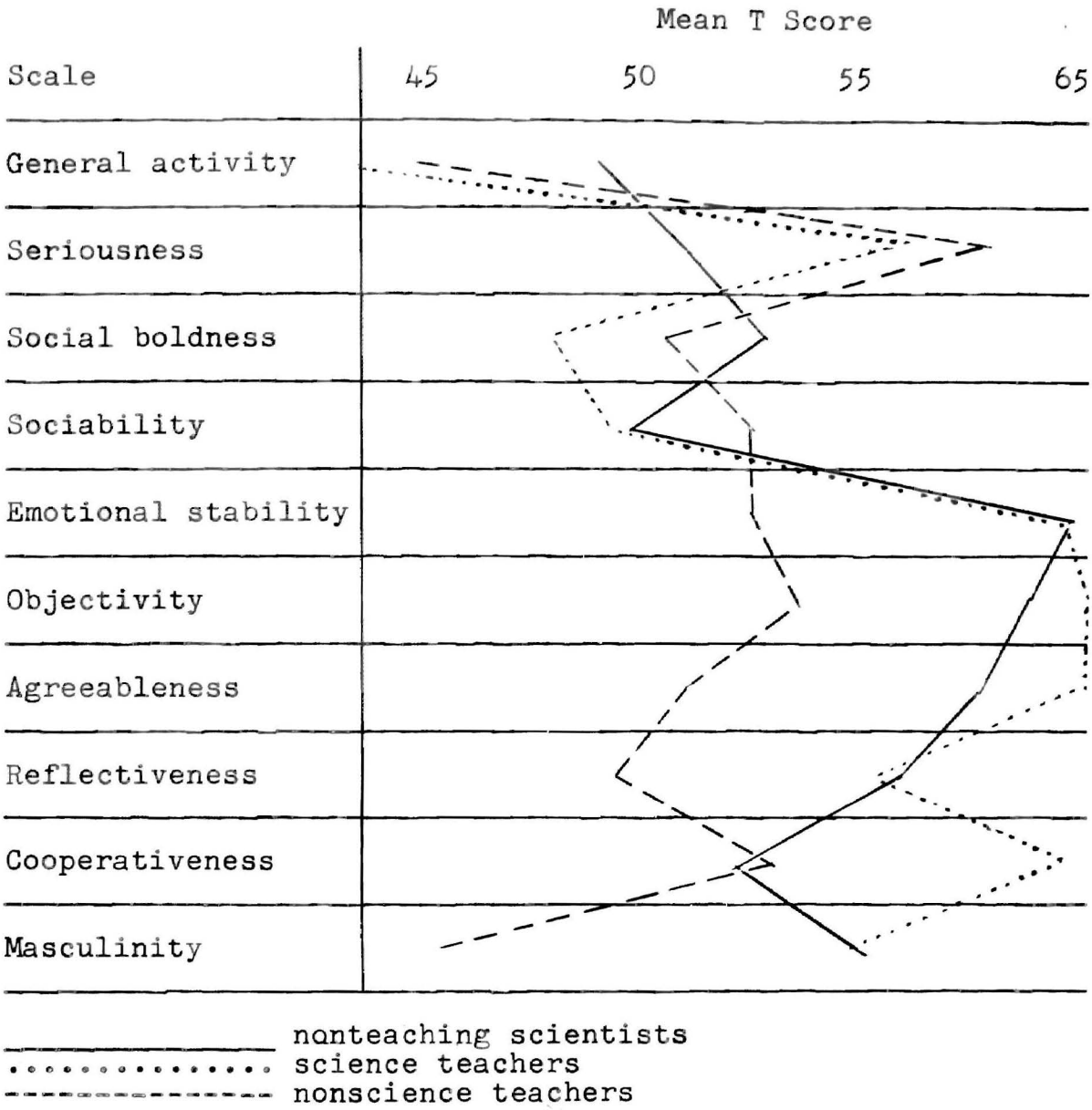

Figure 2. Profiles of Mean Scores Made by Three Populations on the Guilford-Zimmerman Temperament Survey

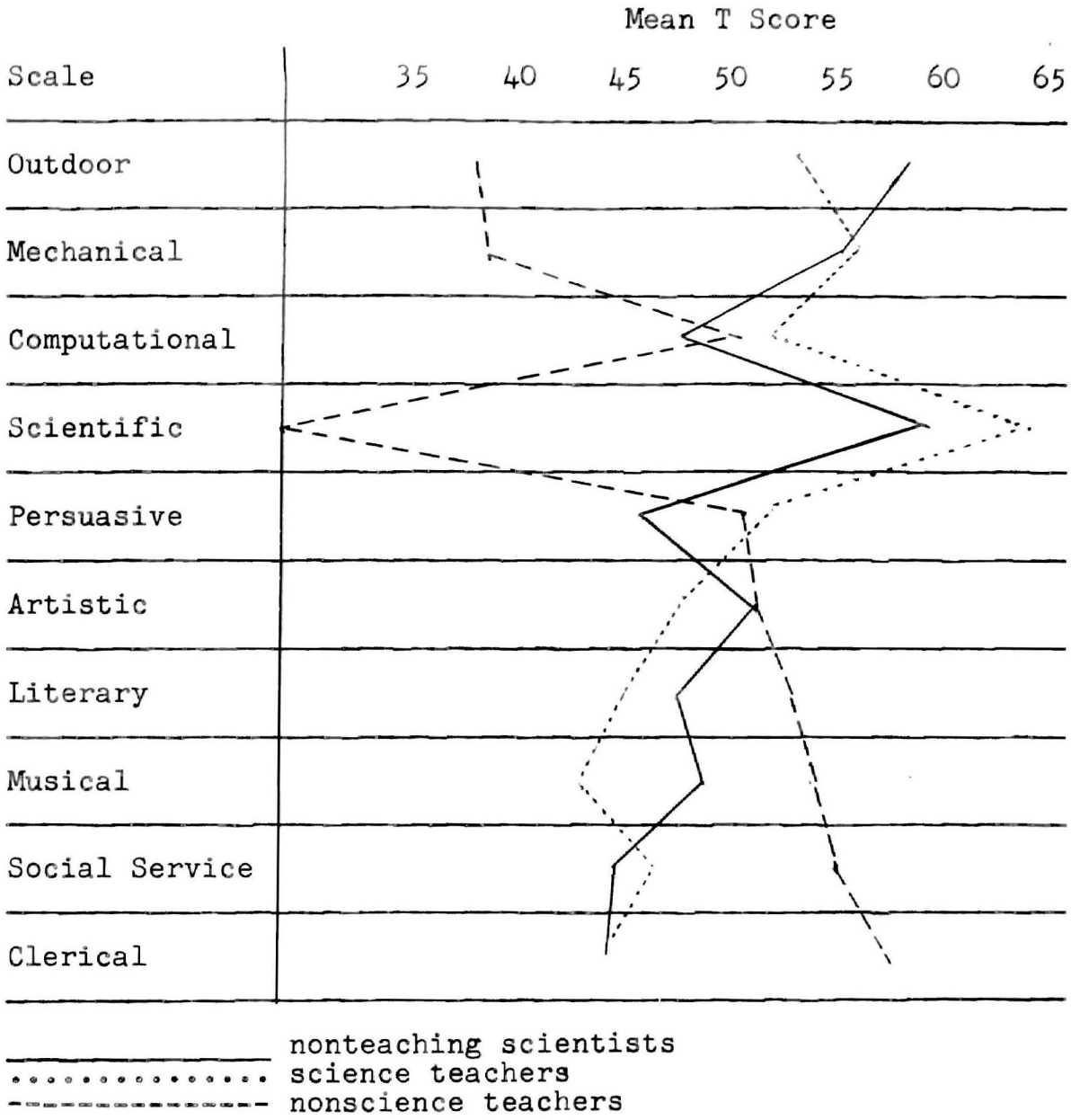

Figure 3. Profiles of Mean Scores Made by Three Populations on the Kuder Preference Record

It was not unexpected that the two groups of scientists ranked very high on the scientific scale. The difference between the scientists and the nonscience teachers was significant at the .01 level. The differences in the mean standard scores on the literary scale may be seen in Figure 3, but analysis of variance shows the differences to be not significant. The musical interests of the three groups were not significantly different. The social service and clerical scales, although revealing rather high and low individual differences, proved to lack differences among the groups at the .05 level of significance.

CHAPTER VI

SUMMARY AND CONCLUSIONS

Summary

The Problem

Science has become more important in American society during recent years. Scientific research and development have been given increasing recognition as a necessity for economic survival, not only in certain major industries but also in the total social structure. In the minds of many people, science has graduated from a role of creating gadgets of convenience or producing magic to a role of developing weapons, machines, and techniques which are basic to the survival of a free nation. It is becoming increasingly obvious that, to maintain scientific leadership, means must be found to increase the number of competent scientists. It is generally assumed that competent science teachers are needed in order to develop competent scientists. In order to insure that a sufficient number of persons become competent science teachers, the factors which influence their choice of science teaching as a career need to be known. This dissertation was an attempt to gain information which may serve as a basis for understanding

some of these vocational factors and which could serve as a basis for further studies of a statistical nature involving larger populations.

The Study

This study involved the following three populations: (1) nonteaching scientists, (2) science teachers, and (3) nonscience teachers. Ten students enrolled in graduate school at Oklahoma State University were selected for each of these populations. Each person selected was asked to participate in three ways. First, he was asked to complete a psychological autobiography questionnaire. Second, he was asked to participate in an interview. Third, he was asked to take three standardized psychological tests. The psychological autobiography questionnaire, interview technique, and standardized psychological tests are explained more fully in the following paragraphs.

The Psychological Autobiography Questionnaire.--The psychological autobiography questionnaire was composed of three parts: (1) general information, (2) objective questionnaire items concerning possible vocational factors, and (3) a chronological autobiography. The objective questionnaire items were formulated on the basis of information obtained from a preliminary study which the author conducted at Central State College, Edmond, Oklahoma, and on the basis of results reported by other researchers. The data obtained

by the psychological autobiography questionnaire have been tabulated and discussed in Chapter IV.

The Interview.--The interviews were conducted informally and lasted about one hour each. The interviewee was asked to develop his story of the factors which influenced his vocational choices at various educational levels. The interviews were mechanically recorded. The recordings were transcribed at a later time, and the transcriptions were analyzed for factors which influenced the subject's vocational choices. The interview analyses were used in constructing individual vocational profiles for each participant in the study. These profiles utilized pertinent information from the other instruments and were, therefore, called case study syntheses. The case study syntheses were presented in Chapter IV. Information obtained from the case study syntheses of persons in each population was brought together in the construction of a composite autobiographical profile for each group. The composite autobiographical profiles were presented in Chapter V.

The Standardized Psychological Tests.--The following three tests were selected to provide information regarding traits of personality adjustment, personal temperament, and vocational interests: Minnesota Multiphasic Personality Inventory, Guilford-Zimmerman Temperament Survey, and Kuder Preference Record. The scores made on each scale of these tests were used to construct individual profiles for each

person. The individual scores were computed into standard scores with a mean of fifty and a standard deviation of ten. The standard scores were used in computing means of each population on each scale. An analysis of variance technique was used to determine whether or not significant differences existed among the three groups of persons on any scale. The standard scores made by each person and the group mean scores on each scale of the standardized tests were tabulated in Chapter IV. The analysis of variance computations also were tabulated in Chapter IV. For each test a graphic profile was constructed showing the relationships among the mean scores of the three groups of persons for each scale of the test. The graphic profiles were presented in Chapter V.

Findings

The responses of the three populations to items on the questionnaire indicated that a majority of the teachers and a minority of the nonteaching scientists lettered in high school sports. A majority of the scientists reacted to their first college science course with an increased interest in science, while a minority of the nonscience teachers reacted accordingly. The nonteaching scientists and nonscience teachers differed in the number of their responses to the question "Are you better satisfied when you are completely occupied with a project or when you have free time for social activities?" A majority of the nonscience

teachers indicated a preference for free time. A majority of the nonteaching scientists indicated that they believed scientists and teachers are accorded high prestige, while a majority of the science teachers and nonscience teachers indicated a belief that teachers were accorded only average prestige. A majority of the science teachers answered "no" and a majority of the nonscience teachers answered "yes" to the question "Did you begin study for another occupation before changing to teacher education?" Analysis of the interviews indicated that one of the major factors relating to the choice of a career in science appeared to be the quality of the science courses taken by the individual and his response to these courses. Teachers appeared to wield greater influence than other persons on vocational choice. The differences in the scores made by the three populations on the Minnesota Multiphasic Personality Inventory and the Guilford-Zimmerman Temperament Survey were not significant at the .05 level. The differences in the scores made by the three populations on the outdoor and scientific scales of the Kuder Preference Record were significant at the .01 level. The nonteaching scientists and science teachers made high scores on these two scales. The differences in the scores made by the three populations on the mechanical scale of the Kuder Preference Record were significant at the .05 level. The nonteaching scientists and science teachers made high scores on this scale.

Conclusions

The scope of the study is too limited to establish with high probability the factors that affect the choice of science teaching as a vocation. The differences in the psychological development and patterns of experience among the three populations used in the study were such that two tentative conclusions may be warranted:

1. On the basis of the responses of the populations used in the study to items on the questionnaire, and on the basis of the interview analyses, it may be concluded tentatively that science teachers, more than any other single factor, affect the vocational choice of science teaching as a career.
2. On the basis of the scores made on the Kuder Preference Record by the populations used in the study, it may be concluded tentatively that scientific, outdoor, and mechanical interests are factors that affect the vocational choice of science as a career.

Suggestions for Further Study

From the findings in this study, the following recommendations for further study are made:

1. A large scale statistical study based on objective questionnaire items should be made to determine the

factors which influence a scientist to choose industry, or teaching, as a career. The influence of manpower shortages and economic change should be considered.

2. A study based on interest tests and a structured interview should be made to determine the influence of specific science courses on both science and nonscience students.

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APPENDICES

NDIX "A"

/PSYCHOLOGICAL/ AUTOBIOGRAPHY

autobiography will aid in research to determine the
ors which influence vocational choice of science teach-
as a career. Information you contribute may add mater-
y to our common effort to keep the United States in
d leadership in science and education.

se complete all items. Feel free to enlarge upon any
so as to include reference to feeling, motives, and
ions where they are discernible.

ITEMS TO BE ANSWERED BY ALL SUBJECTS

ION A

number _____ X1. Age _____

ee for which you are now working_____

ect area of concentration_____

High school from which you are graduated_____

Approximate number of students in your high school
senior class _____

Approximate number of science courses offered each year
by full-time science teachers in your high school _____

What were your vocational objectives as a senior in high
school? _____

e: On the following objective items, please place the
er of the most appropriate choice in the space provided
he left of the item number.)

ple:
_ 60. Which educational institution are you now attend-
ing?
a. Oklahoma State University
b. University of Oklahoma

_ 1. What type of school did you attend for most of
your elementary schooling?
a. one room
b. two or three room
c. more than three room

2. Did you letter in sports in high school?
   a. yes
   b. no

3. Were you an officer of any high school organizations?
   a. yes (specify) _____
   b. no

4. How did you rank academically in your high school graduating class?
   a. in the upper one-fourth of the class
   b. in the second one-fourth of the class
   c. in the third one-fourth of the class
   d. in the lower one-fourth of the class

5. Were you influenced in choosing a career by vocational guidance received in high school?
   a. yes
   b. no

6. What was your primary objective for entering college?
   a. to prepare for a vocation
   b. to increase social and economic standing
   c. to help decide on a career
   d. it was taken for granted by parents
   e. other (specify) _____

7. Why did you decide to enter Oklahoma State University?
   a. reputation for scholarship in chosen field
   b. proximity to home
   c. recommendation of a friend or teacher
   d. low tuition rates
   e. other (specify) _____

8. Why did you take your first college science course?
   a. required
   b. curiosity
   c. it was a challenge
   d. to begin a major in science
   e. other (specify) _____

9. Did this first science course increase your interest in science?
   a. yes
   b. no

10. Which college courses did you like <u>best</u> in college?
    a. education
    b. humanities
    c. science
    d. social science
    e. other (specify) _____

____ 11. Which college courses did you like <u>least</u> in college?
a. education
b. humanities
c. science
d. social science
e. other (specify) _____

____ 12. What percentage of your college expenses did you earn?
a. most
b. about one-half
c. about one-fourth
d. little or none

____ 13. What was the chief source of funds used to meet your college expenses?
a. personal savings
b. parents or guardian
c. earnings while attending college
d. earnings during summer months
e. G. I. bill
f. other (specify) _____

____ 14. What do you plan do do after completing your college program?
a. begin teaching at first opportunity
b. enter other civilian employment
c. continue study toward an advanced degree or other occupation
d. enter military service
e. other (specify) _____

____ 15. Were you influenced in choosing a career by vocational guidance received in college?
a. yes
b. no

____ 16. Are you better satisfied when you are completely occupied with a project or when you have free time for social activities?
a. completely occupied
b. free time

____ 17. Do you do better work when you are under pressure or when you have time to pursue your work leisurely?
a. when under pressure
b. when done leisurely

____ 18. Do you prefer large social functions (such as dances) or small group activities (such as cards)?
a. large social functions
b. small group activities

_ 19. What is your impression of scientists as a group c people?
a. high prestige
b. average prestige
c. low prestige

_ 20. What is your impression of teachers as a group of people?
a. high prestige
b. average prestige
c. low prestige

_ 21. What was your father's occupation when you left home?
a. teacher
b. profession, other than teaching
c. business
d. skilled labor, supervisor, etc.
e. farmer
f. other (specify) _____

_ 22. Do you think your social status would be lower or higher as a scientist?
a. lower
b. higher

_ 23. Do you think your social status would be lower or higher as a teacher?
a. lower
b. higher

_ 24. Do you think you would earn more or less as a scientist than otherwise?
a. more
b. less

_ 25. Do you think you would earn more or less as a teacher than otherwise?
a. more
b. less

_ 26. Do you feel a strong need to find answers to unsolved problems?
a. very strong
b. strong
c. moderate
d. not applicable

_ 27. Do you believe you are more curious than most people?
a. yes
b. no

_____ 28. Do you believe academic achievement is a better index to a person's worth to society than group leadership ability?
a. yes
b. no

_____ 29. What is the extent of your interest or affiliation in religious work?
a. active . . . give time and money
b. financial support and attendance
c. inactive but interested
d. financial support only
e. inactive, no affiliation

_____ 30. Do you authorize the researcher to see your college records for the purpose of this study?
a. yes
b. no

ITEMS TO BE ANSWERED BY PROSPECTIVE TEACHERS ONLY

SECTION B

If you are not now teaching, or do not plan to teach, please omit this section and proceed to section C.

_____ 1. What experiences or activities first influenced you to become interested in teaching? (if more than one, list in order)
a. association with youth groups
b. helped teacher in teaching or grading papers
c. part-time employment (specify) _____
d. other (specify) _____

_____ 2. When did you first decide definitely to prepare for a teaching career?
a. in junior high school or before
b. in high school
c. in college
d. other (specify) _____

_____ 3. What was your marital status when you first decided definitely to prepare for a teaching career?
a. single
b. married, no children
c. married, one or more children

_____ 4. Which persons influenced you the most to teach?
a. parents
b. other relatives
c. friends
d. teacher (specify grade or level taught) _____
e. other (specify) _____

_ 5. Did you begin college study for another occupation before changing to teacher education?
a. yes (specify occupation) _____
b. no

_ 6. Has your attitude toward the teaching profession changed since you entered college?
a. yes (if yes, in what way)_____
b. no

_ 7. Which of the following factors influenced your choice of teaching the most?
a. aptitude, interest
b. research and study opportunities
c. preference for the "way of life" of academic community
d. financial and economic opportunities
e. influence of family, friends

ITEMS TO BE ANSWERED BY PROSPECTIVE SCIENTISTS ONLY

ION C

ou are not majoring in science, or do not plan to be- a scientist, please omit this section and proceed to ion D.

_ 1. What experiences or activities first influenced you to become interested in science?
a. part-time employment (specify) _____
b. leisure-time activity (specify) _____
c. school activity (specify) _____
d. other (specify) _____

_ 2. When did you first decide definitely to major in science or to pursue science as a career?
a. in junior high school or before
b. in high school
c. in college
d. other (specify) _____

_ 3. What was your marital status when you first decided definitely to major in science or pursue science as a career?
a. single
b. married, no children
c. married, one or more children

_ 4. Which persons influenced you the most to enter science?
a. parents
b. other relatives
c. friends
d. teacher (specify grade or level taught) _____
e. other (specify) _____

__ 5. Did you begin college study for another occupation before changing to science?
a. yes (specify) _____
b. no

__ 6. Has your attitude toward the scientific profession changed since you entered college?
a. yes (specify) _____
b. no

CHRONOLOGICAL AUTOBIOGRAPHY OF VOCATIONAL INTERESTS

TION D

ld you please trace, in chronological order, your in-tions and interests in vocations, beginning as early as can remember. Please include each vocation you aspired at any age, and list the reasons you were interested in vocation and the reasons, if any, for your change in erests.

Example: At the age of 10, I wanted to be an FBI agent because it appeared to be exciting work. At age 12, I decided it was too dangerous.

At the age of 12, my father took me on a week-end fishing trip, and I became interested in fish and insects. I pursued this interest more as a hobby, however, and did not aspire to become a biologist.

At the age of 13, I saw a movie which interested me in psychiatry. An English theme on Freud which I wrote this same year also strengthened my desire to become a psychiatrist. etc.

NDIX "B"

INTERVIEW OUTLINE

ibe how, and to what extent, each of the items listed be-
nfluenced your choice of a vocation. Insofar as possible,
ate during which of the following periods the influence
red:

A. Before Junior High School
B. During Junior High School and High School
C. During Undergraduate College or University
D. Later

e include each vocation in which you were interested at
ge, completing the procedure described above for each
ion in chronological order. It would be helpful if you
include feelings and attitudes as you recall them for
period of time. Your contributions will be held in
t confidence.

ur opinion of your capacities.

ur interests.

ur goals.

ur values.

ur time budget for your life's work.

ur opinion of educational prerequisites for specific
cupation.

ur opinion of conditions governing entrance into occu-
tion.

ur opinion of the environment in which work would be
rformed.

ur expected rewards from work.

e influence of family and class standards on your object-
es with respect to work.

onomic presures.

fluence exerted by your parents.

fluence exerted by your teachers.

fluence exerted by your friends.

VITA

Lavon Preston Richardson

Candidate for the Degree of

Doctor of Education

Thesis: FACTORS AFFECTING THE VOCATIONAL CHOICE OF SCIENCE TEACHING AS A CAREER

Major Field: Higher Education

Biographical:

Personal data: Born in Ranger, Texas, July 6, 1925, son of Lloyd Henry and Clifford Kathryn Richardson.

Education: Attended grade school in Corpus Christi, Texas, Wetumka, Oklahoma, and Shidler, Oklahoma; attended high school in Norman, Oklahoma, and graduated from Foster High School, Oklahoma City, in 1943; received the Bachelor of Arts degree from Texas Christian University, with a major in biology, in June, 1948; received the Master of Arts degree from North Texas State College, with a major in bacteriology, in August, 1949; completed the requirements for the Doctor of Education degree in July, 1958.

Professional experience: Entered the United States Marine Corps in 1943, serving on active duty in the United States, the Pacific area, and in China until 1946; entered the United States Navy Reserve in 1951, serving on active duty in 1951 and 1952 as a bacteriologist in the Medical Service Corps; served as Assistant Professor of Biology at Central State College, Edmond, Oklahoma from 1949 until 1957; presently serving as Instructor of Bacteriology, Oklahoma State University.