

THE KUDER INTEREST TEST PATTERNS OF THE
STUDENTS AND THE GRADUATES OF THE FIRE PROTECTION SCHOOL
AT OKLAHOMA A. & M. COLLEGE

by

JOHN LELAND BRYAN

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Bachelor of Science

Oklahoma Agricultural and Mechanical College

Stillwater, Oklahoma

1953


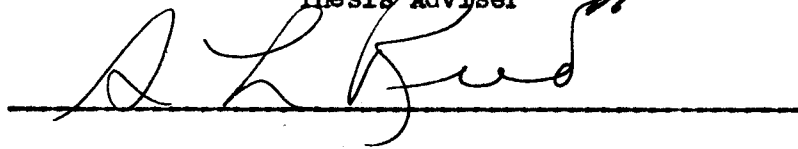

Submitted to the faculty of the Graduate School of
the Oklahoma Agricultural and Mechanical College
in partial fulfillment of the requirements
for the degree of
MASTER OF SCIENCE
May, 1954

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Thesis Approved:


Thesis Adviser


Dean of the Graduate School

333825

PREFACE

Fire Protection is a relatively new endeavor of instruction being assumed by some educational institutions in the United States. The writer while employed on a municipal fire department, and while employed as a fire inspector by a national fire insurance company, observed that the persons employed in the area of fire protection, appeared to have common interest and experience bonds. The purpose of this study was an attempt to discover whether these interests for the student and the graduate populations of the Fire Protection School at Oklahoma A. & M. College actually exist. A corollary purpose was to determine the vocational experiences of the graduate population as related to these interests.

The writer wishes to express his appreciation to Dr. Harry Brobst of the Psychology Department, and Professor R. J. Douglas of the Fire Protection School for their valuable assistance and information which enabled the undertaking of this study. The writer especially wishes to acknowledge his indebtedness to Dr. Alexis M. Anikeeff of the Psychology Department for his valuable guidance, encouragement, and his constructive criticisms during the writing and development of this thesis. Appreciation is extended to the Bureau of Tests and Measurements and the Registrar's Office of the Oklahoma A. & M. College for their valuable assistance in the processing and collecting of data for this study. Indebtedness is also acknowledged for assistance in the collection of material and information to the following: Professor

George S. Speer, Institute for Psychological Services, Illinois
Institute of Technology and Gloria Bauer of Science Research Associates,
Chicago, Illinois.

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CHAPTER I

INTRODUCTION

The subject of vocational interests in college students has been under investigation for many years, with added impetus given to this type of investigation after Kuder's development of his Vocational Preference Record in 1939. This study was given inducement by Speer's¹ study on the students and the graduates of the Fire Protection Engineering School at the Illinois Institute of Technology in 1948.

The Fire Protection School at Oklahoma A. & M. College, with which this study is concerned was established in 1938. The school at Oklahoma A. & M. differs from the school at Illinois Tech, since the students are graduated as technicians with a certificate after completing two years, while the students at Illinois Tech are graduated as engineers after completing 4 years. The course at A. & M. is administered through the School of Technical Training under the Engineering division of Oklahoma A. & M. College, The Oklahoma Institute of Technology. It is possible for the students graduating from the Fire Protection School at A. & M. to continue their schooling and receive a B.S. degree in several departments of Oklahoma A. & M. College. This study is directly concerned with the Illinois Tech study, as these two schools are the only colleges in the country turning out fire protection personnel for employment in

¹G. S. Speer, "The Kuder Interest Test Patterns of Fire Protection Engineers," Journal of Applied Psychology, XXXII (1948), 521-526.

the overall area of fire protection. The graduates of these two schools obtain employment in similar fields, and with similar positions. The University of Southern California has a college program with the students obtaining degrees in Public Administration with a major in Fire Administration. However the graduates of this school are trained and orientated for employment within the area of municipal fire protection, and not the overall area of fire protection.

The graduates of the Fire Protection School at Oklahoma A. & M. College have been found by this study to have entered into five areas of specialization in fire protection. The area of public protection comprises the graduates who are employed by municipalities in fire departments, and municipal inspection bureaus. The graduates employed by industry have entered the area of plant protection and safety, as these two areas are often interrelated in the modern industrial plants. The graduates in the insurance field are employed by fire and casualty insurance companies, state inspection and rating bureaus, and privately owned inspection companies. The equipment and appliance area includes the employment of graduates by automatic sprinkler companies, and fire alarm and equipment companies selling their services to industry and the general public. The last area of specialization was found to be education and training, with the graduates in this group being employed by state and governmental agencies for the training and education of municipal and industrial fire protection personnel.

It was felt that many of the graduates of the Fire Protection School at A. & M., entered the most available or convenient area of specialization, with little consideration of their interests for the type of employment involved. These graduates would then become dissatisfied with their

work, and change to other areas of specialization after a period of adjustment. It was hoped that this study, by giving the students some indication of how their interests ranked with the graduates in the different area of specialization, could be used to counsel the students as to what field they would probably be most satisfied in for employment. This purpose is based on the assumption, that where ability, opportunity, and effort are equal, the student will achieve the most satisfaction in the area of specialization where he has the greatest interest.

Values of the Study

The overall purpose of this study was to determine the interest profiles of the students and the alumni of the Fire Protection School at Oklahoma A. & M. College, and the relationships between these profiles. This general purpose upon examination and analysis breaks down into several related values:

- 1- To develop an awareness and an appreciation of the importance of interests in the guidance of students in a particular highly technical curriculum in their choice of specialized areas of employment.
- 2- To help administrators, professors, and counselors in a particular curriculum realize the importance of interest in the satisfactory adjustment of the student to the vocational situation.
- 3- To collect and evaluate data to enable the establishing of interest profiles from the graduates for the specialized areas in fire protection.
- 4- To stimulate interest for further research into the areas of interest with all types of fire protection personnel.

Limitations of the Study

This study is limited in the following aspects and viewpoints:

- 1- The study is confined to the graduates of the Fire Protection School at Oklahoma A. & M. College.
- 2- The study includes only those students enrolled in Fire Protection and majoring in this curriculum at Oklahoma A. & M. College during the school year 1953 - 1954.
- 3- The only testing instrument used for this study was the Kuder Preference Record, Vocational, Form-C.
- 4- The graduates who did not return the questionnaire were not included in the study. This group consisted of seven subjects out of a total population of fifty-one.
- 5- The small population from which the samples were drawn generally limits the conclusiveness of the results of this study. There were only fifty-one subjects in the graduate population, and a total of forty-one in the student population with a total tested sample for the study of eighty-five subjects.

Statement of the Problem

The principle problem of this study is to analyze the relationship of the interest profiles of the graduates and the students of the Fire Protection School at Oklahoma A. & M. College. It is the purpose of this study to attempt to form some valid conclusions from the following aspects of this problem.

- 1- What is the relationship between the interest profiles of the students and the graduates of the Fire Protection Schools at the Illinois Institute of Technology and at Oklahoma A. & M. College?
- 2- What is the relationship between the interest profiles of the students and the graduates of the Fire Protection School at Oklahoma A. & M. College?
- 3- Is there any measurable relationship between the interest profiles of the students and the graduates of the A. & M. Fire Protection School and their college academic achievement?
- 4- Is there any measurable difference in interest for the graduates of the Fire Protection School at Oklahoma A. & M. College as related to their different areas of specialization?
- 5- Are there any common interests or lack of interests as shown by the Kuder Preference Record, Vocational Form C, to identify personnel who are employed in the fire protection area or enrolled in the Fire Protection School at Oklahoma A. & M. College?

CHAPTER II

REVIEW OF LITERATURE

In our review of previous research and published studies, we have attempted to guide our investigation according to three areas. The first area includes previous studies concerned with fire protection personnel of one type or another, in relation to interests, or where measured interests were obtained. Secondly we are concerned with studies that investigated the measurement of interest with the Kuder Preference Record. Lastly, we concerned ourselves with the review of studies made investigating the relationship of measured interest and scholastic achievement, as this type of relationship is one of the problems of this study.

Previous Studies Concerned With Fire Protection Personnel

Speer at the Illinois Institute of Technology has made two studies which are concerned with the students enrolled in the Department of Fire Protection Engineering. In his first study, Speer¹ was concerned with the vocational interests of engineering and non-engineering students at the Illinois Institute of Technology. A group of thirty-four freshmen fire protection engineering students were tested with the Kuder Preference Record, Vocational form B. He discovered, according to his study, that freshman fire protection engineering students had no characteristically

¹George S. Speer. "The Vocational Interests of Engineering and Non-Engineering Students." Journal of Psychology, XXV, (1948), P. 357-363.

high or low points in their measured interest profile. The interests tended to lie along the mean with a low of 39 percentile for clerical interest, and a high of 65 percentile for computational and persuasive interest. These findings prompted him to make another study confined solely to the students and the alumni of the Fire Protection Engineering Department at the Illinois Institute of Technology.

This second study made by Speer,² is the basic study which prompted our project, and is involved in our project with a comparison of both the students and the alumni interests as compared to the measured interests of the students and the graduates of the Fire Protection School at Oklahoma A. & M. College. This study made by Speer was extended to 177 alumni of the department in an attempt to find the type of work which was engaged in after graduation, and to determine the interest patterns of these alumni. He explains the lack of a marked interest as measured by the Kuder Preference Record with the freshman group due to the heterogeneous character of the group, and he assumed that the students enter the school with different goals in mind.

In the results of this study Speer,³ found that the alumni as a group showed a marked interest only in the area of persuasive interest with a mean percentile score of 88. However the alumni showed greater interest than the freshmen students on the scales of mechanical, persuasive, and social service. He also found that the alumni who have left the area of employment in fire protection showed more interest on literary, musical and computational scales, and less interest on the

²G. S. Speer. "The Kuder Interest Test Patterns of Fire Protection Engineers." Journal of Applied Psychology, XXII, (1948), P. 521-526.

³Ibid., P. 522.

mechanical and scientific scales as compared with the alumni still in fire protection. In comparing the alumni to the students in regard to the type of work they engaged in, he found that the alumni engaged in sales work had less interest on the scientific scale than the students, but had more interest on the persuasive and the social service scales. The alumni engaged in engineering work had a greater interest than the students on the persuasive, mechanical, and the social service scales. The alumni who were engaged in work of an administrative nature, differ least from the student profile, being only slightly higher on the mechanical and persuasive scales. In this study as with his previous study Speer used the Kuder Preference Record, Vocational form B.

Wolff and North⁴ in their study on the selection processes for municipal firemen, tested forty-seven subjects with the Kuder Preference Record. These subjects were all employed in a municipal fire department for a city of 500,000 population, and were selected from a population of 351 firemen. In the results of their study, which were not conclusive in regard to interests, they recommended further investigation with Kuder interest profile scores in the selection of firemen.

Interest and The Kuder Preference Record

In the study with which we are concerned, it seems of value to consider the characteristics of interest, the trait we are attempting to measure. Strong⁵ in his book on the measurement of interest, pointed

⁴W. M. Wolff and A. J. North. "Selection of Municipal Firemen." Journal of Applied Psychology, XXXV, (1951), P. 26 - 29.

⁵E. K. Strong Jr. Vocational Interests of Men and Women. (Stanford University Press, Stanford, California, 1948), P. 313.

out that interests are fairly permanent. He stated, "At 25 years of age a individual is largely what he is going to be and even at 20 years of age he has acquired pretty much the interests he will have throughout life." Kaplan⁶ in his text explains interests as changing somewhat between 15 and 23 years of age. Since as will be shown in the next chapter, the mean age of the subjects in our study was 24.3 years of age, we may assume these interests to be considered fairly stable.

In the study made at Westminster College, Pennsylvania by Reid⁷ in 1948, he selected 145 students with a mean age of 18.4 years, and administered the Kuder Preference Record, Vocational form B. The first administration of the inventory was in the fall of 1948, when the students entered college, and he retested them fifteen months later. He obtained a median correlation for interests of .77, with the lowest correlation being on the computational scale with .72, and the highest correlation was found on the persuasive scale with .89. He points out in his study that the interval between the starting of college, and the mid-sophomore year, is often one of re-orientation and more shift of interest than in later college years. In his conclusions Reid makes the statement, "The study confirms that for young adults as a group, interests are fairly permanent."⁸

Traxler and McCall⁹ in their study on relationships between the Kuder Preference Record, form A, and interest, collected data on the

⁶O. J. Kaplan. Encyclopedia of Vocational Guidance I. (The Philosophical Library, New York, 1948), P. 605.

⁷John W. Reid. "Stability of Measured Interests in Young Adults." Journal of Educational Research, XLV, (1951), P. 307-312.

⁸Ibid., P. 310.

⁹Arthur E. Traxler, and William McCall. "Some Data on The Kuder Preference Record." Educational and Psychological Measurement, L, (1941), P. 253-268.

stability of interests measured with the Kuder Preference Record. They found that the scores on the Kuder Preference Record were not influenced by practice when an interval of several weeks was allowed between administrations. They also pointed out that for adults they obtained correlations on the scales ranging from .60 to above .90 after an interval of fifteen months. From their study of high school and college groups they concluded. "It appears that interest and motivation in the seven areas are relatively mature by the time students reach secondary school."¹⁰ They also found that the differences between the mean scores of the high school group and the college freshmen group were small.

In interpreting profiles obtained by using the Kuder Preference Record, much information may be overlooked by concentrating on the high points or scales of interest. The areas of slight interest or lack of interest should also be carefully considered. Wittenborn, Triggs, and Feder¹¹ in their study point out that there are indications that the lack of interest in certain areas, may give important clues in the vocational guidance of students.

The literature as reviewed here tends to indicate that the interests measured with the preference type of items as used in the Kuder Preference Record could be considered fairly stable. Most of the literature which has been reviewed up to this point has been concerned with form B of the Kuder Preference Record. However we hope it does not

¹⁰Ibid., P. 267.

¹¹J. R. Wittenborn, Frances O Triggs and Daniel D. Feder. "A Comparison of Interest Measurement by the Kuder Preference Record and The Strong Vocational Interest Blanks for Men and Women." Educational and Psychological Measurement, III, (1943), P. 254.

seem too ambiguous if we apply these conclusions to form C, since the content and the development of this form is essentially an enlargement and improvement of form B. Other references on the reliability, fakability, validity, and the stability of the Kuder Preference Record are reviewed in chapter IV of this study.

Bardin¹² writing in the mental measurements yearbook reaffirms the statement that for most purposes in the testing of vocational interests the Kuder Preference Record, and the Strong Vocational Interest Blank are the usual choices. He establishes the chief difference in the development of these inventories as being the fact that the Kuder Preference Record identifies broad areas of vocational interest and proceeds to translate them into specific occupations. While the Strong Vocational Interest Blank identifies the interests of specific occupational groups, and through the use of factor analysis translates them into broad areas of vocational interest.

Carter¹³ writing in this same journal brings up the point that the Kuder Preference Record is best suited for use with high school students and college freshmen. He also considers it well suited for what he considers as adults not in the professions. He points out the possibility of subjects making poor responses to items when they are ignorant or misinformed about an activity, and therefore can hardly have a well developed interest in it.

¹²O. K. Bures. The Fourth Mental Measurements Yearbook. (Gryphon Press, Highland Park, New Jersey, 1953), P. 742.

¹³Ibid., P. 742.

Towler¹⁴ elaborates on this same aspect of the use of preference items on the Kuder Preference Record with this statement: "Student responses may vary according to what they think the items mean."

Freeman¹⁵ in his text on testing emphasizes the fact that has been the basic assumption used by Kuder in the development of this preference record. He states the assumption in this manner: "Motivation as determined by one's interests, values, and preferences may be the deciding factor in the selection of a course of study or an occupation." Later in his book he elaborates on this by saying:

The principle underlying these and similar inventories is that an individual who has a pattern of preferences and dislikes similar to the distinguishing aspects of a given group or occupation has a greater chance of finding the activity congenial and hence of succeeding in it, provided of course he also has the degree of aptitude required.¹⁶

Since this study is concerned with the measuring of interests for a selected population it seems important at this point that we get a concept of the definition of the term interest. Super¹⁷ in his text gives us four interpretations of interest, as connected with the method of obtaining the evaluation of these interests:

Expressed interest is the verbal profession of interest in an object, activity, task, or occupation. The stability of expressed interests for children and adolescents are questionable. The importance to be attached to expressed interest depends on the maturity of the subjects, and the manner in which the questions are formed to determine this interest.

¹⁴Ibid., P. 742.

¹⁵Frank S. Freeman. Theory and Practice of Psychological Testing. (Henry Holt and Company, New York, 1950), P. 300.

¹⁶Ibid., P. 302.

¹⁷Donald E. Super. Appraising Vocational Fitness. (Harper and Brothers, New York, 1949), P. 377 - 379.

Manifest interest is synonymous with participation in an activity or occupation. It must be appreciated that manifest interest may be the result of interest in the concomitants or the by-products of the activity itself. Also opportunities for the manifestation of an interest may be limited by financial and environmental conditions.

Tested interest is used to refer to interest as measured by objective tests, as differentiated from inventories which are based on subjective self-estimates. These tests are based on the assumption that since interest in a vocation is likely to manifest itself in action, it should also result in an accumulation of relevant information. Interest is thus measured by the type and amount of information retained.

Inventoried interest is assessed by means of lists of activities and occupations. Each item is responded to with an expression of preference. Scores are weighted, and the results yield a pattern of interests.

From these classifications it could be seen that the interests as measured and used in our study are inventoried interests. We have used the term "measured interests" to be synonymous with "inventoried interests," as defined by Super in his study. Super further states in his text that interests are the product of the interaction between the inherited aptitudes and endocrine factors of the individual balanced with the opportunities and the social evolution of the individual.¹⁸

Ferguson¹⁹ in his text, has given us some data on the early history of the development of the Kuder Preference Record. Ferguson points out that Kuder developed his scales with the opposite approach from Strong. Kuder developed his scales without reference to what they might actually measure in terms of vocational significance. The first development toward the Kuder Preference Record was a list of 200 activities, which Kuder arranged into forty groups, with five activities in each group.

¹⁸Ibid., P. 406.

¹⁹Leonard W. Ferguson. Personality Measurement. (McGraw-Hill, New York, 1952), P. 68 - 71.

These items were then administered to 500 students at Ohio State University, and the students were asked to rank the activities in order of their preference for each of the forty groups. The literary scale was first developed, and then the experimental scale²⁰ was developed by correlating the items ranked by the students. Kuder was attempting to establish scales which were independent, and had very little inter-correlation between scales. Kuder then improved on his work by collecting additional items, and administering these with the previous items to new groups of students. He thus developed a scale for social prestige, and he attempted to develop scales for such areas as athletics, religion, finance, politics, and annoyances. The main hinderance in these areas was the fact that the new scales showed a marked correlation with the social prestige scale. He was thus forced to discard the social prestige scale, and he divided these items among other scales which were then being proposed.

Kuder worked until he got seven scales which he called, literary, experimental, artistic, computational, persuasive, musical and social service. These scales were first published as the Kuder Preference Record, form A about 1939. Two additional scales were added in 1942 for mechanical and clerical activities, and published as form B. Kuder developed these additional scales in terms of a criterion of internal consistency and he did not concern himself with how these two scales correlated with the original seven scales of form A. Form C, of the Kuder Preference Record was first published in 1948 with an added scale for outdoor activities, and a verification scale. This is the form with which our study is concerned.

²⁰ This scale was later renamed as the scientific scale.

Interest and Scholastic Achievement

Since one of the problems with which this study is concerned is the relationship between scholastic achievement and interests for the fire protection students at Oklahoma A. & M. College, it could be important at this time to review some of the previous studies made on the relationship of the Kuder Preference Record scores and scholastic achievement with college students.

Crosby²¹ in his study at Cornell University attempted to seek the relationship between interests as established by the Kuder Preference Record, and achievement in various fields of college work as measured by grades. He selected 140 students in agriculture and home economics, and took their scores on the scientific scale and correlated it with their mean chemistry and biological grades. Next he selected 80 students from the hotel school at Cornell and correlated their Kuder Preference scores on the computational scale with their mean accounting grades. With both of these groups Crosby used only the extremes of the groups, as both groups had a tendency to gather at the mean on the interest scales. Crosby's study resulted in the following Pearsonian correlation coefficients. Scientific interest scale to mean chemistry grade .64, and to the mean biological grade .67, computational interest scale to mean accounting grade .67. Crosby concludes his study with the statement. "These studies confirm Kuder in that they show a positive relationship between interest in certain scales of the Kuder Preference Record and achievement in school subjects."²²

²¹R. C. Crosby. "Scholastic Achievement and Measured Interests." Journal of Applied Psychology, XXVII, (1943), P. 101-103.

²²Ibid., P. 103.

Frandsen²³ points out the need for experimental designs in this area of interest and achievement to avoid the influence of masking factors. He further states that interests may correlate significantly when achievement involves performance over a long period of time as opposed to a short period of time. He found for college sophomores a correlation of .50 between scientific interest, as measured by the Kuder Preference Record, and long range achievement in science as measured by the General Educational Development Test in Natural Science.

Triggs²⁴ in her study at the University of Illinois with 267 students, formed as one of her conclusions the following statement in appraising the relationship between interest and ability: "More marked relationships appear between interest and ability, when the tests used measure similar factors, such as computational interests and computational abilities."

Wesley, Corey and Stewart²⁵ in their investigation with interest and ability point up Strong's theory on studies showing low correlation between interest and ability. This theory states that a low or negligible correlation seems to lie in the fact that different interests are matched with a single general ability such as college grade point averages or intelligence test scores, rather than matching specific abilities corresponding to specific interests. In their study Wesley, Corey, and

²³Arden Frandsen. "Interests and General Educational Development." Journal of Applied Psychology, XXXI, (1947), P. 57 - 66.

²⁴Frances O. Triggs. "A Study of The Relation of The Kuder Preference Record Scores to Various Other Measures." Educational and Psychological Measurement, III, (1943), P. 354.

²⁵S. M. Wesley, Douglas Q. Corey, and Barbara M. Stewart. "The Intra-Individual Relationships Between Interest and Ability." Journal of Applied Psychology, XXXIV, (1950), P. 193 - 197.

Stewart attempted to measure the relationship between vocational interests and abilities, when the magnitude of the test scores was relative to the individual's own level, rather than to the group level of interest and ability. The Kuder Preference Record, and ability tests corresponding to seven interest areas were administered to 156 male college students. The Kuder Preference Record, form B was used, and the scales of persuasive and social service were omitted due to a lack of adequate tests of ability in these areas. In their results these investigators found a mean correlation using the Pearsonian coefficient of correlation between interest and ability of .30 for the group, and .42 for the individual. They also determined the rank order correlations between the seven interest areas and the seven ability areas for 100 of the subjects. The mean of these correlations was .46.

Freeman²⁶ in his book gives support to what has been stated in some of the previous studies reviewed here. He stated, "Scores obtained with the Kuder Preference Record have a low correlation with educational achievement tests, course marks, and with tests of general intelligence."

Phillips and Osborne²⁷ in their study attacked the problem of interest and ability or achievement in another manner. They attempted to determine if the Kuder Preference Record would differentiate between students on scholastic probation. They found that the Kuder Preference scores for students on scholastic probation do not differ significantly

²⁶Freeman. Theory and Practice of Psychological Testing. P. 303.

²⁷W. S. Phillips and R. T. Osborne. "A Note on The Relationship of The Kuder Preference Record Scales to College Marks, Scholastic Aptitude, and Other Variables." Educational and Psychological Measurement, IX, (1950), P. 338.

from the scores made by students not on probation. The subjects used in their study were all business administration students at the University of Georgia. Their data also showed there was no significant relationship between the several Kuder Preference Record Scales and the course grade, and that college marks could not be successfully predicted from scores on the Kuder Preference Record.

In summarizing the studies which have been reviewed in this area, it appears that interests as obtained on the scales of the Kuder Preference Record when correlated with general measures of achievement or ability will usually yield low correlations. However it seems when the individual scales are correlated with matching ability tests, or specific achievement tests relative to the area involved, or college grades relative to the scale involved, higher correlations may sometimes be obtained. This seems reasonable when we consider we could no more expect a high correlation between the musical scale and accounting grades, than we could between the computational scale and music grades.

It has been the purpose of this chapter to give a review of the previous research as directly related to this study. And to review studies that would give us a better understanding of the concept, of interest as relative to its measurement. We have also attempted to include studies which may give an insight into the development, structure and characteristics of the Kuder Preference Record.

CHAPTER III

DEFINITION OF THE POPULATION FOR THE STUDY

The Fire Protection School at Oklahoma A. & M. College differs from the only comparable school, that of Fire Protection Engineering at The Illinois Institute of Technology in various ways. First, academically, the school at the Illinois Institute of Technology is set up with a four-year curriculum, with the graduates receiving a bachelor of science degree in fire protection engineering and safety. The school at Oklahoma A. & M. College is set up with a two-year curriculum, and the graduates receive a certificate as technicians in fire protection.

It was felt the differences in the learning and living experiences of the students of the two schools might be reflected in their measured interests. The students at the Illinois Institute of Technology, have the usual or typical experiences of college students which consist of attending classes, attending laboratories, and taking field trips. Also the students attending The Illinois Tech school live in less formal or more diverse groups in homes, dormitories, and boarding houses. In contrast at the Oklahoma A. & M. school all the single students, and some of the married ones live and eat in the two city fire stations. Here the students operate as a more homogeneous group, with their own social functions, studying conditions, and learning experiences within the overall influence of college activities. The students at Oklahoma A. & M., after their first semester, obtain experience to supplement their studies, with their inclusion as members of the city fire

department. In this manner the students work together in a variety of emergency situations. These circumstances tend to give them an experience bond of common knowledge and learning.

It was thought that possibly these differences in school and living environment of the two student populations, might result in differences between their measured group interests. This is the basic assumption behind the comparison of the students in the two schools, since as graduates they go into similar employment situations, and sometimes work for the same organizations.

Student Population

The student population enrolled in the Fire Protection School at the Oklahoma A. & M. College for the school year 1953 and 1954, is a heterogeneous group according to age. The students are all white, male, with an age range of from 18 years of age to 44 years of age. The mean age of the group of forty-one students as considered in this study is 23.3 years of age, which is slightly high, considering that most of the students are classified as freshmen and sophomores in their college standings. This distribution of ages of the students is further clarified in Table 1.

Marital Status

It could be expected that the fire protection student body as a group would have a rather large marital population, commensurate with the higher age levels represented in the population. Over 31 per cent of the total student population are married. This represents fourteen of the students out of the group of forty-one. Table 2 shows this distribution in relation with the graduate population.

TABLE 1.
DISTRIBUTION OF AGES OF SUBJECTS IN
TOTAL TESTED POPULATION

Age In Years	No. Of Graduates#	No. Of Students	Total No. Of Subjects
18	-	9	9
19	-	6	6
20	1	2	3
21	1	3	4
22	1	2	3
23	4	3	7
24	7	4	11
25	6	2	8
26	2	1	3
27	1	-	1
28	4	3	7
29	2	-	2
30	5	1	6
31	2	1	3
32	2	-	2
33	1	2	3
34	2	-	2
35	2	-	2
36	-	-	-
37	-	-	-
38	-	1	1
39	-	-	-
40	-	-	-
41	1	-	1
42	-	-	-
43	-	-	-
44	-	1	1
Total N =	44	41	85
Mean Age In Years	27.5	23.3	24.3
S.D.	4.39	5.89	5.57
S.E. _M	.67	.93	.60

#The term graduates in this study refers to graduates of the two-year Fire Protection School at Oklahoma A. & M. College.

TABLE 2
MARITAL STATUS OF THE
TOTAL POPULATION

GROUP	MARRIED	SINGLE	N
Tested Graduate Population	36	8	44
Non-Tested Graduate Population	2	5	7
Tested Student Population	14	27	41
Total Tested Population	50	33	85

Geographical Origin

Since, as we have already stated, schools on a college level for training in fire protection are limited to only two schools in the United States, we might expect the school at Oklahoma A. & M. College to draw a large out of state enrollment. Of the forty-one students considered in this study, only 29 per cent, or twelve students come from the state of Oklahoma. The remaining 71 per cent of the students come from twenty other states ranging from Connecticut to California, and from Minnesota to Texas. The distribution of states represented is clarified in Table 3.

Graduate Population

The graduate population from the Fire Protection School at Oklahoma A. & M. College, was not as large as it was first expected to

TABLE 3
GEOGRAPHICAL DISTRIBUTION OF TOTAL
TESTED POPULATION

Total N = 85

STATE [#]	NO. OF STUDENTS	NO. OF GRADUATES
Alabama	-	1
Arkansas	1	-
California	2	2
Connecticut	1	1
Georgia	-	1
Hawaii	1	-
Illinois	-	3
Indiana	1	2
Iowa	2	-
Kansas	-	1
Louisiana	1	1
Maryland	2	-
Massachusetts	1	2
Minnesota	1	-
Missouri	-	3
Montana	1	-
New Jersey	3	-
New Mexico	2	1
New York	3	1
Ohio	1	2
Oklahoma	12	16
Oregon	-	1
Pennsylvania	1	1
Rhode Island	1	-
Tennessee	1	1
Texas	2	2
Virginia	-	1
Washington	1	-
Wisconsin	-	1
Totals	29	44

[#]For graduates this is the state location of residence when tested. For students this is the state location of their residence before entering school.

be. This may be accounted for by several factors. First the school was started in 1938, and thus counting two years for each class, we could expect the first graduates in the spring of 1940. We would therefore expect to have about thirteen graduating classes to be considered in this study. However, due to the period of time during World War II, when the young male population was drawn into the armed services, the school was not operating for a period of four years. The fact that the early classes had a large percentage of withdrawals, and that the first enrollments were not very large should also be considered.

Year of Graduation

The total graduate population of the Fire Protection School as far as could be determined from the records of the school, and of the Oklahoma A. & M. College, numbers only fifty-one persons. These graduates received their certificates in nine graduating classes from 1940 through 1953. Seven of the graduates out of this population either failed to return their questionnaires or their interest inventories, and are not included in the results of this study. Table 4 classifies both the tested graduates, and the non-tested graduates as to their year of graduation. From this table it can be seen that the largest number of graduates have entered the field after 1950, with the largest class being graduated in 1952.

Age Distribution

The graduate population, like the student population is composed of all white, male subjects. The ages of the tested graduate population

TABLE 4
CLASSIFICATION OF GRADUATES AS TO YEAR GRADUATED
FROM FIRE PROTECTION

Year Graduated	Tested Graduates		Non-Tested Graduates	
	N	%	N	%
1940	2	4.5	-	-
1942	3	6.9	-	-
1944	-	-	1	14.2
1948	2	4.5	-	-
1949	5	11.3	-	-
1950	4	9.1	2	28.6
1951	8	18.2	2	28.6
1952	13	29.6	2	28.6
1953	7	15.9	-	-
Total N =	44	100.0	7	100.0

ranged from 20 years of age to 41 years of age. The mean age of this population was 27.3 years as compared to the student population mean age of 23.3 years. This information is further clarified and compared with the students age range in Table 1. By referring to this table, it also may be seen that the mean age for the total tested population of both graduates and students was 24.3 years of age.

Marital Status

It is not surprising that we find the graduate population has a higher number of married subjects than the student population. Over 81 per cent of the graduate population is married as compared to

41 per cent of the student population. By referring to Table 2 it may also be seen that for the total tested population of both students and graduates, 58 per cent of the total population is married.

Geographical Spread

With some of the graduates being out of school for eight or ten years, they are fairly well scattered throughout the United States. The tested graduates were located in nineteen states in addition to Oklahoma when they took the Kuder Preference Record. From Table 3 it will be noticed that over 36 per cent, or sixteen out of the forty-four graduates, were located in Oklahoma at the time they took the inventory. However it must be remembered that eight of these sixteen had graduated from fire protection and were still in school at Oklahoma A. & M. College obtaining a bachelor's degree, and not actively employed in fire protection. It might be interesting to consider at this point, if we have lost some geographical distribution from the seven graduates who did not participate in the study. Of these seven graduates there are only two located in states not represented by members of the tested graduate population. These states are Florida and Idaho, and the loss of these representatives is not considered to have seriously affected the results of this study.

Degree Population

Since many of the graduates of the Fire Protection School continue to attend college, either at Oklahoma A. & M. or some other institution for a bachelor's degree, a comparison of the interests of the graduates who go on for a degree and those who enter employment was considered an important part of this study. In considering those graduates who

continue for a degree, we find that out of a total tested graduate population of forty-four, twenty-four, or more than 54 per cent of the graduates receive a degree. The majority of the graduates have received their degrees in trade and industrial education, with twenty-two of the graduates receiving their degrees in this field. One graduate has received his degree in commerce, with his major field of study being property insurance. The remaining graduate received his degree in general education. By referring to Table 5 it may also be seen that for the non-tested graduate population three of the subjects received their bachelor's degree in trade and industrial education, and one received his bachelor's and his master's degree in trade and industrial education.

TABLE 5

CLASSIFICATION OF GRADUATES AS TO
COLLEGE DEGREE RECEIVED

College Degree Received in	Tested Graduates		Non-Tested Graduates	
	N	%	N	%
Trade & Industrial Education	22	50.0	3	42.9
Commerce (Property Insurance)	1	2.3	-	-
Education	1	2.3	-	-
No Degree	20	45.4	3	42.9
Advanced Degree	-	-	1	14.2
Total N =	44	100.0	7	100.0

Employment Stability

On the questionnaire that was mailed to all the graduates before they received the interest inventory, information was received as to the number of jobs held since graduation. It was felt that this item, might give some information as to the stability of the subjects in their specialized areas of fire protection. From Table 6 it can be seen that the largest number of jobs held by any graduate included in this study was four. Twenty-six or over 72 per cent of the graduates have only held one job since graduation. The total N for this table is only thirty-six since the eight subjects who were attending school at the time of testing were not employed in the field of fire protection. This leaves only ten or about 28 per cent of the graduates who have changed employment at least once since their graduation.

TABLE 6

NUMBER OF JOBS SINCE GRADUATION FOR
TESTED GRADUATE POPULATION

Total N = 36	
NO. OF JOBS	NO. OF SUBJECTS
One	26
Two	5
Three	4
Four	1
MEAN NUMBER OF JOBS PER GRADUATE 1.4	

Present Employment Tenure

As a further indication of the possible stability of the graduate's employment in fire protection, present job tenure was tabulated from the

questionnaire. Only the thirty-six graduates actively employed in fire protection were considered in this tabulation. The mean job tenure of these graduates on their present job was found to be 3.5 years. However since this distribution appeared to be skewed toward the lower end of the scale the median job tenure was also calculated, and was found to be 2.1 years, which is somewhat lower than the mean job tenure. The range of tenure for the graduates on their present jobs was from one year or less for seven subjects to seventeen years for one subject. This information is presented for examination in Table 7. It is of interest to note at this time that the graduate with the longest job tenure, is employed in the specialized area of public protection, and some of this tenure was accumulated while he was attending school.

TABLE 7

TENURE ON PRESENT JOB FOR TESTED
GRADUATE POPULATION

Total N = 36

YEARS	NO. OF SUBJECTS
0 - 1	7
1 - 2	10
2 - 3	9
3 - 4	3
4 - 5	-
5 - 6	2
6 - 7	1
7 - 8	-
8 - 9	-
9 - 10	-
10 - 11	-
11 - 12	-
12 - 13	1
13 - 14	1
14 - 15	1
15 - 16	-
16 - 17	1
Mean Job Tenure For Present Job = 3.5 Years	
Median Job Tenure For Present Job = 2.1 Years	
S. D. = 0.27	S.E.M = 1.06

Areas Of Specialization

Since one of the basic problems of this study was to attempt to discover if the graduates in their specialized areas of fire protection, differed in measured interest from graduates in other areas of fire protection, this data was tabulated from the questionnaires. It was found that 50 per cent of the graduates of the Fire Protection School at Oklahoma A. & M. College have entered the area of insurance employment. The area of specialization with the smallest number of graduates is the area of education and training which is represented by only one graduate. This information is presented in Table 8, with a classification of the non-tested graduate population. It is of interest to note that of the total graduate population of fifty-one, only two are not employed in fire protection, and both of these graduates are serving in the United States Army.

TABLE 8

CLASSIFICATION OF TOTAL GRADUATE POPULATION AS TO AREA OF FIRE PROTECTION

AREA OF FIRE PROTECTION	TESTED GRADUATES		NON-TESTED GRADUATES	
	N	%	N	%
Public Protection	5	11.4	-	-
Plant Protection And Safety	6	13.6	2	28.6
Equipment & Appliances	2	4.5	-	-
Insurance	22	50.0	2	28.6
Education & Training	1	2.3	-	-
Not In Fire Protection	1	2.3	1	14.2
Attending School for A Degree	7	15.9	2	28.6
Total N =	44	100.0	7	100.0

To further clarify the type of work and the number of graduates in the five different areas of specialization in fire protection, Table 9 presents the areas of specialization, with the job titles of the graduates, and the number of men directly supervised by these graduates. This table considers only the forty-four tested graduates, as this information was not available for the non-tested graduate population. It may be of interest to note that the largest number of men are supervised by the graduates in public protection, with but one exception with a graduate doing similar work in the plant protection and safety area. The large number of varied titles given for the graduates in the insurance area, with seven of the graduates having the title, "engineer" of one sort or another, may be noted. This may be explained by the practice prevalent among many of the insurance companies of classifying their employment positions with no standardization between the companies within the industry.

It is realized at this point, there may be some confusion, as to the difference in the employment duties of the graduates in the areas of specialization. It is for this reason that for the purpose of this study we have attempted to further clarify these areas with an employment description.

Public Protection. The graduates in this area are employed by municipalities in fire departments. The duties of these graduates embrace fire fighting, inspection of public and private buildings, prevention and educational programs on a municipal basis, and the training of men under their supervision in the above aspects.

Plant Protection and Safety. Industry employs the graduates in this area, usually in a staff capacity. Their duties often embrace the

TABLE 9
CLASSIFICATION OF JOB TITLES FOR TESTED GRADUATE
POPULATION FROM QUESTIONNAIRE

Area of Fire Protection	Job Titles	No. of Graduates	No. of Men Supervised
Public Protection	Fire Fighter	2	-
	Fire Captain	1	35
	Asst. Fire Chief	1	35
	Fire Chief	1	50
Plant Protection and Safety	Fireguard	1	-
	Fire Protection Engineer	1	-
	Fire Chief	1	45
	Safety Supervisor	1	-
	Safety Engineer	1	-
	Safety Director	1	3
Equipment and Appliances	President of Sprinkler Co.	1	10
	Sprinkler Engineer	1	1
Education and Training	Fire Marshal (U.S.A.)	1	27
Not In Fire Protection	Army Officer	1	-
Attending School for a Degree	Student	7	-
Insurance	Fire Prevention Analyst	1	-
	Loss Prevention Manager	1	10
	Engineer	1	-
	Fire Insurance Inspector	2	-
	Inspector	9	-
	Fire Protection Engineer	3	-
	Supervising Engineer	1	-
	Fire Insurance Engineer	1	-
	Fire Protection & Safety Engr.	1	5
	Tour Section Supervisor	1	7
	Fire Sales Engineer	1	-

area of safety as well as fire protection. These duties include fire prevention, fire fighting, the maintenance and designing of automatic alarm and extinguishing devices for special hazards specific to their industry, inspection for both fire and safety features, and employee education and training.

Equipment and Appliances. This area consists of the selling, installation, and the designing of automatic and manual detection and extinguishing equipment. The graduates in this area are both in the automatic sprinkler and detection field. This includes the surveying and inspection of buildings, as to their internal construction, and as to the insurance rate standards. These graduates then plan and install the equipment to fit the occupancy and the hazards involved with consideration to basic fire protection and insurance rating principles.

Education and Training. This area consists of the education, and the development of educational and training material for municipal and industrial fire protection personnel. The jobs in this area are usually on a state or governmental basis. The only graduate in this area happens to be doing this type of work for the United States Army.

Insurance. The graduates in this area of specialization are employed by fire and casualty insurance companies, and by state rating organizations. A complete description of the operation of these agencies is beyond the scope of this paper. Generally however the graduates employed by the rating bureaus, are engaged in setting insurance rates for cities, and for buildings of specific construction and hazard. These duties include largely inspection work, and to some extent investigation work. The graduates employed by the insurance companies are generally concerned with the inspection of the risks insured, to determine the liability

involved, and any corrective action that may be taken by the owner to reduce his hazard. Also these graduates may be concerned with the analysis of the losses of the company, and some investigation work as to the causes of the company losses.

Financial Compensation

As a possible measure of the financial success of the tested graduates with which this study is concerned, the information on the yearly salary of the graduates is presented in Table 10. It may be seen that the median salary is \$4550 per year. This is of considerable interest when it is remembered that the median job tenure of the

TABLE 10
SALARY DISTRIBUTION OF TESTED GRADUATE
POPULATION

YEARLY SALARY SCALE	NO. OF GRADUATES	% OF GROUP
\$1900 - \$2400	-	-
\$2500 - \$3000	1	2.8
\$3100 - \$3600	5	13.9
\$3700 - \$4200	6	16.7
\$4300 - \$4800	12	33.3
\$4900 - \$5400	4	11.1
\$5500 - \$6000	3	8.3
Above \$6000	5	13.9
Total N =	36	100.0
Median Salary Of Group = \$4550 per year		

graduates is only 2.1 years. The salaries range from a low of between \$2500 and \$3000 to a high of above \$6000. It is realized that the grouping of the salaries in these intervals leaves detailed information lacking, however it was felt the information obtained is essentially

complete for the purposes of this study. This grouping was accomplished to facilitate questionnaire response on this item.

Nature of Employment

Since this study is also concerned with a comparison of the graduates of the Oklahoma A. & M. Fire Protection School, and the graduates at the Illinois Institute of Technology, Speer's¹ Table 3 classifications as to the nature of employment duties was included in the questionnaire for this study. This classification was modified to the extent that the classification of "other" was included for graduates who felt they belonged in none of the Illinois Tech classifications. This information is presented in Table 11 of this study. It is of interest to note, that although two of the graduates are in the area of specialization in fire protection of equipment and appliances, they considered their work more engineering than sales in nature. It also may prove of interest to note that 69.5 per cent of the graduates consider their work to be engineering in nature, despite the fact that the curriculum at the Oklahoma A. & M. Fire Protection School does not grant a degree or certificate in engineering. This table includes only the tested graduates as this information was not available for the seven non-tested graduates.

It has been the purpose of this chapter to attempt to clarify the populations with which this study is concerned, and to explain the similarities and the differences between the Oklahoma A. & M. and the Illinois Institute of Technology populations.

¹George S. Speer. "The Kuder Interest Test Patterns Of Fire Protection Engineers." Journal of Applied Psychology, (1948), P. 525.

TABLE 11
CLASSIFICATION OF GRADUATES AS TO NATURE OF EMPLOYMENT
USING ILLINOIS TECH CLASSIFICATIONS

Work Classification	No. of Graduates	% of Group
Sales	-	-
Engineering	25	69.5
Administrative	9	25.0
Other	2	5.5
Total N =	36	100.0

CHAPTER IV

SELECTION OF THE TESTING INSTRUMENT

The Kuder Preference Record was first published in 1939 with form A, which contained seven scales. The development on this form started in 1934, and the work is still progressing on the improvement and the development of the Kuder Preference Record. Form B was developed in 1942, and contained nine scales, namely; mechanical, computational, scientific, persuasive, artistic, literary, musical, social service, and clerical. The present form C was first published in 1948, and has the added interest scale of outdoor, as well as a verification scale.¹ The form B scale was used by Speer² in his investigation at the Illinois Institute of Technology, and was one of the factors considered in the selection of the Kuder Preference Record for this investigation, since a comparison of the measured interests of the Illinois Institute of Technology population and the Oklahoma A. & M. Fire Protection School population was one of the chief problems of this study.

At this point it seems important to give a brief description of the Kuder Preference Record, Vocational form C, which is used in this study. The test booklet has seventeen pages with the test items listed on the pages, and the answers are marked on separate answer sheets.

¹Kuder, Examiner Manual For The Kuder Preference Record. P. 1

²Speer, "The Kuder Interest Test Patterns Of Fire Protection Engineers." P. 521-526.

Under each item there are grouped three activities, and the subject indicates his preference among the three as to the activity he likes the most, and the activity he likes the least. The test is clearly written and is self-administrable for most persons. The average adult usually completes the inventory in from thirty to forty minutes.

It now seems logical to consider the Kuder Preference Record with other interest measuring instruments in use today in the United States. Diamond³ in his study on the interpretation of interest profiles found that the Kuder Preference Record was the most commonly used of all the interest inventories in guidance centers. It was thus felt that the selection of this instrument by counselors skilled in guidance, was a positive recommendation for the use of the instrument in this study.

Roeber⁴ in his study on word usage in relation to interest inventories, compared seven of the instruments presently in publication. These were: The Brainard Occupational Interest Inventory, The Cleeton Vocational Interest Inventory, The Garretson-Symonds Interest Questionnaire, The Kuder Preference Record, The Lee-Thrope Occupational Interest Inventory, The Strong Vocational Interest Blank for Men, and The Thurstone Vocational Interest Schedule. Since the study was made with the difficulty of the words based on the ninth grade level, the only part of the study with which we are concerned was the tabulation of the number of different words used in the inventories, as a measure of the extensiveness of vocabulary. The Brainard Occupational Interest Inventory, The Kuder Preference Record, and The Lee-Thrope Occupational

³Solomon Diamond. "The Interpretation Of Interest Profiles." Journal Of Applied Psychology, XXXII, (1948), P. 512.

⁴Edward C. Roeber. "A Comparison Of Seven Interest Inventories With Respect To Word Usage." Journal of Educational Research, XIII, (1948), P. 17.

Interest Inventory were all found to have the lowest per cent of different words, among the inventories compared. This report would tend to indicate the Kuder Preference Record compares favorably with other interest measuring devices in relation to word usage in the items on the inventory.

In the study made by Malcolm,⁵ which compared four of the interest inventories, as to the role of the inventory in the counseling situation, he found that the Strong Vocational Interest Blank for Men was the best inventory for college men. The Kuder Preference Record was found to be best for high school men, and second best for college men. The inventories considered in this study were: The Kuder Preference Record, The Lee-Thrope Occupational Interest Inventory, The Strong Vocational Interest Blank, and Cleston's Vocational Interest Inventory. The study limited its comparison of the inventories to each other, and did not attempt to define the rating of best.

The reliability of the Kuder Preference Record as given by Kuder in his manual for form C. are as follows: outdoor .92, mechanical .92, computational .85, scientific .85, persuasive .91, artistic .86, literary .86, musical .86, social service .89, and clerical .86. These reliability coefficients were determined by the Kuder-Richardson formula, and were based on a norm group of 1,000 men. This group was obtained from a selection of 1,000 telephone subscribers in a stratified sample of 138 cities and towns selected from the Postal Guide, distributed all over the United States.⁶ It appears from this information given by Kuder

⁵David D. Malcolm. "Which Interest Inventory Should I Use." Journal of Educational Research, XLIV, (1950), P. 98.

⁶Kuder, Examiner Manual For The Kuder Preference Record. P. 20.

that the Kuder Preference Record may be considered as comparing favorably with other interest inventories on reliability.

Traxler,⁷ checked the reliability of the first Kuder Preference Record, form A, and the second Kuder Preference Record, form B, with a class of forty-one graduate students. He used the test-retest method after an interval of three days, and found a range of reliability coefficients from .93 for social service to .98 for both the computational and the clerical scales. He admitted his results might have been influenced by the memory effect and the small group, however he concluded: "This study suggests the reliability of the Kuder Preference Record compares favorably with that of other measuring instruments of similar length."

The subject of the susceptibility of the Kuder Preference Record to the faking of responses by subjects could also be considered at this time. Kuder explains his verification scale which is found on form C., as a measure for indicating subjects that have not followed directions or have been careless in their answers.⁸ This system was developed by the analysis of answers for the purpose of differentiating between answer blanks answered sincerely, and blanks answered with the intention of making a good impression. When applied to new groups, Kuder⁹ claims this scale has an accuracy of from 87 to 94 per cent, except for about 10 per cent of the group which are usually considered doubtful.

⁷Arthur E. Traxler. "A Note On The Reliability Of The Kuder Preference Record." Journal Of Applied Psychology, XXVII, (1943), P. 510.

⁸G. Frederick Kuder. "Identifying The Faker." Personnel Psychology, III, (1950), P. 166.

⁹Ibid., P. 165.

Cross,¹⁰ in his study on faking with the Kuder Preference Record, found that faking high was easier than faking down, especially for college students. However he points out, "In the properly motivated guidance situation this problem does not arise." In other words the Kuder Preference Record is susceptible to faking, but in the guidance situation this factor may be offset by good rapport established with the subjects.

In the study made by Longstaff,¹¹ on faking with the Kuder Preference Record, and The Strong Vocational Interest Blank, college graduate students were used. He found that the Kuder is easier to fake downward, as compared with the Strong, and the Strong was easier to fake upward as compared with the Kuder. He recommended as the best present method of control for faking the use of special directions to the subjects, especially in the industrial situation. Longstaff also stated, "the facts show little faking in the guidance situation."

In relation to the problem of faking on his interest blank, Strong¹² makes this statement. "The large number of correlations over .80 and over .90, are good evidence that there is a remarkable consistency in response to interest items. A small amount of faking would make such high correlations unlikely." From the above research results it appears that faking is not much of a problem outside of the industrial situation, and that where it does occur it is largely a problem of the proper motivation of the subjects.

¹⁰Orwin H. Cross. "A Study Of Faking On The Kuder Preference Record." Educational and Psychological Measurement, X, (1950), P. 277.

¹¹Howard P. Longstaff. "Fakability of The Strong Interest Blank and The Kuder Preference Record." Journal of Applied Psychology, XXXII, (1948), P. 369.

¹²Strong, Vocational Interests of Men and Women. P. 686-687.

The Validity of the Kuder Preference Record as given by Kuder¹³ in his manual is based on the profiles of occupational groups. A summary of more than 15,000 cases has been compiled. The validity of the Kuder Preference Record is demonstrated in situations where separate investigators, have obtained similar results with separate but similar populations. As in the investigation on business administration students by Phillips and Osbourne, at the University of Georgia, and Shaffer's investigation of the interest of business students at the University of Indiana. Kuder¹⁴ presents in his Table 4, the Pearsonian r coefficients of correlation for a population of 110 male subjects, on the nine comparable interest scales of form B and form C of the Kuder Preference Record. For the mechanical scale an r of .978, for the computational scale .953, the scientific scale .962, the persuasive scale .959, the artistic scale .958, the literary scale .926, the musical scale .958, the social service scale .942, and the clerical scale .951. It appears from the information considered that the Kuder Preference Record compares favorably with other interest inventories.

Having satisfied ourselves as to the acceptability of the Kuder Preference Record in relation to reliability, validity, fakability, its acceptance in the field of testing, and its general suitability for the type of study undertaken there were other factors to be considered. First, as previously mentioned, since we had intended to compare the two populations, from Oklahoma A. & M. College and the Illinois Institute of Technology, it was not practical nor did it seem to lend anything to the study to use two measuring instruments for different parts of the study.

¹³Kuder, Examiner Manual for the Kuder Preference Record. P. 13.

¹⁴Ibid., P. 18.

This factor in itself was a strong point for the selection of the Kuder Preference Record as the measuring instrument of this study. Secondly, there was the practical consideration of obtaining the test materials, booklets, answer sheet etc., and arranging for the scoring and the pro-filing of the results. The fact that the Bureau of Tests and Measurements of Oklahoma A. & M. College was able to supply these materials and execute the processing of the answer sheets, was another factor toward the use of The Kuder Preference Record. Finally since the testing instrument would have to be mailed to the graduates in the field, it was felt that a testing instrument should be used that was easy to understand, and was capable of being self-administered.

Although it is realized that there are other interest measuring inventories which have wide and favorable usage, for the purposes of this study the Kuder Preference Record, Vocational, form C was selected.

CHAPTER V

PROCEDURE

In Chapter One, it was indicated that the principal problem of this study was the analysis, and the comparison of the interests of the graduates and the students of the Fire Protection School at Oklahoma A. & M. College. In order to attack this general problem, it was first necessary to secure the cooperation of the graduates of the Fire Protection School. With the assistance of Professor R. J. Douglas, Head of The School of Fire Protection, a list was obtained of the persons obtaining a certificate, and graduating from the curriculum. The addresses were obtained for these graduates from the school's files, and the files of the Stillwater Fire Department. A letter was then formulated and sent to all the graduates with a questionnaire. In an effort to secure as high a response as possible, considering the small number of fifty-one subjects in the graduate population, these letters were all typed and addressed as personal letters to the subjects.

The Letter To The Graduates

Dear John Doe,

With the cooperation of Professor R. J. Douglas, and The School of Fire Protection at Oklahoma A. & M. College, I am conducting a research project into the interests of the students and the graduates of the Fire Protection School. This project is to include the interests of the subjects as determined by the Kuder Preference Record, an interest inventory, and as determined by the type of work they enter after graduation.

This project was suggested by a study made on the students and the graduates of the Fire Protection Engineering

Department at the Illinois Institute of Technology in 1948. I am interested in conducting a similar survey here.

I would appreciate very much your cooperation in filling out the enclosed questionnaire, and returning same in the self-addressed envelope. The information received for this project will be kept in the strictest confidence, and will be used only as it applied to the results of the group, and will not be used individually. By returning the questionnaire you will indicate to us a desire to participate in the project, and a copy of the Kuder Preference Record with directions will follow shortly. A copy of the summary of the study when it is completed will be sent to all persons cooperating in the project who desire it.

It would be most helpful if the questionnaire could be returned as promptly as possible. Thank you very much for your kind cooperation and consideration in helping us complete this research.

The Questionnaire

Since the survey of the literature for this study, has shown there are a number of variables that may effect the stability of a subject's interest patterns, a questionnaire was developed to be sent with the letter to all the graduates. This questionnaire was also devised as a means of obtaining supplementary information for the study, as to the area of specialization entered in fire protection, the job tenure of the subject, educational achievement level of the subject, and other factors which were believed to be of importance in evaluating a subject's interest pattern response. A secondary use of the questionnaire was to identify the cooperating graduates, before the Kuder interest inventories were mailed, since the inventories were sent only to those graduates who returned the questionnaire. Fifty-one letters and questionnaires were sent out to the total graduate population, and forty-six were returned for a response of 90 per cent. This response was far beyond our expectations, and may be considered as an indication of the cooperativeness of the graduate population in this study. This questionnaire was

Questionnaire Sent To The Graduates

SUBJECT INFORMATION

Name _____

Address _____

Age _____ Married _____ Children _____

Year Graduated from fire protection _____ Bachelor Degree year _____
(If Bachelor's was completed)

Bachelor Degree in what field _____

Master's or Doctor's Degree in what fields _____

Number of jobs since graduation _____

Number of promotions in each job _____

Number of raises in salary (include bonus) _____

Number of years on present job _____

Present job in which field (check one)

Equipment & Appliances _____

Public Protection _____

Plant Protection & Safety _____

Insurance _____

Education & Training _____

Not in Fire Protection _____

If not in Fire Protection, indicate field _____

Present job duties are largely of the following nature. (check one)

Sales _____

Engineering _____

Administrative _____

Other _____

Present salary range. (check one, and include all compensations)

\$1900 - \$2400 _____

\$2500 - \$3000 _____

\$3100 - \$3600 _____

\$3700 - \$4200 _____

\$4300 - \$4800 _____

\$4900 - \$5400 _____

\$5500 - \$6000 _____

above \$6000 _____

Give your present job title _____

If duties are supervisory or administrative, indicate number of persons
under your supervision _____

constructed with the basic problems of this study in mind, and consideration was given to the factors of questionnaire formation as outlined in Good, Barr, and Scates.¹

The list of the job duties on the questionnaire was obtained from the classification of the nature of the work of the Illinois Institute of Technology alumni as used by Speer² in Table 1 of his study. The areas of specialization were empirically determined to insure a comprehensive inclusion of all the graduates. The method of listing salaries on the questionnaire, in a range, rather than asking for a salary statement was used in an attempt to insure a high response on this item, and to overcome the operation of possible ego-involvement factors.

The Presentation of the Inventory to the Graduates

Since the graduates were scattered geographically throughout the United States, the only practical method of administering the inventory was to send the inventory booklet with an answer blank to the graduates through the mail. It was realized that the adoption of this procedure would necessitate the formulation of supplementary directions to be sent with the test booklets of the Kuder Preference Record. These directions were constructed, mimeographed, and sent to the graduates with a self-addressed return envelope, the test booklet, and an answer sheet of the machine scoring type. To avoid the shipping of the electrographic pencils through the mail, and the possible loss of these pencils, the

¹C. V. Good, A. S. Barr, and D. E. Scates, The Methodology Of Educational Research. (D. Appleton-Century Company, New York, N. Y. 1941), P. 337-343.

²Speer, "The Kuder Interest Test Patterns of Fire Protection Engineers." P. 522.

subjects were instructed to use ordinary lead pencils. When the answer sheets were received the responses were marked over with an electro-graphic scoring pencil. This method of administering the inventory to the graduates raises the possibility of the subject's receiving outside influence on his responses, and the problem of different environmental conditions of the different subjects. However it is felt that for the purposes of this study, it was one of the most effective methods of obtaining the responses of the graduates on the inventory.

Supplementary Directions Sent to the Graduates

DIRECTIONS

In this envelope you should find a self-addressed envelope, a test booklet, and an answer sheet. This inventory is merely an expression of your interest or preference for one type of activity over other activities.

First read the directions on the test booklet thoroughly. Then fill in your name on the answer sheet. Do not write on the test booklet. You will notice that the activities are placed under each item in groups of three. You should mark in the left hand column, the activity liked most, with an X made with an ordinary lead pencil. In the right hand column mark the activity liked least, with an X. The X should be made directly over the parallel lines opposite the activity chosen. Be sure that you mark for each item the activity liked most, and the one liked least. Do not skip any of the items, and leave them with no markings. Compare the three activities on each item as to the one you like most out of the three, and the one you like least out of the three.

This is a measure of your preferences, so make the comparisons as truthfully, and as sincerely as possible. There are no right or wrong answers, as this is a gauge of your interests, just be as sincere as possible.

There is no time limit on this inventory, take your time, as a true indication of your preferences, and not speed is desired. Most adults usually take from thirty to forty minutes to complete the inventory. If any of the words or phrases used in the inventory are difficult to understand, turn to the "List of Words and Phrases" which appear on the back of page 1 in the test booklet.

After you have completed the test, place the answer sheet in the return envelope with the test booklet, and mail as soon as possible.

Return On The Inventories

Forty-six inventories were sent out to the graduates who returned the questionnaire. Only two graduates failed to return the inventories sent out, thus giving a total response for the tested graduates of forty-four out of a total population of fifty-one subjects. This is a response of 86.9 per cent. There was a lapse of two months before the return of all the inventories was completed.

Testing Of The Students

As stated in chapter four, the testing instrument selected for this study was the Kuder Preference Record, Vocational, form C, using the machine scoring answer blanks. The students were tested in three separate groups, at three different times, under as similar conditions

as were possible. The students in group I were all enrolled in fire protection, and had been in school for a period of two months to six months. There were seventeen students in this group, all white, male, classified by the college as freshmen, with an age range from 18 to 38 years of age.

The second group was tested about a week after the first group, which was in the middle of November during the Fall Semester of the 1953-1954 school year. This group II consisted of students enrolled in fire protection, who had completed one year, and were engaged in their second and final year of study in fire protection. All of the subjects in this group were classified as sophomores with the exception of two, one a junior and one a senior, since they had received previous college training before entering the fire protection curriculum. This group had a total number of sixteen subjects, all white, male, and varying in age from eighteen to forty-four years of age. Both of these groups were tested during a regular class laboratory period, with all the time needed to complete the inventory being allowed. The same directions were used for all the groups, and the inventory was administered by the same person to the subjects. The testing was done in the same classroom for both groups, however, group I was tested in a morning period and group II was tested during an afternoon period.

The third group consisted of the freshmen students who entered the Fire Protection School for the Spring Semester of the school year 1953-1954. This group consisted of eight students, and all had been in school about one week at the time of testing. These students were all white, male, and they varied in age from eighteen to thirty years of age. These students were tested in a different classroom from the other two groups, but were tested during a regular class laboratory period. The students

were divided into these groups as a matter of convenience for testing, and according to the class schedules in fire protection. By referring to Table 12 a summarization of the student groups as classified for the administering of the Kuder Preference Record may be obtained.

TABLE 12
GROUPINGS OF THE STUDENTS FOR ADMINISTERING
OF THE KUDER PREFERENCE RECORD

Total N = 41			
Group	No. Of Subjects	Age Range	College Classifications
I	17	18 - 38	Freshmen
II	16	19 - 44	Sophomore - Senior
III	8	18 - 30	Freshmen
Total 3	41	18 - 44	Freshmen - Senior

Directions Given to the Students

The directions read to all three of the student groups before the administering of the Kuder Preference Record were as standardized as could be made possible by the author. All three of these groups were allowed to work until the inventories were completed. When each student had completed his inventory he was allowed to leave after the administrator had checked over the answer sheet for mechanical errors of marking the wrong column or omitting responses. All of the students marked their responses with the scoring pencils on the mechanical scoring type of answer sheet.

Directions

I am making a study on the interests of the students and the graduates of the Fire Protection School, and your Professor has graciously allowed me this time to obtain a record of your interests.

You are not required to take this inventory, and anyone not wishing to participate, may leave the room after we have started, just leave your test materials on the seat. This test is nothing but an indication of your interests, or your preference for one activity over other activities. There are no right or wrong answers, all that is wanted is a true indication of your own interests. There is no time limit, and speed is not a requirement, as you will be allowed to work until you finish.

First fill in your answer sheet with your name, age, and group number. Now open your test booklet and read the directions on page 1 of the booklet. You understand that you are to mark the activity liked most in the left hand column, and the activity liked least in the right hand column? For each item there are three activities, and you should mark the one liked least, and the one liked most. Be sure that you do not skip or omit any of the items.

Are there any questions? Remember this is an indication of your own interests. These results will be kept confidential and when the results are received, if you will come to me personally I will let you see your results.

All of the students who took the Kuder Preference Record appeared to show high interest in the taking of the inventory, and not one subject out of all the groups declined to participate in the project. All of the students showed enthusiasm in determining their results, after the profiles were established. This excellent cooperation of the students resulted in a 100 per cent response of the student population enrolled in fire protection for the school year of 1953-1954.

The Clarification of the Interest Profiles

After the scoring, and processing of all the interest inventories on the Kuder Profile sheets,³ the interest profiles were analyzed with

³The scoring and profiling of all the inventories was done by the Bureau of Tests and Measurements of Oklahoma A. & M. College.

the specific problems of this study in mind. The student testing groups I and III were combined to get all the freshmen students into one group. The following procedures were then adopted and worked through.

The raw Kuder scores of the freshmen students, and the arithmetic mean, standard deviation, and the standard error of the mean were obtained for the group on each of the ten scales of the Kuder Preference Record. The equivalent percentile mean score was obtained from the arithmetic mean by the use of the Kuder Interest Profile Sheet for the group on each of the ten scales of the inventory.

The statistical procedures which were followed with the freshmen students are also followed with the data obtained for the second year students in fire protection as a group, and for all the graduates of the School of Fire Protection considered as a group. The graduates were then sub-divided into groups as classified by their areas of specialization in fire protection from their questionnaire response. This data was then processed with an arithmetic mean, standard deviation, and standard error of the mean, and the equivalent percentile mean obtained on the ten scales, for the sub-divided groups of graduates. The specialized areas of education and training, and equipment and appliances were omitted, as the number of graduates in these two areas were too small to be of any significant value.⁴

The material needed for the comparison of the freshmen student population and the graduate population from the Illinois Institute of Technology study was obtained through the mail from Mr. George S. Spear.⁵

⁴The area of Education & Training has only 1 subject, and the area of Equipment & Appliances has only 2 subjects.

⁵Director, Institute for Psychological Services, Illinois Institute of Technology, Chicago, Illinois.

The final problem of the relationship of the interests of the Oklahoma A. & M. Fire Protection School students and graduates to their college achievement as measured by grades, was processed by the obtaining of the overall college and the fire protection course grade point averages from the Registrar's Office of Oklahoma A. & M. College.

The results and the detailed explanation of the statistical procedures, and comparisons as related to this study are found in Chapter VI.

CHAPTER VI

RESULTS OF THE STUDY

Comparison of the Oklahoma A. & M. and Illinois Tech Fire Protection Populations

The first section of our results is a comparison of the freshmen students and the graduates of the Oklahoma A. & M. Fire Protection School, with the freshmen students and the graduates of the Fire Protection Engineering Department at the Illinois Institute of Technology. In Table 13, the percentile rank of the mean Kuder Raw scores for the two populations are presented. The percentile ranks for the Illinois Tech population were taken from Table 1 of Speer's¹ study. As may be seen from our table, the graduates in the Oklahoma A. & M. population are lower than the Illinois Tech graduates on the mechanical, computational, persuasive, artistic, literary, and the social service interest scales. However, the Oklahoma A. & M. graduates are higher than the Illinois Tech graduates on the scientific, musical, and the clerical interest scales. Generally, we may see that the two graduate populations resemble each other on the Kuder interest scales with the exception of the persuasive, and the clerical scale.

To get an indication of how significant the differences on the Kuder interest scales for the two graduate populations are, we computed a critical ratio of the difference between the raw arithmetic mean Kuder

¹Speer. "The Kuder Interest Test Patterns of Fire Protection Engineers." P. 522.

TABLE 13

PERCENTILE RANK OF MEAN KUDER RAW SCORES OF A. & M. AND
ILLINOIS TECH FIRE PROTECTION FRESHMEN AND GRADUATES

Interest Scales	A. & M. Fire Protection		Illinois Tech Fire Protection Engineering	
	Freshmen	Graduates	Freshmen	Graduates
Mechanical	53	60	56	64
Computational	31	50	65	56
Scientific	45	53	55	49
Persuasive	63	43	65	88
Artistic	63	45	50	50
Literary	31	50	60	55
Musical	23	50	47	43
Social Service	59	48	43	53
Clerical	42	48	39	26
N	25	44	34	118

scores on each interest scale of the Kuder Preference Record. In order to compare the raw scores of the two populations, we first had to convert the form B Kuder Preference Record scores of the Illinois Tech graduate population to equivalent form C scores. This was accomplished by taking the percentile rank of the mean raw scores for the Illinois Tech graduates, and plotting this percentile rank on a form C Kuder Preference Record interest profile sheet. The raw scores were then read from the form C profile sheet and plotted in Table 14 of our study. The above procedure for converting the form B scores to form C scores was followed according to instructions from Science Research Associates, the publishers of the Kuder Preference Record.

TABLE 14
AVERAGE RAW KUDER SCORES OF A. & M. AND ILLINOIS
TECH FIRE PROTECTION GRADUATES

Interest Scales	A. & M. Graduates Fire Protection		Illinois Tech Graduates Fire Protection Engineering		D_{M1-M2}	S.E. _D	CR
	M	S.E. _M	M [#]	S.E. _M			
Mechanical	49.2	1.49	50.2	1.48	1.0	2.11	.48
Computational	27.8	1.24	29.4	1.07	1.6	1.64	.98
Scientific	41.1	1.63	40.0	1.25	1.1	2.05	.54
Persuasive	37.1	1.90	60.5	1.84	23.4	2.65	<u>8.83**</u>
Artistic	20.5	1.40	21.8	1.76	1.3	2.25	.58
Literary	18.9	1.11	20.2	1.61	1.3	1.95	.66
Musical	11.4	.85	10.4	.81	1.0	1.17	.85
Social Service	41.9	2.14	43.5	1.51	1.6	2.62	.61
Clerical	44.1	2.12	37.5	1.43	6.6	2.56	<u>2.58**</u>
N	44		118				

[#] These raw arithmetic mean scores are converted from form B raw scores to form C raw scores with the use of the Kuder Profile Sheet according to instructions from Science Research Associates.

** Critical ratios found significant at the 1 per cent level of confidence.

In Table 14 of our study we have presented the average raw Kuder scores of both the Oklahoma A. & M. and the Illinois Tech graduate populations. We have obtained the arithmetic mean of the raw scores, the standard error of the mean, and the difference between the means. To find the significance of this difference between the means of the two populations, we computed the standard error of the difference, and our critical ratio. From the critical ratio it may be seen that the difference of 23.4 on the persuasive scale and the difference of 6.6 on the clerical scale are both significant at the 1 per cent level of confidence.

Comparison of A. & M Fire Protection and Illinois Tech Fire Protection Engineering Freshmen

In Table 13, the percentile rank of the mean Kuder raw scores on each of the interest scales are presented for the freshmen students in both the Oklahoma A. & M. fire protection population and the Illinois Tech fire protection engineering population. The Oklahoma A. & M. freshmen are lower than the Illinois Tech freshmen on the mechanical, computational, scientific, persuasive, literary, and the musical interest scales. The Oklahoma A. & M. freshmen are higher than the Illinois Tech freshmen on the artistic, social service, and the clerical interest scales. The two populations are similar in the fact that the percentile rank scores tend to cluster around the mean with no characteristically high or low scores. The highest scores for the A. & M. population are at the 63rd percentile on the persuasive and the artistic scales. While the highest scores for the Illinois Tech freshmen are at the 65th percentile on the computational and the persuasive scales.

In Table 15 we have presented the average raw Kuder scores for both the Oklahoma A. & M. and the Illinois Tech freshmen populations. The raw Kuder scores for the Illinois Tech population were converted from form B scores in the same manner as the graduate scores were converted. First we computed the mean raw scores, and the standard error of the mean for both the populations. Then we determined the difference between these mean raw scores for each of the Kuder interest scales. To test the reliability of these obtained differences, the standard error of the difference, and the critical ratio were found. The difference of 6.2 between the mean raw scores on the literary scale, and the difference of 5.5 on the social service scale were both significant at the 5 per cent level of confidence. The difference of 7.5 on the computational scale was significant above the 1 per cent level of confidence.

In all the tables of this study presenting the percentile rank of the mean raw scores for the A. & M. population, the percentile rank scores were obtained by plotting the raw mean scores on the Kuder Preference Record form C profile sheet. In all the tables of this study presenting the raw Kuder mean scores, the standard error of the mean was obtained with the formula² as follows: $S.E._M = \frac{SD}{\sqrt{N-1}}$. The standard error of the difference between the means in all the tables of this study was computed by the use of the formula³ stated below.

$$S.E._D = \sqrt{S.E._M1^2 + S.E._M2^2}$$

. The formula⁴ used in the tables of our study to determine the critical ratio of the difference found between

²H. E. Garrett. Statistics in Psychology and Education. (Longmans, Green and Co., Inc., New York, 1952), P. 190.

³Ibid., P. 213.

⁴Ibid., P. 215.

TABLE 15
AVERAGE RAW KUDER SCORES OF A. & M. AND ILLINOIS
TECH FIRE PROTECTION FRESHMEN

Interest Scales	A. & M. Freshmen Fire Protection		Illinois Tech Freshmen Fire Protection Engineering		$D_{M1 - M2}$	$S.E._D$	CR
	M	$S.E._M$	$M^{\#}$	$S.E._M$			
Mechanical	46.7	2.11	47.6	3.25	0.9	3.87	.23
Computational	24.0	1.65	31.5	1.96	7.5	2.56	<u>2.92**</u>
Scientific	38.6	2.65	41.7	2.10	2.9	3.38	.86
Persuasive	44.8	3.27	45.0	3.05	0.2	4.47	.04
Artistic	25.1	1.89	21.8	2.10	3.3	2.83	1.16
Literary	14.9	1.26	21.1	2.71	6.2	2.99	<u>2.07*</u>
Musical	7.4	1.24	10.9	1.32	3.5	1.81	1.93
Social Service	45.4	2.15	39.9	1.63	5.5	2.70	<u>2.03*</u>
Clerical	42.4	2.68	41.3	1.65	1.1	3.15	.35
N	25		34				

#These raw arithmetic mean scores are converted from form B raw scores to form C raw scores with the use of the Kuder Profile Sheet according to instructions from Science Research Associates.

* Critical Ratios significant at or above the 5 per cent level of confidence.

** Critical Ratios significant at or above the 1 per cent level of confidence.

the means is $CR = \frac{D}{S.E._D}$. The obtained critical ratios were then checked for significance level with the use of Table D in Garrett's text.⁵

Comparison of A. & M. Fire Protection Graduates and
Illinois Tech Fire Protection Engineering Graduates According
to Nature of Employment Classifications

From the questionnaires sent to the A. & M. fire protection graduates we obtained classifications according to the nature of the services performed. For the Illinois Tech Fire Protection Engineering graduates we obtained this information from Table 3 of Speer's study.⁶ The classification of the nature of employment for "sales" as used in Speer's table was omitted from our comparison since none of the A. & M. graduates marked this classification. The arithmetic mean raw Kuder scores were obtained for the A. & M. graduates on each of the Kuder interest scales, and these scores were then converted to percentile ranks, since percentile ranks were used by Speer for his population. In the A. & M. population two of the thirty-six graduates employed in fire protection marked the neutral classification of "other," on the questionnaire, and were not included in this comparison. This gave us a total N for this comparison of thirty-four graduates in the A. & M. population.

The percentile ranks of the mean Kuder raw scores for each of the interest scales from both populations, are compared in Table 10 according to administrative and engineering employment classifications. The A. & M. graduates are higher than the Illinois Tech graduates for the

⁵Ibid., P. 427.

⁶Speer, "The Kuder Interest Test Patterns of Fire Protection Engineers." P. 525.

TABLE 16

PERCENTILE RANK OF MEAN KUDER RAW SCORES OF A. & M. AND ILLINOIS TECH
FIRE PROTECTION GRADUATES ACCORDING TO NATURE OF WORK CLASSIFICATION

Interest Scales	A. & M. Graduates Fire Protection		Illinois Tech Graduates Fire Protection Engineering	
	Adm.	Eng.	Adm.	Eng.
Mechanical	71	67	69	75
Computational	18	55	65	55
Scientific	37	63	47	56
Persuasive	45	40	77	77
Artistic	61	52	49	39
Literary	35	54	61	53
Musical	56	44	43	47
Social Service	62	36	41	64
Clerical	21	48	30	20
N	9	25	30	36

administration classification on the mechanical, artistic, musical and the social service interest scales. The only interest scale for the A. & M. graduates in this classification which is above the 65th percentile and which might be suggestive of high interest according to Kuder,⁷ is the mechanical scale. The Illinois Tech graduates in the administration classification have a score on the persuasive scale above the 75th percentile, which is considered high. These same graduates also have scores above the 65th percentile on both the mechanical and the computational interest scales.

⁷Kuder, Examiner Manual for the Kuder Preference Record. P. 13.

The graduates who classified their work as engineering in nature of the A. & M. population have only one score above the 65th percentile, and this is on the mechanical scale. The A. & M. graduates in this classification have higher percentile scores than the Illinois Tech graduates on the scientific, artistic and the clerical interest scales, with a slightly higher interest on the literary scale. The Illinois Tech graduates in the engineering classification have two scores that could be considered as high interest, being above the 75th percentile, on the mechanical and the persuasive interest scales. One of the important aspects of this classification appears to be the fact that the Illinois Tech graduates in both the administrative and the engineering classifications, have their highest scores on the persuasive and the mechanical interest scales. While the A. & M. graduates have their highest scores for both the administrative, and the engineering groups on the mechanical interest scale.

Overall Comparison of the A. & M. Fire Protection and the Illinois Tech Fire Protection Engineering Populations

From the preceding tables and presented information, it appears that the populations of the Oklahoma A. & M. Fire Protection School and the Illinois Institute of Technology Fire Protection Engineering Department are basically similar in interests as measured by the Kuder Preference Record. The freshmen of Illinois Tech are very significantly higher on the computational scale, and are significantly higher on the literary interest scale than are the A. & M. freshmen. The A. & M. freshmen are significantly higher on the social service interest scale than are the Illinois Tech freshmen. The graduates of the Illinois Tech population are very significantly higher than the A. & M. graduates

on the persuasive interest scale. The A. & M. graduates are very significantly higher on the clerical scale than are the Illinois Tech graduates. In all the comparisons made in this study between these two populations, the outdoor scale of the Kuder Preference Record was omitted, since the Illinois Tech population was tested with form B of the Kuder, which did not include this scale.

Analysis of the Oklahoma A. & M. Fire Protection Population

Comparison of Freshmen and Sophomore Students

The raw mean scores of the students were converted to percentile scores with the use of the Kuder Preference Record form C profile sheet. The freshmen students did not have any score that was above the 75th or the 65th percentile on the interest scales. Their scores tended to cluster around the mean with a low at the 23rd percentile on the musical scale, and a high at the 63rd percentile on the persuasive and the artistic interest scales. The sophomore students have one score above the 65th percentile, a score of 67 on the persuasive scale. The sophomore students' scores also tended to group around the mean with a low score at the 32nd percentile on the computational scale. Their high score was at the 67th percentile, as previously mentioned on the persuasive scale. The sophomore students are higher than the freshmen students on the computational, scientific, persuasive, literary, and the musical interest scales. The factor that seems to be of interest here is the fact that the highest percentile score for both groups is found on the persuasive interest scale. The students scores appear distinctive as related to the fact that these scores are spread along the mean with no characteristically high or low scores. This phenomenon

we will remember is what first prompted Speer to make his study at the Illinois Institute of Technology on the Fire Protection Engineering Population. The percentile scores of the freshmen and the sophomore student groups of the A. & M. population are presented in Table 17.

TABLE 17

PERCENTILE RANK OF MEAN KUDER RAW SCORES
OF A. & M. FRESHMEN AND SOPHOMORE STUDENTS
IN FIRE PROTECTION

Interest Scales	Freshmen Students	Sophomore Students
Outdoor	58	40
Mechanical	53	53
Computational	31	32
Scientific	45	48
Persuasive	63	67
Artistic	63	58
Literary	31	49
Musical	23	53
Social Service	59	54
Clerical	42	37
N	25	16

In our comparison of the average raw Kuder scores for the freshmen and the sophomore students we found that there was no difference between the means on the interest scales that was significant at the 5 per cent or the 1 per cent level of confidence. The arithmetic mean, the

standard error of the mean, the standard error of the difference, and the critical ratio were all computed using the formulas presented earlier in this chapter. The raw score data for the freshmen and the sophomore student groups of the A. & M. population are presented in Table 18.

TABLE 18
AVERAGE RAW KUDER SCORES OF A. & M. FRESHMEN
AND SOPHOMORE STUDENTS IN FIRE PROTECTION

Interest Scales	Freshmen Students		Sophomore Students		$D_{M1} - M2$	S.E. _D	CR
	M	S.E. _M	M	S.E. _M			
Outdoor	46.6	3.66	39.4	4.02	7.2	5.44	1.32
Mechanical	46.7	2.11	46.6	2.93	0.1	3.61	.03
Computational	24.0	1.65	24.2	1.88	0.2	2.51	.08
Scientific	38.6	2.65	39.9	3.23	1.3	4.18	.31
Persuasive	44.8	3.27	46.8	3.53	2.0	4.81	.42
Artistic	25.1	1.89	23.8	2.79	1.3	3.37	.39
Literary	14.9	1.26	18.7	1.74	3.6	2.15	1.67
Musical	7.4	1.24	11.9	1.89	4.5	2.26	1.99
Social Service	45.4	2.15	43.9	3.18	1.5	3.84	.39
Clerical	42.4	2.68	40.7	2.69	1.7	3.80	.45
N	25		16				

The consideration of the possibility of there being a significant difference between the variability of the two student groups as measured by the standard deviation of the raw scores from the mean for each of the

interest scales was next studied. The standard deviation of the raw scores for each scale was obtained using the formula⁸ $SD = \sqrt{\frac{N\sum X^2 - (\sum X)^2}{N}}$.

This formula is used throughout this chapter for obtaining the standard deviation of raw scores from the mean. Once the standard deviations were obtained the difference between these standard deviations were found. The significance of the difference ratio was obtained with the use of Burr's modification of the F ratio, which divided the larger standard deviation by the smaller standard deviation, and used the following formula:⁹ $\text{Significant Ratio} = \frac{S_1}{S_2}$. This formula is used in other tables in this study when we are dealing with uncorrelated data. The information on the variability of the raw scores on the interest scales for the freshmen and the sophomore groups is presented in Table 19. It may be of interest to note that the largest standard deviation for both groups was on the outdoor scale. The smallest standard deviation was found on the literary scale for the sophomore students, and on the musical scale for the freshmen students. None of the differences in variability between the two groups was found to be significant at or above the 5 per cent level of confidence. From the previously presented information and tables, it appears that the members of the freshmen and the sophomore student populations do not differ significantly from each other according to their mean interest profiles on the Kuder Preference Record.

⁸Garrett, Statistics in Psychology and Education. P. 55.

⁹I. W. Burr, "Tables for Determining Significance Between Small Sample Standard Deviations." Dept. of Mathematics, Purdue University: mimeo.

TABLE 19
THE VARIABILITY OF THE RAW KUDER SCORES
OF A. & M. FRESHMEN AND SOPHOMORE STUDENTS IN FIRE PROTECTION

Interest Scales	Freshmen Students	Sophomore Students	$D_{SD_1 - SD_2}$	Burr [#] Ratio
	SD	SD		
Outdoor	17.9	15.6	2.3	1.15
Mechanical	10.4	11.3	.9	1.09
Computational	8.1	7.3	.8	1.11
Scientific	13.0	12.5	.5	1.04
Persuasive	16.0	13.7	2.3	1.17
Artistic	9.3	10.8	1.5	1.16
Literary	6.2	6.8	.6	1.10
Musical	6.1	7.3	1.2	1.20
Social Service	10.6	12.3	1.7	1.16
Clerical	13.1	10.4	2.7	1.26
N	25	16		

[#]Burr's modification of the F ratio whereby larger S.D. is divided by the smaller S.D.

Comparison of the Graduates and the Students
of the Oklahoma A. & M. Fire Protection Population

The average raw Kuder scores for the forty-four graduates who participated in this study were computed, and the arithmetic mean raw scores on each interest scale was found. This mean raw score was then converted into an equivalent percentile rank score with the use of the Kuder Preference Record profile sheet, for form C. The tendency of the percentile scores to group around the mean, which we noticed in connection with the freshmen and the sophomore student profiles, is more pronounced with the graduate population. It appears there is no percentile score that could be considered high, since the mechanical scale shows the highest score at the 60th percentile. The persuasive scale shows the lowest score on the graduate profile at the 43rd percentile. This gives us a spread of seven percentile points below the mean and ten percentile points above the mean, for the ten interest scales in the graduate interest profile. These percentile scores are presented with the overall student profile of percentile scores in Table 20.

The overall student profile includes both the freshmen and the sophomore student groups, as previously considered. The only score that may be considered to have an indication of high interest is the percentile score of 65 on the persuasive scale. The student percentile scores range from a low at the 32nd percentile on the musical scale to a high at the 65th percentile on the persuasive scale. This gives us a spread of 18 percentile points below the mean and a spread of 15 percentile points above the mean. The mean percentile score on all the interest scales for the students is 48.5, as compared to a mean percentile score for the graduates of 50.3. The student percentile scores are

TABLE 20

PERCENTILE RANK OF MEAN KUDER RAW SCORES OF GRADUATES
AND STUDENTS OF A. & M. FIRE PROTECTION SCHOOL

Interest Scales	Students	Graduates
Outdoor	52	56
Mechanical	53	60
Computational	32	50
Scientific	47	53
Persuasive	65	43
Artistic	62	45
Literary	37	50
Musical	34	50
Social Service	57	48
Clerical	46	48
N	41	44

higher than the graduate percentile scores on the persuasive, artistic, and the social service scales. Thus the graduate percentile scores are higher than the student percentile scores on the outdoor, mechanical, computational, scientific, literary, musical, and the clerical interest scales.

In order to determine if the difference in the mean raw scores on each of the interest scales between the graduate and the student populations were significant, we first obtained the raw arithmetic mean score, and the standard error of the mean on each interest scale. The difference in the means for each interest scale were next obtained.

The smallest difference of 2.0 was found on the outdoor scale, and the largest difference of 8.5 was found on the persuasive scale. To determine the significance of these differences we had to obtain the standard error of the difference between the means, and then compute a critical ratio. These computations were obtained using the formulas previously given in this chapter. From the information as presented in Table 21, it may be seen that the difference between the means is significant above the 1 per cent level of confidence on the persuasive interest scale. While the difference on the computational interest scale is significant above the 5 per cent level of confidence. These critical ratios as with all the critical ratios used in this study, were checked against Table D in Garrett's text.¹⁰

We next considered the variability between the raw scores on each of the interest scales for both of the populations, using the standard deviation. In order to determine if there was a significant difference between the variability of the two populations, the difference between the standard deviations for the graduate and the student populations was found on each of the interest scales. The smallest difference of .3 was found on the computational interest scale, and the largest difference of 5.6 was found on the outdoor interest scale.

The Burr Ratio was then computed, and by referring to Table 22, we find that the difference between standard deviations on the outdoor and the social service interest scales are the only differences significant above the 1 per cent level of confidence. The mechanical, scientific, persuasive, artistic, literary, musical, computational, and the clerical interest scales all have differences in variability between the two populations which are not significant.

¹⁰Garrett, Statistics in Psychology and Education. P. 427.

TABLE 21
AVERAGE RAW KUDER SCORES OF GRADUATES AND STUDENTS
OF A. & M. FIRE PROTECTION SCHOOL

Interest Scales	Students		Graduates		$D_{M1} - M2$	S.E. _D	CR
	M	S.E. _M	M	S.E. _M			
Outdoor	43.8	2.75	41.8	2.11	2.0	3.47	.58
Mechanical	46.6	1.70	49.2	1.49	2.6	2.26	1.15
Computational	24.1	1.23	27.8	1.24	3.7	1.75	<u>2.11*</u>
Scientific	39.1	2.03	41.1	1.63	2.0	2.60	.77
Persuasive	45.6	2.40	37.1	1.90	8.5	3.06	<u>2.77**</u>
Artistic	24.6	1.57	20.5	1.40	4.1	2.10	1.90
Literary	16.4	1.06	18.9	1.11	2.5	1.53	1.63
Musical	9.2	1.10	11.4	.85	2.2	1.38	1.59
Social Service	44.8	1.79	41.9	2.14	2.9	2.79	1.04
Clerical	41.7	1.93	44.1	2.12	2.4	2.86	.84
N	41		44				

* Critical Ratio significant above the 5 per cent level of confidence.

** Critical Ratio significant above the 1 per cent level of confidence.

TABLE 22
THE VARIABILITY OF THE
RAW KUDER SCORES OF GRADUATES AND
STUDENTS OF A. & M. FIRE PROTECTION SCHOOL

Interest Scales	Students SD	Graduates SD	$D_{SD1 - SD2}$	Burr Ratio
Outdoor	17.4	13.8	5.6	<u>1.26</u> **
Mechanical	10.7	9.8	.9	1.09
Computational	7.8	8.1	.3	1.04
Scientific	12.8	10.7	2.1	1.20
Persuasive	15.2	12.4	2.8	1.23
Artistic	9.9	9.2	.7	1.08
Literary	6.7	7.3	.6	1.09
Musical	6.9	5.6	1.3	1.23
Social Service	11.3	14.0	2.7	<u>1.24</u> **
Clerical	12.2	13.9	1.7	1.14
N	41	44		

** Burr Ratio significant at or above the 1 per cent level of confidence.

In our comparison between the overall student population and the graduate population of the Oklahoma A. & M. Fire Protection School it appears that the populations tend to be similar in interest. This is shown by the fact that there are only two significant differences between the raw mean scores of the populations, and there are only two very significant differences in variability between the populations. The students seem to have a wider spread of scores as shown by the standard deviation of the raw scores on the outdoor, mechanical, scientific, persuasive, artistic, and the musical interest scales. The graduates thus have a wider spread of raw scores on the computational, literary, social service, and the clerical interest scales. Generally it appears that the two populations tend to resemble each other on their overall interest profiles in the fact that the scores tend to cluster around the mean on all the interest scales.

Comparison of the Graduates of the Oklahoma A. & M. Fire Protection School with and without College Degrees

Over half of the graduate population as considered in this study went on to receive college degrees after completing the two-year fire protection course at Oklahoma A. & M. College. It was felt it might be of interest to determine if these graduates had a significant difference in interest as measured by the Kuder Preference Record from the graduates who did not receive a college degree.

By referring to Table 23 it may be seen that the graduates with college degrees do not have any percentile score that might be considered as indicative of high interest, as their highest score is at the 63rd percentile on the musical interest scale. The graduates without degrees have a percentile score of 65 on the mechanical scale which might be

TABLE 23

PERCENTILE RANK OF MEAN KUDER RAW SCORES OF
FIRE PROTECTION GRADUATES WITH AND WITHOUT DEGREES

Interest Scales	Graduates With Degrees	Graduates Without Degrees
Outdoor	43	48
Mechanical	57	65
Computational	52	43
Scientific	48	58
Persuasive	40	46
Artistic	35	54
Literary	48	52
Musical	63	32
Social Service	51	43
Clerical	46	50
N	24	20

considered as indicating a high interest. The graduates with degrees are higher than the graduates without degrees on the scientific, computational, musical, and the social service interest scales. While the graduates without degrees are higher on the outdoor, mechanical, persuasive, artistic, literary, and the clerical interest scales.

In order to find out which, if any, of these differences were significant the average raw Kuder scores for both populations on the ten interest scales are presented in Table 24. The arithmetic mean, the standard error of the mean, and the difference between the means with the standard error of this difference are all presented. These findings

TABLE 24
AVERAGE RAW KUDER SCORES OF FIRE PROTECTION
GRADUATES WITH AND WITHOUT DEGREES

Interest Scales	Graduates With Degrees		Graduates Without Degrees		$D_{M1} - M2$	S.E. _D	CR
	M	S.E. _M	M	S.E. _M			
Outdoor	40.8	2.41	42.9	3.68	2.1	4.40	.48
Mechanical	48.0	2.48	50.5	1.41	2.5	2.85	.88
Computational	28.6	1.92	26.7	1.47	1.9	2.42	.78
Scientific	39.8	1.99	42.6	2.71	2.8	3.36	.83
Persuasive	36.4	2.57	37.9	2.88	1.5	3.86	.39
Artistic	18.6	1.40	22.8	2.55	4.2	2.91	1.44
Literary	18.4	1.89	19.5	.72	1.1	2.02	.54
Musical	13.7	1.23	8.8	.84	4.9	1.49	<u>3.29</u> **
Social Service	42.9	2.79	40.1	3.43	2.8	4.42	.63
Clerical	43.6	2.64	44.7	3.49	1.1	4.38	.25
N	24		20				

** Critical Ratios significant at or above the 1 per cent level of confidence.

were computed with the formulas presented earlier in this chapter. The only significant difference between the mean raw scores for these two graduate populations was a difference of 4.9 on the musical interest scale. This difference was found to be significant above the 1 per cent level of confidence.

In considering the difference in the spread of the raw scores on each of the interest scales for both of the populations as measured by the standard deviation, we obtained the reliability of the differences by using Burr's Ratio as presented earlier in this chapter. The differences between the standard deviations on the musical and the artistic interest scales for the two populations were both significant above the 5 per cent level of confidence. The differences between the standard deviations on the musical scale and on the literary interest scale were both significant above the 1 per cent level of confidence. This information is presented in Table 25. From this table it may be seen that the smallest standard deviation of 3.1 on the literary scale, and the largest standard deviation of 16.0 on the outdoor scale are both in the graduate without degree population.

From the tables and information that have been presented it appears that the graduate with college degree population differs from the graduate without college degree population in respect to raw mean scores on the Kuder interest scales very significantly, only on the musical interest scale. In the variability of the raw scores the only significant differences between the two populations are found on the mechanical, artistic, literary, and the musical interest scales. The graduate with college degree population is higher than the graduate without college degree population on the computational, musical, and the social service interest scales.

TABLE 25
THE VARIABILITY OF THE
RAW KUDER SCORES OF FIRE PROTECTION
GRADUATES WITH AND WITHOUT DEGREES

Interest Scales	Graduates With Degrees	Graduates Without Degrees	$D_{SD_1 - SD_2}$	Burr [#] Ratio
	SD.	SD.		
Outdoor	11.6	16.0	4.4	1.38
Mechanical	11.9	6.1	5.8	<u>1.95</u> **
Computational	9.2	6.4	2.8	1.44
Scientific	9.5	11.8	2.3	1.24
Persuasive	12.3	12.5	.2	1.02
Artistic	6.7	11.1	4.4	<u>1.66</u> *
Literary	9.0	3.1	5.9	<u>2.90</u> **
Musical	5.9	3.6	2.3	<u>1.64</u> *
Social Service	13.4	14.9	1.5	1.11
Clerical	12.7	15.2	2.5	1.20
N	24	20		

[#]Burr's modification of the F ratio whereby the larger S.D. is divided by the smaller S.D.

* Critical Ratios significant at or above the 5 per cent level of confidence.

** Critical Ratios significant at or above the 1 per cent level of confidence.

Comparison of the Graduates of the Oklahoma A. & M.
Fire Protection School as to Their Area of Specialization

One of the original purposes of this study was to attempt to determine if the graduates would have different interest profiles, when classified as to the specialized area of employment they entered in fire protection. We have considered only the areas of insurance employment, plant protection and safety, and public protection. The two areas of equipment and appliances, and education and training were omitted from this comparison due to the extremely small number of subjects in both these areas. In making this comparison between the three remaining areas, it is realized that the usefulness of these results are affected by the limited number of subjects in both the plant protection and the public protection classifications.

The percentile ranks of the arithmetic mean raw score on the ten interest scales for the three groups are presented in Table 26. As may be seen from this table, the graduates in insurance have one score that might indicate a possible high interest, and that score is at the 69th percentile on the mechanical scale. It might also be considered at this time, that the only score above the 65th percentile for the graduates in public protection is also on the mechanical scale. The graduates employed in the area of plant protection show a surprisingly high percentile score at the 74th percentile on the musical scale. This is the only score for this group that might be indicative of high interest. The thirty-six graduates actively employed in fire protection were the only subjects considered in this comparison. These graduates tend to show a little deviation from the previously observed tendency, of the interest scale scores to group or cluster around the mean. However, it

TABLE 26

PERCENTILE RANK OF MEAN KUDER RAW SCORES OF
A. & M. FIRE PROTECTION GRADUATES AS TO AREA OF EMPLOYMENT

Interest Scales	Graduates in Insurance	Graduates in Plant Protection	Graduates in Public Protection
Outdoor	53	34	55
Mechanical	69	60	69
Computational	46	26	55
Scientific	58	59	61
Persuasive	39	50	30
Artistic	56	46	33
Literary	52	60	27
Musical	34	74	48
Social Service	45	40	57
Clerical	43	28	41
N	22	6	5

must be considered that this could be caused by the small number of subjects in the groups of this comparison.

In our comparison of the mean raw Kuder scores for the three groups, we first compared the graduates in insurance with the graduates in plant protection. The only significant difference between the raw arithmetic mean scores was found on the musical scale, with a difference of 7.2 being significant above the 5 per cent level of confidence. This information is presented in Table 27 for further analysis.

We next compared the graduates employed in the specialized area of insurance with the graduates employed in the specialized area of public

TABLE 27

AVERAGE RAW KUDER SCORES OF
A. & M. FIRE PROTECTION GRADUATES
IN INSURANCE AND PLANT PROTECTION

Interest Scales	Graduates in Insurance		Graduates in Plant Protection		$D_{M1 - M2}$	$S.E._D$	CR
	M	$S.E._M$	M	$S.E._M$			
Outdoor	44.3	3.27	37.8	3.50	6.5	4.79	1.36
Mechanical	51.7	1.83	49.0	2.76	2.7	3.31	.82
Computational	27.1	1.39	22.8	2.91	4.3	3.23	1.33
Scientific	42.4	2.34	42.7	5.07	.3	5.58	.05
Persuasive	36.2	2.90	39.3	4.10	3.1	5.02	.62
Artistic	23.3	2.38	21.0	2.24	2.3	3.27	.70
Literary	19.5	1.24	21.5	4.69	2.0	4.85	.41
Musical	9.3	1.09	16.5	1.49	7.2	1.85	<u>2.89</u> **
Social Service	40.4	3.06	38.7	6.78	1.7	7.44	.23
Clerical	42.5	2.99	38.3	4.32	4.2	5.25	.80
N	22		6				

____** Critical Ratios significant at or above the 1 per cent level of confidence.

protection. As may be seen from Table 28 the graduates in these two areas of specialization do not have any significant differences between their raw mean scores on the ten interest scales of the Kuder Preference Record. It thus appears that the graduates in the specialized areas of insurance and public protection might possibly be considered as one population in regard to their arithmetic mean raw scores on the interest scales.

TABLE 28

AVERAGE RAW KUDER SCORES OF
A. & M. FIRE PROTECTION GRADUATES
IN INSURANCE AND PUBLIC PROTECTION

Interest Scales	Graduates in Insurance		Graduates in Public Protection		D_{M1-M2}	$S.E._D$	CR
	M	S.E. _M	M	S.E. _M			
Outdoor	44.3	3.27	45.8	6.30	1.5	7.10	.21
Mechanical	51.7	1.83	51.8	2.90	.1	3.43	.03
Computational	27.1	1.39	29.2	4.50	2.1	4.71	.45
Scientific	42.4	2.34	43.8	2.80	1.4	3.65	.38
Persuasive	36.2	2.90	32.6	4.80	3.6	5.61	.64
Artistic	23.3	2.38	18.0	3.50	5.3	4.23	1.25
Literary	19.5	1.24	14.0	2.90	5.5	3.15	1.74
Musical	9.3	1.09	11.0	18.70	1.7	59.20	.03
Social Service	40.4	3.06	44.6	7.40	4.2	8.01	.52
Clerical	42.5	2.99	42.2	5.40	.3	6.17	.05
N	22		5				

To complete our comparison of the graduates when classified as to their specialized areas of employment, we have compared the raw arithmetic mean scores on each of the ten interest scales for the graduates employed in the area of public protection and for the graduates employed in the area of plant protection. Since this comparison has a small number of subjects in both populations, it is not surprising that we find there is no significant difference between the raw mean scores on any of the interest scales. This information is presented in Table 29.

TABLE 29

AVERAGE RAW KUDER SCORES OF
A. & M. FIRE PROTECTION GRADUATES
IN PUBLIC PROTECTION AND PLANT PROTECTION

Interest Scales	Graduates in Public Protection		Graduates in Plant Protection		$D_{M1 - M2}$	S.E. _D	CR
	M	S.E. _M	M	S.E. _M			
Outdoor	45.8	6.30	37.8	3.50	8.0	7.21	1.11
Mechanical	51.8	2.90	49.0	2.76	2.8	4.00	.70
Computational	29.2	4.50	22.8	2.91	6.4	5.36	1.19
Scientific	43.8	2.80	42.7	5.07	1.1	5.79	.19
Persuasive	32.6	4.80	39.3	4.10	6.7	6.31	1.06
Artistic	18.0	3.50	21.0	2.24	3.0	4.15	.72
Literary	14.0	2.90	21.5	4.69	7.5	5.51	1.36
Musical	11.0	18.70	16.5	1.49	5.5	59.30	.09
Social Service	44.6	7.40	38.7	6.78	5.9	31.70	.19
Clerical	42.2	5.40	38.3	4.32	3.9	6.92	.56
N	5		6				

The Relationship Between the Interest Scores and Fire Protection Grades

It was believed that it might be possible to determine which interest scales, on the Kuder Preference Record correlated highly with fire protection grades. This comparison was sought to attempt to identify what scales might be representative of interest factors which have a relationship with the fire protection grades in the Fire Protection School at Oklahoma A. & M. College.

Correlation Between Students' Raw Interest Score and Fire Protection Mean Grade Point

The individual student's raw scores on each of the ten interest scales of the Kuder Preference Record were correlated with his fire protection grade point average. Eight of the students out of the total population of forty-one were omitted from this comparison since these students were freshmen who entered at the beginning of the spring semester, 1954, and no grades were available for these subjects. A Pearsonian coefficient of correlation¹¹ was obtained for the student population, and it is presented in Table 30, with the standard error of the r .¹² It may be noted that a high positive correlation is shown between the social service scale and fire protection grades with an r of .93. The clerical scale also shows a high positive correlation with fire protection grades with an r of .83. It is of interest to note that the outdoor interest scale shows a fairly high negative correlation with

¹¹Formula used to compute r .
$$r^2 = \frac{[N\sum XY - (\sum X)(\sum Y)]^2}{[N\sum X^2 - (\sum X)^2][N\sum Y^2 - (\sum Y)^2]}$$

¹²Formula used to compute S.E._r.
$$S.E._r = \frac{1 - r^2}{\sqrt{N - 1}}$$

TABLE 30

THE CORRELATION BETWEEN RAW KUDER SCORES AND
STUDENT'S FIRE PROTECTION GRADE POINT AVERAGE

Interest Scales	Pearsonian r	S.E. _{r}	Equivalent [#] Z
Outdoor	-.77	.07	-1.02
Mechanical	-.58	.12	-.66
Computational	.51	.13	.56
Scientific	.33	.16	.34
Persuasive	-.55	.12	-.62
Artistic	-.43	.14	-.46
Literary	.51	.13	.56
Musical	-.59	.11	-.68
Social Service	.93	.02	1.66
Clerical	.83	.05	1.19
N	33		

[#] Fisher's Z function as used to find the reliability of the difference between two r 's.

an r of $-.77$ for fire protection grades and the student population. It may also be noted from this table that five of the interest scales correlated positive with the fire protection grades and five of the interest scales correlated negatively with the fire protection grades. This table also includes the equivalent z score for each of the coefficients of correlation as determined from Table C of Garrett's text on statistics.¹³

Correlation Between Graduates' Raw Interest Scores and Fire Protection Mean Grade Point

It was decided to compute a correlation using the Pearsonian r on the relationship between the graduates' raw scores on the interest scales for each individual, and his fire protection grade point average. This was done in an effort to clarify the results obtained from the correlation found between interest scores and fire protection grades with the student population. It was realized that the results for the graduate population might be affected by the fact that the interest scores were determined some time after the grade points were obtained. Since some of the graduates were in school in 1939 and 1940 there is a time difference in some cases of as much as fourteen years, and in other cases as little time as six months. This correlation was computed on forty-three of the graduates, since one of the graduates was omitted from this procedure when it was found that his college transcript record was not available.

By referring to Table 31 it may be observed that the graduates' coefficients of correlation between fire protection grade point average and interest scores are presented with the standard error of the r , and the equivalent z scores for r . The graduates have five scales with a positive coefficient of correlation, and five scales with a negative

¹³Garrett. Statistics in Psychology and Education. P. 426.

TABLE 31

THE CORRELATION BETWEEN RAW KUDER SCORES AND
GRADUATES' FIRE PROTECTION GRADE POINT AVERAGE

Interest Scales	Pearsonian r	S.E. r	Equivalent z
Outdoor	-.63	.09	-.74
Mechanical	-.53	.11	-.59
Computational	-.56	.10	-.63
Scientific	.51	.11	.56
Persuasive	.44	.12	.47
Artistic	-.49	.12	-.54
Literary	.64	.09	.76
Musical	.89	.03	1.42
Social Service	.32	.14	.33
Clerical	-.75	.07	-.97
N	43		

coefficient of correlation. The graduate population has four coefficients of correlation that may be considered fairly high, two of which are positive and two of which are negative. The positive coefficients of correlation are an r of .89 on the musical scale and an r of .64 on the literary interest scale. The negative coefficients of correlation were found on the clerical scale, with an r of -.75, and on the outdoor scale with an r of -.63.

It might be of interest to note the interest scales where the coefficients of correlation from the two populations are at the opposite ends of the scale, positively or negatively. The students have a

positive r on the computational scale and the graduates have a negative r . While the students have a negative r on the persuasive scale and the graduates have a positive r . We find this same situation occurring on the musical and the clerical interest scales. It appears from the correlations of these populations and their mean fire protection grades, the only two scales that show a fairly high r for both populations are the literary scale with a positive r , and the outdoor scale with a negative r . However if we consider just the student population the social service and the clerical scales would also have to be considered.

The mean fire protection grade point for the student population was found to be 2.97, and for the graduate population the mean fire protection grade point was found to be 3.26.

The significance of the differences occurring between the coefficients of correlation for the student and the graduate populations as related to their fire protection grade point average are presented in Table 32. After the equivalent Z function scores were obtained for the r 's the difference between the Z 's was obtained. Then the standard error of this difference was obtained using the formula¹⁴ from Garrett's text.

$$S.E._{DZ} = \frac{1}{\sqrt{N_1 - 3}} + \frac{1}{\sqrt{N_2 - 3}}$$
 After the standard error of the difference was obtained, a critical ratio was computed and checked for significance. The only significant differences between the Z 's were found on the musical of 2.10 and on the clerical scale of 2.16, both of these differences were significant above the 1 per cent level of confidence. It should be noticed from this table that the differences between the Z 's from both populations was only .28 on the outdoor scale and on the literary scale this difference was only .20.

¹⁴Ibid., P. 239.

TABLE 32

SIGNIFICANCE OF THE DIFFERENCE BETWEEN THE r 's OF THE STUDENTS' AND
GRADUATES' RAW KUDER SCORES AND FIRE PROTECTION GRADE
POINT AVERAGE USING FISHER'S Z FUNCTION

Interest Scales	Student Z	Graduate Z	$D_{Z_1 - Z_2}$	S.E. _D	CR
Outdoor	-1.02	-.74	.28	.76	.37
Mechanical	-.66	-.59	.07	.76	.09
Computational	.56	-.63	1.19	.76	1.57
Scientific	.34	.56	.22	.76	.29
Persuasive	-.62	.47	1.09	.76	1.43
Artistic	-.46	-.54	1.00	.76	1.32
Literary	.56	.76	.20	.76	.26
Musical	-.68	1.42	2.10	.76	<u>2.76</u> **
Social Service	1.06	.33	1.33	.76	1.75
Clerical	1.19	-.97	2.16	.76	<u>2.84</u> **
N	33	43			

____** Critical Ratios significant at or above the 1 per cent level of confidence.

The results presented in this chapter were obtained in an attempt to investigate the relationship between the Oklahoma A. & M. College, and the Illinois Institute of Technology Fire Protection populations in respect to interest as measured by the Kuder Preference Record. The graduate population of the Oklahoma A. & M. Fire Protection School population was examined as to degree and non-degree subjects, nature of work classifications, and fire protection grade points. Since the uncontrolled variable of job tenure and seniority affected the salaries of the graduates it was decided we would not attempt in this study to include a financial grouping or classification of the graduates with respect to their measured interests. The student population of the Oklahoma A. & M. College Fire Protection School was compared with the interests of the graduates, and with the students' fire protection grade point average. The general conclusions based upon the use of statistical procedures which were presented in this chapter are given in chapter VII.

CHAPTER VII

SUMMARY AND CONCLUSIONS

General Summary of the Study

The principal problem of this study was to analyze the relationship of the interest profiles of the graduates and the students of the Fire Protection School at Oklahoma A. & M. College. This problem upon analysis and examination had several aspects.

- 1- An examination of the relationship between the interest profiles of the freshmen students and the graduates of the Oklahoma A. & M. College Fire Protection School and the Illinois Institute of Technology Fire Protection Engineering Department.
- 2- An analysis of the relationship between the freshmen and the sophomore students of the Oklahoma A. & M. Fire Protection population in regard to their interest profiles.
- 3- The determination of the relationship between the interest profiles of the students and the graduates of the Oklahoma A. & M. Fire Protection population, and their college achievement as measured by fire protection grades.
- 4- The examination of the interest profiles of the graduates of the Oklahoma A. & M. Fire Protection School in an effort to determine the relationship between interest and employment in different specialized areas of fire protection.
- 5- The analysis of the interest profiles of the graduates of the Oklahoma A. & M. Fire Protection School as to any measurable

differences in interest between graduates with college degrees, and graduates without college degrees.

The interests of the 85 subjects of this study were determined with the Kuder Preference Record, Vocational, form C. Applicable information on the graduates was determined by a questionnaire sent to the total graduate population of 51 subjects, and the 44 subjects responding were included in this study. These subjects were administered the Kuder Preference Record through the mail. The 41 students were tested with the Kuder Preference Record at the Fire Protection School of Oklahoma A. & M. College. The interest profiles of all the subjects were plotted on Kuder interest profile sheets for form C. These profiles were analyzed according to percentile mean scores, and raw arithmetic mean scores. The variability of the raw scores was analyzed by the use of the standard deviation, and Burr's Ratio. The mean fire protection grade point average and the raw mean interest scores were correlated using the Pearsonian r for the Graduate and the Student populations of the Oklahoma A. & M. Fire Protection School.

Summary of the Results

- 1- The Oklahoma A. & M. Fire Protection graduates scored higher on the clerical interest scale than did the graduates of the Fire Protection Engineering Department at the Illinois Institute of Technology. This difference was significant at the one per cent level of confidence.
- 2- The Illinois Institute of Technology Fire Protection Engineering graduates scored significantly higher, at the one per cent level

of confidence, on the persuasive interest scale than did the graduates of the Oklahoma A. & M. Fire Protection School.

- 3- The freshmen students of the Oklahoma A. & M. Fire Protection School scored significantly higher than the freshmen students in fire protection engineering at the Illinois Institute of Technology on the social service interest scale. This difference was significant at the five per cent level of confidence.
- 4- The Illinois Institute of Technology Fire Protection Engineering freshmen scored significantly higher on the literary interest scale than did the Oklahoma A. & M. Fire Protection freshmen. This difference was significant at the five per cent level of confidence. The Illinois Institute of Technology freshmen also scored higher on the computational scale than did the Oklahoma A. & M. Fire Protection freshmen. This difference was significant at the one per cent level of confidence.
- 5- The Oklahoma A. & M. Fire Protection freshmen and the graduates had no scores that seemed to indicate high interest on any of the scales.
- 6- The Oklahoma A. & M. Fire Protection graduates who classified their employment as administrative in nature, and the graduates who classified their employment as engineering in nature had scores that might indicate high interest on the mechanical interest scale. The Illinois Institute of Technology Fire Protection Engineering graduates who classified their employment as administrative in nature, and the graduates who classified their employment as engineering in nature had scores that might indicate high interest on both the mechanical and the persuasive interest scales.

- 7- The Oklahoma A. & M. Fire Protection freshmen and sophomore students showed no significant difference between the means of the raw interest scores, or in the variability of their raw interest scores.
- 8- The Oklahoma A. & M. Fire Protection freshmen and sophomore students when considered as one population have a score on the persuasive interest scale that might be indicative of high interest.
- 9- The students and the graduates of the Oklahoma A. & M. Fire Protection School differed significantly between their raw mean scores at the one per cent level of confidence on the persuasive interest scale. These two populations also differed significantly at the five per cent level of confidence on the computational interest scale.
- 10- The variability of the raw scores of the students and the graduates of the Oklahoma A. & M. Fire Protection School differed significantly at the one per cent level of confidence on the outdoor interest scale, and the social service interest scale.
- 11- The graduates of the Oklahoma A. & M. Fire Protection School with college degrees were significantly higher than the graduates without degrees on the musical scale. This difference was significant at the one per cent level of confidence.
- 12- The graduates of the Oklahoma A. & M. Fire Protection School with degrees differed in variability from the graduates without degrees on the mechanical and the literary scales, significant at the one per cent level of confidence; and on the artistic

and the social service interest scales, significant at the five per cent level of confidence.

- 13- The graduates of the Oklahoma A. & M. Fire Protection School classified in the area of insurance employment had a score on the mechanical scale above the 65th percentile, which could indicate a high interest.
- 14- The graduates of the Oklahoma A. & M. Fire Protection School classified in the area of public protection employment scored above the 65th percentile on the mechanical scale, which might indicate a high interest.
- 15- The graduates of the Oklahoma A. & M. Fire Protection School classified in the area of plant protection and safety employment, scored above the 74 percentile on the musical scale, which might indicate a high interest.
- 16- The only significant difference found between the raw mean scores of the graduates of the Oklahoma A. & M. Fire Protection School, when grouped as to their area of employment was found between the graduates in insurance and the graduates in plant protection and safety. This difference was found on the musical scale and was significant above the five per cent level of confidence.
- 17- The Pearsonian r coefficients of correlation on the raw scores of the interest scales for the students of the Oklahoma A. & M. Fire Protection School and their fire protection grade point average ranged from an r of $-.77$ to an r of $.93$.
- 18- The Pearsonian r coefficients of correlation on the raw scores of the interest scales for the graduates of the Oklahoma A. & M.

Fire Protection School and their fire protection grade point average ranged from an r of $-.63$ to an r of $.89$.

- 19- The only significant difference between the coefficients of correlation for the student population and the graduate population of the Oklahoma A. & M. Fire Protection School and their fire protection grade point average were found on the musical and the clerical interest scales. Both of these differences were above the one per cent level of confidence.

Review of Limitations

This study was limited by the following factors: The student population included only those subjects majoring in fire protection at Oklahoma A. & M. College during the school year 1953-1954. The graduate population included only those subjects who indicated a desire to participate in the study by returning the questionnaire. The interests as used in this study were determined as measured by the Kuder Preference Record, Vocational, form C.

The small number of subjects in this study from the Oklahoma A. & M. Fire Protection School generally tends to limit the conclusions that may be drawn from this study.

Conclusions

- 1- It appears that the students and the graduates of the Oklahoma A. & M. Fire Protection School tend to be a rather heterogeneous group in regard to their interests as measured with the Kuder Preference Record.

- 2- The student and the graduate populations of the Oklahoma A. & M. Fire Protection School do not appear to have any high or low interests that might be considered as characteristic of the group.
- 3- The interests of the student and the graduate populations of the Oklahoma A. & M. Fire Protection School appear to differ on the persuasive and the computational interest scales.
- 4- The literary and the outdoor interest scales appear to be the principal interest scales that show a consistent trend toward a stable relationship with fire protection grade point average for the student and the graduate populations of the Oklahoma A. & M. Fire Protection School.
- 5- It appears that the freshmen student populations of the Oklahoma A. & M. and the Illinois Institute of Technology fire protection populations tend to be similar in their interest profiles, in regard to the absence of high or low interests.
- 6- The high persuasive interest of the Illinois Institute of Technology Fire Protection Engineering graduates, as compared to the average persuasive interest of the Oklahoma A. & M. Fire Protection graduates may be the principal difference in interest between the two populations.
- 7- It is recommended that further study is needed on all aspects of the problems considered in this study.

Suggestions for Further Study

It is recommended that further study be conducted with interests as measured by the Kuder Preference Record and grades for college fire

protection students. This research might investigate the relationship between students with high and low grades and their interests.

The interest profiles of fire protection populations and their specialized areas of employment could be investigated when larger groups of subjects are available.

Further study into the interests of fire protection populations on a college level might be accomplished using other interest measuring inventories. It might be possible that the Kuder Preference Record does not measure some unknown interest factor common to college fire protection populations.

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VITA

John Leland Bryan
Candidate for the degree of
Master of Science

Thesis: THE KUDER INTEREST TEST PATTERNS OF THE STUDENTS AND THE GRADUATES
OF THE FIRE PROTECTION SCHOOL AT OKLAHOMA A. & M. COLLEGE.

Major: Psychology

Biographical and Other Items:

Born: November 15, 1926 at Washington, D. C.

Undergraduate Study: Oklahoma Agricultural and Mechanical College,
1948-1950 and 1952-1953.

Graduate Study: Oklahoma Agricultural and Mechanical College,
1953-1954.

Experiences: United States Navy, 1944-45. Municipal fireman,
1946-48. Fire Inspector employed by Grain Dealers Mutual
Insurance Company, 1950-52.

Member of Iota Lambda Sigma, Kappa Delta Pi, Psi Chi, and Associate Member
of The National Fire Protection Association, The International
Association of Fire Chiefs, and Junior Member of The Society of
Fire Protection Engineers.

Date of Final Examination: May, 1954.

THESIS TITLE: THE KUDER INTEREST TEST PATTERNS OF THE STUDENTS AND
THE GRADUATES OF THE FIRE PROTECTION SCHOOL AT
OKLAHOMA A. & M. COLLEGE.

AUTHOR: John Leland Bryan

THESIS ADVISER: Dr. Alexis M. Anikeeff

The content and form have been checked and approved by the author and thesis adviser. The Graduate School Office assumes no responsibility for errors either in form or content. The copies are sent to the bindery just as they are approved by the author and faculty adviser.

TYPIST: Mrs. Gordon F. Culver