To the Graduate Council:

I am submitting herewith a dissertation written by Robert E. Barnett entitled "The California Achievement Test-Level 19 as a Predictor of Success on State Board Test Pool Examination for Practical Nursing Candidates." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Education, with a major in Vocational-Technical Education.

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We have read this dissertation
and recommend its acceptance:

Accepted for the Council:

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Vice Chancellor
Graduate Studies and Research

THE CALIFORNIA ACHIEVEMENT TEST-LEVEL 19 AS A PREDICTOR OF SUCCESS ON STATE BOARD TEST POOL EXAMINATION FOR PRACTICAL NURSING CANDIDATES

A Dissertation

Presented for the

Doctor of Education

Degree

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Robert E. Barnett

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ABSTRACT

The primary purpose of the study was to determine the relationship between each of the subtests of the California Achievement Test--Level 19 (CAT-19) taken by the Practical Nursing students and their subsequent achievement on the State Board Test Pool Examination (SBTPE), and to determine which subtest or group of subtests, if any, could be used as a predictor of success on the SBTPE. A secondary objective was to study the relationship of the age of the students upon their performance on the SBTPE.

The population for the study was the students enrolled in the Practical Nursing Programs operated under the supervision of the Division of Vocational Education, State of Tennessee. The final population for the study was 884 students.

Data for the study were secured from: (1) a printout by individual Nursing Programs of the scores on the CAT-19, (2) Student Qualification Sheets, and (3) results of the SBTPE. The data were analyzed by frequency distribution charts using a cross-tabulation procedure, by correlation coefficients calculated by Pearson Product Moment, and selection of the Best Variable Model by the Maximum R^2 Improvement Technique.

The major findings of the statistical analyses were that: (1) statistically significant relationships were found for all independent variables and their relationship to success on the SBTPE,

(2) frequency distributions for all variables showed that as the score of the variable increased the average score on the SBTPE increased, and (3) the best single subtest selected was Reading Vocabulary.

Among the conclusions of the study were that (1) students between 17-23 enrolled in the program as a group will not perform as well as the students above that age, (2) students with low ability in measurable academic abilities can be expected as a group to provide a disproportionate share of the failures, and (3) students with poor reading skills will have a difficult time succeeding in the program.

TABLE OF CONTENTS

CHAPTER		PAGE
I.	STATEMENT OF THE PROBLEM	1
	Introduction	1
	Statement of the Problem	3
	Objective of the Study	3
	Hypotheses to be Tested	3
	Importance of the Study	5
	Assumptions of the Study	6
	Limitations of the Study	7
	Definitions of Terms	7
	Organization of the Study	8
II.	REVIEW OF RELATED LITERATURE AND RESEARCH	9
	Introduction	9
	Historical Studies	9
	Review of Related Literature	10
	Concepts of Tests as Predictors	16
	Summary of Related Literature and Research	17
III.	PROCEDURES OF THE STUDY	18
	Introduction	18
	Identification of the Population	18
	Selection of the Instrument	19
	Description of the Instrument	20
	Data Gathering Techniques	21
	Method of Data Analysis	23
IV.	PRESENTATION AND ANALYSIS OF DATA	26
	Introduction	26
	Age as a Factor	27
	Reading as a Factor	34
	Spelling as a Factor	47
	Language Scores as a Factor	50
	Mathematics as a Factor	63
	Reference Skills as a Factor	77
	Total Battery Score as a Factor	79
	Test for Best Variable	84
	Summary	86

CHAPTER PAGE

V. SUMMARY, CONCLUSION, AND RECOMMENDATIONS. 88

Summary 88
Findings. 91
Conclusion. 92
Recommendations 93

BIBLIOGRAPHY. 95

APPENDIX. 98

Letter of Support 99
Individual Data Card. 100
Student Qualification Sheet 101

VITA. 102

LIST OF TABLES

TABLE		PAGE
I.	State Board Test Pool Examination Scores	28
II.	Comparison of Age of Subjects and Performance on State Board Test Pool Examination.	29
III.	Frequency Distribution of State Board Test Pool Examination Scores by Age of Students.	32
IV.	Comparison of Raw Scores on Reading Vocabulary and Performance on State Board Test Pool Examination . . .	35
V.	Frequency Distribution of State Board Test Pool Examination Scores by Raw Scores on Reading Vocabulary	37
VI.	Comparison of Raw Scores on Reading Comprehension and Performance on State Board Test Pool Examination . . .	39
VII.	Frequency Distribution of State Board Test Pool Examination Score by Raw Scores on Reading Comprehension.	40
VIII.	Comparison of Raw Scores on Reading Total and Performance on State Board Test Pool Examination . . .	42
IX.	Frequency Distribution of State Board Test Pool Examination Scores by Raw Scores on Total Reading. . .	45
X.	Comparison of Raw Score on Spelling and Performance on State Board Test Pool Examination.	48
XI.	Frequency Distribution of State Board Test Pool Examination Scores by Raw Scores on Spelling	49
XII.	Comparison of Raw Score on Language Expression and Performance on State Board Test Pool Examination . . .	51
XIII.	Frequency Distribution of State Board Test Pool Examination Scores by Raw Scores on Language Expression	53

TABLE PAGE

XIV. Comparison of Raw Scores on Language Mechanics and Performance on State Board Test Pool Examination . . . 55

XV. Frequency Distribution of State Board Test Pool Examination Scores by Raw Scores on Language Mechanics. 57

XVI. Comparison of Raw Score on Total Language with Performance on State Board Test Pool Examination . . . 58

XVII. Frequency Distribution of State Board Test Pool Examination Scores by Raw Scores on Total Language . . 60

XVIII. Comparison of Raw Scores on Mathematics Computation and Performance on State Board Test Pool Examination . 64

XIX. Frequency Distribution of State Board Test Pool Examination Scores by Raw Scores on Mathematics Computation. 66

XX. Comparison of Raw Scores on Mathematics Concepts and Applications with Performance on State Board Test Pool Examination 68

XXI. Frequency Distribution of State Board Test Pool Examination Scores by Raw Scores on Mathematics Concepts and Application 70

XXII. Comparison of Raw Score on Total Mathematics with Performance on State Board Test Pool Examination . . . 73

XXIII. Frequency Distribution of State Board Test Pool Examination Scores by Raw Scores on Total Mathematics. 75

XXIV. Comparison of Raw Scores on Reference Skills with Performance on State Board Test Pool Examination . . . 78

XXV. Frequency Distribution of State Board Test Pool Examination Scores by Raw Scores on Reference Skills . 80

XXVI. Frequency Distribution of State Board Test Pool Examination by Raw Scores on Total Battery 82

XXVII. The Best One Variable Model by Maximum R-Square Improvement for Dependent Variable State Board Test Pool Examination. 85

TABLE PAGE

XXVIII. The Best Two Variable Model by Maximum R-Square Improvement for Dependent Variable State Board Test Pool Examination 85

XXIX. The Best Three Variable Model by Maximum R-Square Improvement for Dependent Variable State Board Test Pool Examination 86

CHAPTER I

STATEMENT OF THE PROBLEM

I. INTRODUCTION

In 1945 the Tennessee General Assembly made provisions for the licensing of Practical Nurses by amending the Nurse Practice Act to include the Licensed Practical Nurse. Two years later in response to local demand, the first Practical Nursing class was established as a pilot program in Nashville. Since that time, pilot program classes for Practical Nurses have spread throughout the state as the need for trained health care workers continued to escalate. These programs were operated under the supervision of the Division of Vocational Education, State of Tennessee, in cooperation with local board of educations and/or the State Area Vocational Technical Schools. These educational offerings represented an enormous undertaking involving a substantial financial investment of public funds as well as considerable investment of personal time and funds on the part of the student participants.

In view of the time and cost involved as well as the demands upon the person practicing nursing care, a guideline was adopted that stated that only persons should be selected for practical nursing classes who are mature, who are in good health, who have sufficient general education to profit by the instruction, and who intend to use

this education as their life vocation. In addition, one of the seven objectives of the program was to teach the student the basic nursing and related information necessary for a beginning practitioner of practical nursing. This statement implied that persons who successfully completed the requirements of the program should as a minimum be able to pass the licensing exams [State Board Test Pool Examination (SBTPE)] administered by the State Board of Nursing.

During the ten-year period preceding the study, the attrition rate of students, both those who did not complete the programs and those who completed but did not pass the exam increased. There was considerable concern expressed because of the declining performance of the graduates of the approved practical nursing programs in the State of Tennessee on the State Board Test Pool Examination. These concerns were the subject of attention of the Division of Vocational Education personnel, practical nursing instructors, and local administrative personnel responsible for the day-to-day operation of the programs.

Although the practical nursing students' level of communication and computational skills were identified as possible major contributary causes to the failure rate, only limited research had been done to identify or establish any relationship between measurable academic abilities and success on the State Board Test Pool Examination.

II. STATEMENT OF THE PROBLEM

The problem of the study was to examine the relationship between academic ability as measured by the California Achievement Test-Level 19 and performance on the State Board Test Pool Examination for Practical Nursing candidates.

III. OBJECTIVE OF THE STUDY

The major objective of the study was to investigate the relationship between each of the subtests of the CAT-Level 19 taken by the practical nursing students and their subsequent achievement on the State Board Test Pool Examination and to determine which subtest or group of subtests, if any, could best be used as a predictor of success on the State Board Test Pool Examination. A secondary objective was to study the relationship of the age of the students upon their performance on the State Board Test Pool Examination.

IV. HYPOTHESES TO BE TESTED

Hypotheses associated with the problem and relating to the analysis of the problem were stated in the null form for purposes of statistical analysis as follows:

Hypothesis No. 1 - There is no statistically significant relationship between the age of the students and their performance on the SBTPE.

Hypothesis No. 2 - There is no statistically significant relationship between the performance of the students on the Reading Vocabulary section of CAT-19 and their performance on the SBTPE.

Hypothesis No. 3 - There is no statistically significant relationship between the performance of the students on the Reading Comprehension section of the CAT-19 and their performance on the SBTPE.

Hypothesis No. 4 - There is no statistically significant relationship between the performance of the students on the Total Reading Score of CAT-19 and their performance on the SBTPE.

Hypothesis No. 5 - There is no statistically significant relationship between the performance of the students on the Spelling section of CAT-19 and their performance on the SBTPE.

Hypothesis No. 6 - There is no statistically significant relationship between the performance of the students on the Language Mechanics section of CAT-19 and their performance on the SBTPE.

Hypothesis No. 7 - There is no statistically significant relationship between the performance of the students on the Language Expression section of CAT-19 and their performance on the SBTPE.

Hypothesis No. 8 - There is no statistically significant relationship between the performance of the students on the Total Language Score of CAT-19 and their performance on the SBTPE.

Hypothesis No. 9 - There is no statistically significant relationship between the performance of the students on the Mathematics Computation section of CAT-19 and their performance on the SBTPE.

Hypothesis No. 10 - There is no statistically significant relationship between the performance of the students on the Mathematics Concepts/Application section of CAT-19 and their performance on the SBTPE.

Hypothesis No. 11 - There is no statistically significant relationship between the performance of the students on the Total Mathematics Score of CAT-19 and their performance on the SBTPE.

Hypothesis No. 12 - There is no statistically significant relationship betwen the performance of the students on the Reference Skills section of CAT-19 and their performance on the SBTPE.

Hypothesis No. 13 - There is no statistically significant relationship between the performance of the students on the Total Battery Score of CAT-19 and their performance on the SBTPE.

V. IMPORTANCE OF THE STUDY

Since the education of a practical nursing student represents a significant investment of public funds and effort as well as a tremendous investment of public funds and effort as well as a tremendous investment in personal effort, training costs, and foregone income on the part of the individual student, there was a great need to investigate the relationship between selected measurable academic abilities and expectation of success on the State Board Test Pool Examination.

If a relationship between selected communication and/or computational skills and success on the State Board Test Pool Examination was established the rate of success could possibly be improved by

providing guidelines for: (1) Establishing admission requirements that provide a reasonable assurance of success on the part of enrolling students; and (2) Identifying and/or providing remedial programs for applicants not initially meeting desired admission requirements. If the rate of success can be improved, the public will benefit because of more effective utilizations of the tax dollar, the practical nursing program will benefit because of an improved image, the Health Care industry will benefit because of having more Licensed Practical Nurses available and the graduates will benefit as a result of higher expectation of success on the State Board Test Pool Examination.

VI. ASSUMPTIONS OF THE STUDY

For the purpose of this study, the following assumptions were made:

1. All practical nursing students, regardless of class locations, completed an equivalent program of study as all programs were approved and operated under the supervision of the Division of Vocational Education.

2. All practical nursing students who graduated, regardless of class locations, met a minimum standard of achievement established at a level that assures a reasonable expectation of success on the State Board Exam.

3. The State Board Test Pool Examination administered at three different times contained test questions equivalent as to difficulty and coverage of material and were of equal validity and reliability.

4. The California Achievement Test-Level 19 was administered at all locations in accordance with established test procedures, and under suitable test conditions.

5. All test participants demonstrated their best performance on both the California Achievement Test-Level 19 and the State Board Test Pool Examination.

VII. LIMITATIONS OF THE STUDY

The study was limited to students enrolled in the approved programs of practical nursing operated under the supervision of the Division of Vocational Education, State of Tennessee. The study was further limited to those students actively enrolled in the programs during March and April of 1979 who subsequently completed graduation requirements and wrote the State Board Exam in April 1979, October 1979, or April 1980.

VIII. DEFINITIONS OF TERMS

All of the terms included below will be used in the study.

1. Licensed Practical Nurse (LPN)--One who has been licensed to practice practical nursing which means the performance for compensation of selected acts required in the nursing care of the ill, injured, or infirmed and/or carrying out medical orders perscribed by a licensed physician or dentist or a professional registered nurse.

2. State Board Test Pool Examination (SBTPE)--A licensure exam administered to graduates of approved practical nursing programs applying for licensure by examination.

3. California Achievement Test Level 19 (CAT-19)--A written test designed to measure the achievement of students in the basic subject areas of reading, spelling, language, mathematics, and reference skills.

IX. ORGANIZATION OF THE STUDY

Chapter I introduces the study, states the objectives of the study, sets forth the hypotheses to be tested, gives the importance of the study, and identifies the assumptions and limitations of the study. A review of the literature and related research is reported in Chapter II. Chapter III contains the procedure used in collecting and analyzing the data. Chapter IV includes a presentation and statistical analysis of the data collected in the study. Chapter V summarizes the study and presents the conclusions and recommendations made as a result of the findings.

CHAPTER II

REVIEW OF RELATED LITERATURE AND RESEARCH

I. INTRODUCTION

Chapter II contains a review of literature and research related to the study. The review begins with a brief review of historical information concerning the performance of students on the State Board Test Pool Examination. The second section presents the literature and research findings relating to the relationship between selected variables and performance. The next section reviews selected authors' concepts as to the utilization of tests as predictors of success and the final section summarizes the related literature and research.

II. HISTORICAL STUDIES

Matthews (1962) conducted an indepth historical study of the Practical Nursing Program in Tennessee from the first class in 1947 through 1960. Included in the study was a summary of the results of the students writing the State Board Test Pool Examination which showed the overall failure rate for the thirteen year period was 2.32 percent. During this period of time, there were 3,878 candidates writing the exam with 90 failures.

In contrast to the percent of failures as shown in the study by Matthews, information provided by the Tennessee Board of Nursing

(1978) for the years 1974-1978 revealed a dramatic increase in the failure rate. The first year covered by the report, 1974, had 72 failures out of 920 candidates for a 7.8 percent failure rate. The report for the subsequent years showed a failure rate of 8.5 percent in 1975, 9.0 percent in 1976, 11.4 percent in 1977, and 12.5 percent in 1978. The last year of the study included 983 candidates of which 123 did not pass the test.

The summary report released by the National League of Nursing (1979) for the State Board Test Pool Examination administered in October 1978 provided nationwide comparison of programs operated under different jurisdiction. Tennessee ranked 48 out of the 52 jurisdictions with a passing rate of 86.69 percent at the 350 level. In contrast to the Tennessee program, 25 juristictions had 97 percent or better scoring at the 350 level. The mean score for the total group was 502.4 with the mean for the Tennessee candidates being 462.9.

III. REVIEW OF RELATED LITERATURE

In review of related research, a limited number of studies concerning the relationship of performances on standardized test scores and success on the SBTPE were identified. In one of these studies, Mason (1975) investigated whether scores on the Otis-Lennon Mental Ability Test (OLMAT) and General Aptitude Test Battery (G) (GATB) were related to success in the practical nursing licensing examinations (SBTPE), also having race and age as a demographic variable. The study included 305 adult students enrolled on

Norfolk City Schools during a three year period. Among the major conclusions by Mason were that: (1) Both OLMAT and GATB (G) were significant predictors of success on SBTPE for the total group, and (2) Mature practical nursing students performed better than young subjects on OLMAT, GATB (G), and SBTPE.

Caffey (1977) studied the relationship between the reading levels of the practical nursing students, the readability level of text books, and the pass/fail scores on state board examinations. The population of this study consisted of 246 students enrolled in practical nursing programs in Mississippi who completed the twelve month course of study and had taken the state board examinations required for licensure. The subjects were divided into two independent groups according to pass/fail scores of the state board examination. The Nelson-Denny Reading Test for College Students, Form C, was used to determine reading levels of the students and the reading levels of textbooks was determined through the use of the Flesch readability formula. Analysis of the data revealed a significant difference in the reading gap scores of those students who passed the state board examination and those who did not pass the state board examination. Within the limitation of the study, it was concluded that low reading level ability is a major factor to be considered when enumerating reasons for poor performance on the state board examinations. Caffey recommended further investigation between the relationship of reading ability and success on the state board examinations to provide more information as to the value of providing

remedial instruction to practical nursing students before they start the practical nursing program as opposed to or in conjunction with raising admittance standards.

McCormick (1966) studied relationships between a battery of three tests which assessed characteristics presumed to be relevant to success in a practical nursing program and actual success as measured by passing the state board examination. The instruments used were the Nelson-Denny Reading test, the Otis General Mental Ability test (Gamma form) and the Minnesota Multiphasic Personality Inventory. The test score, plus the age of the entrant, provided the examiner with 17 variables which were utilized to compare the entrants on a pass/fail dichotomy: the attrition group (those who dropped out of the program and received no credit for the course or failed the state licensing examination) and the survival group (those who successfully completed the prescribed course of study and passed the licensure examination).

Reading skills, general mental ability and age were found to be significantly related to standardized achievement tests administered by the participating schools to assess scholastic progress. McCormick concluded that the three tests employed appear to be of value in assessing applicants for practical nursing schools in Oklahoma.

Evans and others (1979) analyzed the use of the PSB-Aptitude for Practical Nursing Examinations which is intended, primarily, as a measure of prospective student ability to succeed in a program to prepare practical nurses. One correlation study cited showed a high correlation (0.89) between the general mental ability subscore and the

cumulative grade point average of the subject studied. The same study, when comparing the general mental ability subscore of the test with scores on the licensing examination, yielded a 0.93 correlation coefficient. A longitudinal study cited by the author revealed that students selected during a four year period not using the PSB-Aptitude for Practical Nursing Examination had a failure rate of 25 percent on the licensing examination. During a 13 year period when findings from the PSB-Aptitude for Practical Nursing Examination were incorporated into the selection process the failure rate on the licensing examination decreased to three percent. Statistics presented from an additional study compared the results on the general mental ability subscore and the percent of students who passed or failed the licensing examination. In this study, 740 subjects were involved with 717 passing the licensing examination. Subjects scoring in the 76-97 percentile rank on the general mental ability subscore experienced a 99.5 percent passing rate on the licensing examination while those in the 1-25 percentile rank experienced only a 11.1 percent passing rate.

In a study by Nolan (1970), the General Aptitude Test Battery was found to be of some value in predicting the performance of practical nursing students on the state board examination. The relationship between the verbal score and the state board exam was the most significant with a Pearson Product Moment correlation coefficient of 0.55.

A study of admission criteria and attrition in selected programs of practical nursing in Virginia was investigated by King (1976). Among the variables studied was the utilization of the General Aptitude Test

Battery as a selection criteria. Included among the conclusions was that there was a significant difference between the "G" scores of those students who withdraw from the program and those who graduate and that there was a significant relationship between the number of pre-admission tests used and attrition in practical nursing programs.

The records of 60 graduates of selected Associate Degree Programs in Arizona were studied by Awe (1975) to determine if certain biographical information would have predictive value relative to achievement on the State Board Examination to become Registered Nurses. One group of the variables were selected independent variables present prior to the students entering the nursing program. In correlating the independent variables with the dependent variable (scores on each of the sub-tests of the State Board Examination), it was found that the ACT sub-score English was the best predictor for success. Awe recommended that the scores on the ACT be used as an integral part of the screening program in the selection of students for the nursing program.

King (1978) investigated the performance of graduates from one baccalaureate school of nursing on the state licensing examination to ascertain if selected scores could be used as predictors of performance on the licensing examination. The selected factors were the American College Testing (ACT) composite score, National League for Nursing Achievement (NLN) test score, and the cumulative grade point average. The statistical treatment of the data used several combinations of composite scores and sub-scores of the three major factors.

The research revealed that five combinations of predictor variables differentiated between successful and nonsuccessful performance on the licensing exam, with the ACT composite score average the best predictor of success or non-success on the exam.

Bain (1974) conducted a study of the effect of selected factors on the performance of nurses on the state board examination for registered nurses. The subjects consisted of 1,024 graduates from ten randomly selected professional schools of nursing in the state of Texas. The study included as one factor the students' scholastic aptitude and achievement test scores prior to admission to a school of nursing. It was found that students achieving higher scores on scholastic aptitude and achievement tests are more likely to perform better on the licensing exam than students making lower scores.

McCourt (1976) conducted a study to investigate the General Aptitude Test Battery as a predictor of success in a vocational stenographic program. Two of the nine aptitude scores, verbal aptitude and manual dexterity, provided by the test represented significant selection criteria for future stenographic employment success. Discriminant analysis correctly predicted the successful group at 69.0 percent and the unsuccessful group at 72.9 percent. McCourt concluded that the General Aptitude Test Battery scores be an integral part of any selection process for admittance to any vocational stenographic program.

IV. CONCEPTS ON TESTS AS PREDICTORS

The concept of using tests as a predictor of success has been widely discussed among educators and other professionals in our society.

Cronbach (1974) in his discussion of mental tests concluded that the relation of mental ability to occupational level has long been recognized. He states that direct studies of the predictive value of mental tests for occupational selection frequently give encouraging results and that, on the whole, tests have excellent validity for predicting grades at the end of the training.

One of his concerns was that among the spectrum of mental ability test is the obscure aspects of testing the ability to learn. Another concern of his in using tests to predict success is the using of a mental test irrelevant to job performance.

Tyler (1953) in a discussion of the application of mental testing procedures warns counselors that some inaccuracy is to be expected in all predictions we make as a result of testing and that we do not really expect a person to achieve exactly the grade point average toward which the test score would point. Tyler further states that an individual who receives an extremely low score is less likely to go wrong by taking it at face value than one who gets a score within the middle range. Another conclusion is that only to a limited extent will extra effort compensate for deficiencies in what the test measures.

Tyler also stated that with achievement tests and intelligence tests, counselors are on somewhat sounder ground when a score is used

to rule out certain possibilities than when it is used to attempt to predict outstanding success. A student with high scores is more likely to achieve less than was predicted than a student with low scores is to achieve more.

The importance of reading is so great according to Humphrey (1954) that if schools can give only a limited number of tests they should include a reading test as the ability to read is probably related to success in numerous vocations. Humphrey states that verbal scores can also be used to predict a student's chance of success in school subjects and in vocations that require the extensive use of language.

V. SUMMARY OF RELATED LITERATURE AND RESEARCH

In general, the research has indicated that selected variables can be used as predictors of success in training programs and on licensing exams. Reading continues to be a predictor of success as found in the literature.

Reading level as measured by the various tests appear to be the variable with the most significant relationship when various correlation procedures are applied for analysis.

Several of the research studies recommend that selected tests could be utilized as admission criteria to schools. The majority of the researchers suggest that further studies are needed.

CHAPTER III

PROCEDURES OF THE STUDY

I. INTRODUCTION

The purpose of the study was to investigate the relationship between measurable academic ability and success on the State Board Test Pool Examination for Practical Nursing. The data for the study were secured through the use of the California Achievement Test-Level 19, results of the State Board Test Pool Examination and selected demographic data.

The procedure and design of the study is presented in Chapter III. The chapter is organized in the following manner: identification of the population, selection of the instrument, description of the instrument, data gathering techniques, and method of data analysis.

II. IDENTIFICATION OF THE POPULATION

The population from which the participants were drawn for the study consisted of the students enrolled in the practical nursing programs operated as part of the public Vocational Educational offerings in the State of Tennessee. These programs were conducted either by a State Area Vocational Technical School or by personnel employed by a city or county school system. It was estimated that approximately 1200-1250 students were enrolled in the practical nursing program at

the time of the study. Exact information concerning enrollment was difficult to ascertain due to the wide geographical spread of the programs with starting and stopping on an irregular basis and dropouts occurring constantly. In the final analysis, the researcher found that 1,147 students enrolled in 43 programs were available to participate in the study. No sampling technique was employed as the survey included the total student population.

III. SELECTION OF THE INSTRUMENT

The selection of the test to be used to measure academic abilities was a major concern. The majority of the practical nursing program had been utilizing the GATB exams as a tool for counseling or screening applicants for school. Although this test has apparently been of much value to the schools in their admissions procedures, several procedural problems prevented the use of this test for the study. These problems included: (1) thetest had to be administered by persons certified by Employment Security to administer the test, (2) schools not having trained personnel could not receive actual test scores, and (3) since the test was the property of an under the close control of a government agency it was questionable as to how the result of the study utilizing the test could be used. On the basis of the concern the GATB test was rejected as the test instrument.

Guidelines were established to follow in the selection of the test instrument. Criteria selected were that: (1) the test should be able to be administered by a classroom teacher or a counselor without

any special training, (2) the test was designed to measure adult population, (3) the test could be either manually or machine scores, (4) the test could be purchased for local use if the study concluded that it was of value as a counseling and admission criteria, and (5) the test was generally accepted by user groups. Those areas of concern were discussed with representatives of the Tennessee State Testing and Evaluation Center. Based upon their professional advice, the California Achievement Test-Level 19 was selected as the test instrument to be used.

IV. DESCRIPTION OF THE INSTRUMENT

The California Achievement Test-Level 19 is a standardized test avilable through the Tennessee State Testing and Evaluation Center. This test has eight subtests--Vocabulary, Comprehension, Language Mechanics, Language Expression, Spelling, Mathematics Computation, Mathematics Concepts/Applications, and Reference Skills. (Separate subtest scores are combined to yield scores in Total Reading (Vocabulary and Comprehension), Total Language (Language Mechanics and Language Expression), Total Mathematics (Mathematics Computation and Mathematics Concepts/Application) and Total Battery score (all subtests except Reference Skills).

The eight sections of the tests have an actual working time of 2 hours 48 minutes. In addition to this time, additional time is required for distribution of materials, instruction, and breaks between tests.

The California Achievement Test-Level 19 was measured for reliability by alternate forms correlation and test-retest correlation (CTB McGraw Hill, 1979). The alternate forms reliability test conducted at two to three week intervals yielded a 0.95 r for the Total Battery score. The test-retest was conducted at six months intervals, in the fall of 1976 and the spring of 1977 and yielded a 0.91 r for the Total Battery score. The validity of the test was established during the program of test development and did not depend upon correlation with any other test. One intercorrelation test between the Total Battery score of the California Achievement Test-Level 19 and the Language IQ Test of the Short Form Test for Academic Abilities yielded an intercorrelation coefficient of 0.79.

V. DATA GATHERING TECHNIQUES

Since the target groups for the study were all students enrolled in programs operated under the supervision of the Division of Vocational Education, the researcher worked closely with the divisional personnel. The Head Start Specialist of Health Occupations Education section endorsed the study and assisted in securing cooperation and participation of the programs (see Appendix). In addition, verbal approval and support for the program was secured from the Chief of the State Area Vocational Technical School section and the Assistant Commissioner for Vocational Education.

Each Regional Health Occupation Supervisor was contacted and asked to establish a list of programs operated in their region. This list was

divided into service areas served by each individual State Area Vocational Technical school. The list contained the names and address of the contact person for each program with an approximate number of students. The school personnel then secured testing materials for the program in their areas from the Tennessee State Testing and Evaluation Center and distributed them to the individual programs. The package of material included a Manual of Instructions for Administering the test along with sufficient test booklets and answer sheets.

Upon receipt of the material, each instructor was asked to test their students. Due to the extreme length of the text, the instructors were asked to divide the test into two different testing days.

After return of completed testing material by all programs in the service area, each area school returned the material to the testing center for scoring. The tests were machine scored with the results reported in the following format: (1) frequency distribution by national percentile, (2) each individual student's test result, and (3) item analysis.

An individual data card (see Appendix) was prepared for each student who participated in the testing program and subsequently took the licensing exam. The information for the card was secured from these sources: (1) the individual scores from the printout by program, (2) the age and educational level from the Student Qualification sheets (see Appendix) on file at the regional office, and (3) results of the

licensing exam from a printout by program. A privacy statement was prepared for the file of each student whose results were utilized in the study. No information was placed on the individual card that would reveal identification of the individual or place of training.

VI. METHOD OF DATA ANALYSIS

The research design was an ex - post facto research as defined by Kerlinger (1973).

> Ex post facto research is systematic empirical inquiry in which the scientist does not have direct control of independent variables because their manifestations have already occurred or because they are inherently not manipulatable. Inferences about relations are made, without direct intervention from concomitant variations of independent and dependent variable. P. 379.

The dependent variable for the study was the student performance on the State Board Test Pool Examination. The independent variables analyzed for the study were as follows:

1. Age
2. Reading Vocabulary
3. Reading Comprehension
4. Total Reading
5. Spelling
6. Language Mechanics
7. Language Expression
8. Total Language
9. Mathematics Computation

10. Mathematics Concepts/Application

11. Total Mathematics

12. Reference Skills

13. Total Battery

The data were analyzed through the use of the computer program entitled Statistical Analysis System (SAS) at The University of Tennessee Computer Center, Knoxville. For the purpose of analysis, the raw score for variable two (2) through thirteen (13) was utilized as it was an exact score instead of a rated score as were the percentile, stanine, and Grade equivalent score.

The data were first analyzed by a correlation procedure which calculated a Pearson Product Moment correlation. This procedure provided: (1) the numbers of observation having non-missing values of the variable, (2) the mean, (3) the standard deviation, (4) the sum, (5) the minimum, (6) the maximum, and (7) the significant probability of the correlations. In conjunction with this analysis, a plot procedure was used to prepare graphs for the two dependent variables having the highest correlation.

A second analysis of the data utilized the maximum R^2 improvement technique. According to Barr (1979), this method of stepwise regression is the superior stepwise technique. Unlike other techniques, this method does not settle on a single model but looks at the "best" one variable model, the best two variable model and so forth. For the purpose of the study the formula was used to select the best one variable, the best two variable model, and the best three variable model.

The data were also analyzed using a cross tabulation table for frequency distribution. Each of the cross-tabulation tables provided: (1) frequency counts, (2) percent of total frequency, (3) row percentage, and (4) column percent. A table was prepared for each of the independent variables compared to the dependent variables.

In a further analysis of the data, each independent variable was analyzed by a Means procedure. In this procedure for each raw score level in the independent variable, a mean score for the dependent variable was given.

CHAPTER IV

PRESENTATION AND ANALYSIS OF DATA

I. INTRODUCTION

The primary objective of the study was to determine the relationship between each of the subtests of the California Achievement Test--Level 19 taken by the practical nursing students and their subsequent achievement on the State Board Test Pool Examination and to determine which subtest or group of subtest, if any, could be used as a predictor of success on the State Board Test Pool Examination. A secondary objective was to study the relationship of the age of the students upon their performance on the State Board Test Pool Examination.

The results of the analysis of the data are presented in Chapter IV. The data were analyzed by the use of means, percentages, standard deviations, correlation, and regression techniques. The results of the analysis are reported in tabular form in this section for easier interpretation. The results have been organized around the research hypotheses presented in Chapter I.

The initial population for the study consisted of 1,147 students who took the California Achievement Test--Level 19 in March to April 1979. Research determined that 891 of that group subsequently completed the program requirements and wrote the State Board Test Pool Examination. In analyzing data, it was found that seven of the 891 had missing

scores on more than two independent variables and they were not included in the analysis of data leaving a final population for the study of 884. Due to the inability to locate Student Qualification Sheets which should have been filed in the regional offices, the age of students could be located for only 741 of the study group.

Table I contains the analysis of the results of the State Board Test Pool Examination. For ease of interpretation, the test scores were grouped in increments of 50. The individual test scores ranged from a low of 161 to a high of 730 with a mean of 490.75. The minimum acceptable score for licensure as established by the State Board of Nursing was 350; therefore, the first four groups in Table I failed to attain the minimum score. The number in the four groups was 76 which represented 8.6 percent of the 884 included in the study.

II. AGE AS A FACTOR

The first hypothesis for the study was concerned with the relationship between the age of the individual and their performance on the State Board Test Pool Examination. Null Hypothesis No. 1 stated:

Ho_1 - There is no statistically significant relationship between the age of students and their performance on the State Board Test Pool Examination.

The results on the State Board Test Pool Examination by each age level represented in the study are presented in Table II. The youngest student was 17 years of age and the oldest 66 years of age.

TABLE I

STATE BOARD TEST POOL EXAMINATION SCORES

N	Score Range	Percentage of Total
4	150 - 199	0.45
11	200 - 249	1.24
23	250 - 299	2.60
38	300 - 349	4.30
81	350 - 399*	9.16
119	400 - 449	13.46
168	450 - 499	19.00
172	500 - 549	19.46
170	550 - 599	19.23
76	600 - 649	8.60
19	650 - 699	2.15
3	700 - 750	0.34
Total		100.0

*Minimum passing score 350. Mean - 490.75. Range 161 - 730. Standard deviation - 97.21

TABLE II

COMPARISON OF AGE OF SUBJECTS AND PERFORMANCE
ON STATE BOARD TEST POOL EXAMINATION

Age	N	State Board Test Pool Examination			
		Mean	Std. Dev.	Minimum	Maximum
17	2	457.5*	169.0	338	577
18	59	445.2*	93.9	215	670
19	51	462.3*	102.0	236	634
20	53	471.6*	106.5	199	695
21	48	484.3	91.3	246	638
22	30	478.1*	113.8	271	730
23	49	487.8*	120.9	179	709
24	30	487.2*	85.7	297	607
25	24	438.0*	102.4	275	584
26	18	511.7	72.9	391	659
27	18	507.1	65.8	364	603
28	28	490.8	96.3	331	663
29	30	491.0	79.5	353	640
30	23	503.0	91.6	342	655
31	27	512.5	85.0	280	640
32	27	545.3	77.6	277	678
33	18	519.0	79.7	424	688
34	20	503.8	88.4	245	611
35	12	529.3	76.2	394	677
36	9	519.7	100.5	260	588
37	12	485.3*	94.3	299	596
38	22	485.3*	94.3	299	596
39	16	497.6	120.3	226	663
40	9	535.0	95.7	328	663
41	15	507.7	67.2	439	693
42	12	545.6	81.7	398	649
43	12	495.3	86.0	314	595
44	12	541.0	79.8	446	691
45	6	507.9	74.4	374	588
46	2	506.0	52.3	469	543
47	3	471.0*	194.3	271	657
48	11	512.9	86.7	360	634
49	6	545.5	41.4	471	592
50	5	549.8	68.3	454	631
51	2	522.5	2.1	521	524
54	2	552.0	87.0	491	614
55	2	485.0*	75.7	432	539

TABLE II (Cont'd)

Age	N	State Board Test Pool Examination Mean	Std. Dev.	Minimum	Maximum
57	1	499.0	-	499	499
59	1	611.0	-	611	611
60	1	460.0*	-	460	460
66	1	446.0*	-	446	446
28.65	741	490.75	97.21		

*Below mean of 490.75.

There was at least one person at every age level from 17 to 56. A study of the data show that the majority of the students were clustered in the younger ages while only 10 of the 741 were above the age of 50. The table also shows that with the exception of the group at age 21, all age levels from 17 to 25 averaged below the group mean score of 490.75 while only 7 of the 32 ages represented from age 27 to 66 had averaged below the mean.

The standard deviation score derived by the analysis ranged from 2.1 to 194.3. The largest standard deviation scores could be accounted for by the wide range between the minimum and maximum scores and scores clustered toward the extremes of the range.

The data are presented in Table III. Data were determined by means of a cross-tabulation procedure which gives age by State Board Test Pool Examination and shown statistically by frequency, percent of total, row percent, and column percent. The State Board Test Pool Examination scores were grouped by increments of 100 and the ages were divided into seven groups.

The youngest age group, those of 17-23, comprised 39.41 percent of the total study population. This group provided 83.33 percent of the person scoring between 150-249 and 53.06 percent of the ones scoring between 250-349. In combining the two columns (150-249 and 250-349) together, this age group provided 36 out of 61 (59.02 percent) of the total failures. In contrast, information from Table II reveals that the highest individual score (730) was in the 17-23 age range group.

TABLE III

FREQUENCY DISTRIBUTION OF STATE BOARD TEST POOL EXAMINATION SCORES BY AGE OF STUDENTS

		State Board Test Pool Examination Scores						
Age		150-249	250-349	350-449	450-549	550-649	650-749	Total
17-23	N	10	26	73	107	70	6	292
	Pct. of Tot.	1.35	3.51	9.85	14.44	9.45	0.81	39.41
	Pct. of Row	3.42	8.90	25.00	36.64	23.97	2.05	
	Pct. of Col.	83.33	53.06	45.63	37.28	32.71	31.58	
24-30	N	0	15	41	65	47	3	171
	Pct. of Tot.	0.00	2.02	5.53	8.77	6.34	0.40	23.08
	Pct. of Row	0.00	8.77	23.98	38.01	27.49	1.75	
	Pct. of Col.	0.00	30.61	25.63	22.65	21.96	15.79	
31-37	N	1	4	23	56	48	4	136
	Pct. of Tot.	0.13	0.54	3.10	7.56	6.48	0.54	18.35
	Pct. of Row	0.74	2.94	16.91	41.18	35.29	2.94	
	Pct. of Col.	8.33	8.16	14.38	19.51	22.43	21.05	
38-44	N	1	3	18	38	33	5	98
	Pct. of Tot.	0.13	0.40	2.43	5.13	4.45	0.67	13.23
	Pct. of Row	1.02	3.06	18.37	38.78	33.67	5.10	
	Pct. of Col.	8.33	6.12	11.25	13.24	15.42	26.32	
45-51	N	0	1	3	17	14	1	36
	Pct. of Tot.	0.00	0.13	0.40	2.29	1.89	0.13	4.86
	Pct. of Row	0.00	2.78	8.33	47.22	38.89	2.78	
	Pct. of Col.	0.00	2.04	1.88	5.92	6.54	5.26	
52-58	N	0	0	1	3	1	0	5
	Pct. of Tot.	0.00	0.00	0.13	0.40	0.13	0.00	0.67
	Pct. of Row	0.00	0.00	20.00	60.00	20.00	0.00	
	Pct. of Col.	0.00	0.00	0.63	1.05	0.47	0.00	
59-66	N	0	0	1	1	1	0	3
	Pct. of Tot.	0.00	0.00	0.13	0.13	0.13	0.00	0.40
	Pct. of Row	0.00	0.00	33.33	33.33	33.33	0.00	
	Pct. of Col.	0.00	0.00	0.63	0.35	0.47	0.00	
Total	N	12	49	160	287	214	19	741
	Percent	1.62	6.61	21.59	38.73	28.88	2.56	100.00

The second youngest age group (24-30) included 30.61 percent of the persons scoring in the 250-349 range while they only comprised 23.08 percent of the total. A further analysis of the two youngest age groups revealed that in the 450-549, 550-649, and 650-749 columns that both of the groups provided a lower column percentage than they comprised of the total population.

In contrast to the data for the first two age groups, the five older age groups all provided a lesser percentage of the failing scores than their percentage of the total population.

The correlation coefficient for the relationship between age and performance on the State Board Test Pool Examination was calculated by the Pearson Product Moment technique.

Prob > [R] under Ho=RHO=0/Number of Observations

No. of Observations	Correlation Coefficient	r^2	Level of Probability
741	0.203	0.041	0.0001

An examination of the data presented above revealed that a statistically significant relationship existed at the 0.0001 level of significance; therefore, Null Hypothesis No. 1 was rejected.

The unsquared correlation (r) gives the impression of a higher degree of relationship than should be connoted. The square of the correlation coefficient (r^2) may be interpreted as the proportion of variance in the dependent variable (SBTPE) that is attributed to the effect of the independent variables. The r^2 of 0.041 shown above indicated that only 4 percent of the scores were directly attributable to the factor of age.

III. READING AS A FACTOR

The second, third, and fourth hypotheses were concerned with the relationship between reading scores and performance on the State Board Test Pool Examination. The Null Hypotheses were stated as follows:

Ho_2 - There is no statistically significant relationship between the performance of the students on the Reading Vocabulary section of CAT-19 and their performance on the State Board Test Pool Examination.

Ho_3 - There is no statistically significant relationship between the performance of the students on the Reading Comprehension section of the CAT-19 and their performance on the State Board Test Pool Examination.

Ho_4 - There is no statistically significant relationship between the performance of the students on the Total Reading Score of CAT-19 and their performance on the State Board Test Pool Examination.

Table IV contains the data comparing the results by each raw score on Reading vocabulary with the performance on the State Board Test Pool Examination. The scores range from a low of 7 correct responses to a high of 30 correct responses which also was the maximum raw score possible. A review of the data show that as the raw score increased the State Board Test Pool Examination mean generally increased. The table revealed that all groups with a raw score of

TABLE IV

COMPARISON OF RAW SCORES ON READING VOCABULARY AND PERFORMANCE ON STATE BOARD TEST POOL EXAMINATION

Raw Score	N	State Board Test Pool Examination Scores			
		Mean	Std. Dev.	Minimum	Maximum
5	1	245.0*	-	245	245
9	7	369.3*	95.8	226	491
10	1	382.0*	-	382	382
11	11	322.6*	87.7	161	461
12	9	425.0*	109.1	280	570
13	18	360.1*	110.1	179	570
14	20	355.5*	85.4	199	510
15	29	408.0*	95.6	196	584
16	16	444.3*	67.4	338	562
17	42	430.3*	79.4	307	609
18	35	434.3*	79.5	236	645
19	51	443.6*	80.3	241	634
20	61	474.2*	85.4	239	640
21	48	465.6*	90.2	221	638
22	64	474.3*	65.1	335	659
23	67	512.3	74.2	316	719
24	55	506.6	84.8	308	640
25	53	513.4	89.8	249	659
26	60	527.2	61.3	405	655
27	46	538.9	63.3	409	677
28	63	566.2	65.7	420	693
29	60	549.3	68.4	328	688
30	67	577.9	60.7	428	730
22.58	884	490.75	97.22		

*Below mean of 490.75. Maximum raw score 30.

22 or less had State Board Test Pool Examination means below the total group mean while all raw scores of 23 or above averaged above the total group mean.

The data are presented in Table V by means of a cross-tabulation procedure which gives Reading Vocabulary scores by State Board Test Pool Examination. In the first group of raw scores on Reading Vocabulary, 5-8 raw score, only one person was included and this person attained a failing score. The second group 9-12 raw score included only 28 persons or 3.17 percent of the total group, however, they provided 20 percent of those with scores in the 150-249 range and 14.75 percent of the scores between 250-349. The third group 13-16 raw score was a slightly larger group comprising 9.39 percent of the total but producing 40 percent of those scoring between 150 and 249 and 32.79 percent of those scoring between 750 and 849.

In contrast to the lower raw score ranges the persons in the top raw score range 29-30 comprised 14.37 percent of the total but produced only 1.64 percent of the raw scoring between 250-349. Of this group, which included 127 persons, all but one had a passing score (above 350) which provided a success rate of 99.21 percent. The group with the 25-28 raw scores had similar statistics. Out of the 220 subjects in this group, only 3 or 1.35 percent had failing scores. This group comprised 25.11 percent of the total but yet provided 50 percent of the 650-749 score and 39.02 percent of the 550-649 score.

The comparison of raw scores by each score on Reading Comprehension and performance on the State Board Test Pool Examination is

TABLE V

FREQUENCY DISTRIBUTION OF STATE BOARD TEST POOL EXAMINATION SCORES BY RAW SCORES ON READING VOCABULARY

Reading Vocabulary		State Board Test Pool Examination Scores 150-249	250-349	350-449	450-549	550-649	650-749	Total
5-8	N	1	0	0	0	0	0	1
	Pct. of Tot.	0.11	0.00	0.00	0.00	0.00	0.00	0.11
	Pct. of Row	100.00	0.00	0.00	0.00	0.00	0.00	
	Pct. of Col.	6.67	0.00	0.00	0.00	0.00	0.00	
9-12	N	3	9	10	4	2	0	28
	Pct. of Tot.	0.34	1.02	1.13	0.45	0.23	0.00	3.17
	Pct. of Row	10.71	32.14	35.71	14.29	7.14	0.00	
	Pct. of Col.	20.00	14.75	5.00	1.18	0.81	0.00	
13-16	N	6	20	34	17	6	0	83
	Pct. of Tot.	0.68	2.26	3.85	1.92	0.68	0.00	9.39
	Pct. of Row	7.23	24.10	40.96	20.48	7.23	0.00	
	Pct. of Col.	40.00	32.79	17.00	5.00	2.44	0.00	
17-20	N	3	20	69	76	21	0	189
	Pct. of Tot.	0.34	2.26	7.81	8.60	2.38	0.00	21.38
	Pct. of Row	1.59	10.58	36.51	40.21	11.11	0.00	
	Pct. of Col.	20.00	32.79	34.50	22.35	8.54	0.00	
21-24	N	1	9	55	114	52	3	234
	Pct. of Tot.	0.11	1.02	6.22	12.90	5.88	0.34	26.47
	Pct. of Row	0.43	3.85	23.50	48.72	22.22	1.28	
	Pct. of Col.	6.67	14.75	27.50	33.53	21.14	13.64	
25-28	N	1	2	26	86	96	11	222
	Pct. of Tot.	0.11	0.23	2.94	9.73	10.86	1.24	25.11
	Pct. or Row	0.45	0.90	11.71	38.74	43.24	4.95	
	Pct. of Col.	6.67	3.28	13.00	25.29	39.02	50.00	
29-30	N	0	1	6	43	69	8	127
	Pct. of Tot.	0.00	0.11	0.68	4.86	7.81	0.90	14.37
	Pct. of Row	0.00	0.79	4.72	33.86	54.33	6.30	
	Pct. of Col.	0.00	1.64	3.00	12.65	28.05	36.36	
Total		15	61	200	340	246	222	884
		1.70	6.90	22.62	38.46	27.83	2.47	100.00

presented by Table VI. The raw scores on the reading comprehension ranged from a low of 12 to a high of 40 (the maximum possible). Data indicated that as the raw score attained on Reading Comprehension increased the mean score on the State Board Test Pool Examination generally increased. All groups with a raw score of 30 or above attained a State Board Test Pool Examination mean score greater than the group mean while all groups with a raw score of 26 or below averaged below the total group mean.

The cross-tabulation data for comparison of Reading Comprehension raw scores with the State Board Test Pool Examination is presented in Table VII. An analysis of this table showed that the persons who scored in the lower ranges on the Reading Comprehension section provided a larger share of the failure groups than they comprised of the total. Although the group scoring between 13-16 raw score comprised only 2.83 percent of the total they provided 20 percent of the persons in the 150-249 range and 16.39 percent of the persons in the 250-349 range. In contrast to the lower raw score groups, the group with the 37-40 raw scores had no one in the failure range and the group with the 33-36 raw score which comprised 21.61 percent of the total group had a success rate of 98.43 percent on the State Board Test Pool Examination.

The scores from the Reading Vocabulary and the Reading Comprehension sections were combined to yield a Total Reading score. Table VIII gives the data by individual raw score levels. The raw scores ranged from 23 to 69 (out of a maximum raw score of 70). The

TABLE VI

COMPARISON OF RAW SCORES ON READING COMPREHENSION AND PERFORMANCE ON STATE BOARD TEST POOL EXAMINATION

Raw Score	N	State Board Test Pool Examination Scores			
		Mean	Std. Dev.	Minimum	Maximum
12	3	269.7*	83.2	207	364
14	6	338.2*	87.4	215	467
15	10	379.2*	89.1	264	532
16	7	369.7*	135.7	196	558
17	8	394.9*	64.8	312	492
18	11	409.0*	127.1	179	592
19	22	416.9*	90.6	226	584
20	22	420.4*	104.9	161	616
21	31	434.6*	79.2	280	592
22	41	407.3*	83.2	241	574
23	31	430.6*	84.9	275	634
24	41	442.8*	86.8	275	624
25	39	437.4*	105.8	199	659
26	48	467.8*	69.8	308	640
27	38	504.0	74.6	360	693
28	49	483.2*	92.9	239	663
29	56	476.6*	69.7	316	618
30	55	509.6	65.1	350	618
31	62	511.2	76.0	279	645
32	68	532.0	65.7	353	663
33	50	544.9	66.9	342	691
34	48	563.5	63.4	449	709
35	45	551.8	76.1	317	719
36	48	562.8	69.0	328	677
37	12	548.9	72.9	461	678
38	16	573.0	48.6	474	640
39	10	623.7	66.7	536	730
40	4	625.5	61.8	543	673
28.36	884	490.75	97.22	161	730

*Below mean of 490.75. Maximum raw score 40.

TABLE VII

FREQUENCY DISTRIBUTION OF STATE BOARD TEST POOL EXAMINATION SCORE BY RAW SCORES ON READING COMPREHENSION

Reading Comprehension		State Board Test Pool Examination Scores						
		150-249	250-349	350-449	450-549	550-649	650-749	Total
9-12	N	2	0	1	0	0	0	3
	Pct. of Tot.	0.23	0.00	0.11	0.00	0.00	0.00	0.34
	Pct. of Row	66.67	0.00	33.33	0.00	0.00	0.00	
	Pct. of Col.	13.33	0.00	0.50	0.00	0.00	0.00	
13-16	N	3	10	5	6	1	0	25
	Pct. of Tot.	0.34	1.13	0.57	0.68	0.11	0.00	2.83
	Pct. of Row	12.00	40.00	20.00	24.00	4.00	0.00	
	Pct. of Col.	20.00	16.39	2.50	1.76	0.41	0.00	
17-20	N	5	6	32	15	5	0	63
	Pct. of Tot.	0.57	0.68	3.62	1.70	0.57	0.00	7.13
	Pct. of Row	7.94	9.52	50.79	23.81	7.94	0.00	
	Pct. of Col.	33.33	9.84	16.00	4.41	2.03	0.00	
21-24	N	1	26	61	45	11	0	144
	Pct. of Tot.	0.11	2.94	6.90	5.09	1.24	0.00	16.29
	Pct. of Row	0.69	18.06	42.36	31.25	7.64	0.00	
	Pct. of Col.	6.67	42.62	30.50	13.24	4.47	0.00	
25-28	N	4	10	50	72	35	3	174
	Pct. of Tot.	0.45	1.13	5.66	8.14	3.96	0.34	19.68
	Pct. of Row	2.30	5.75	28.74	41.38	20.11	1.72	
	Pct. of Col.	26.67	16.39	25.00	21.18	14.23	13.64	
29-32	N	0	6	40	121	72	2	241
	Pct. of Tot.	0.00	0.68	4.52	13.69	8.14	0.23	27.26
	Pct. of Row	0.00	2.49	16.60	50.21	29.88	0.83	
	Pct. of Col.	0.00	9.84	20.00	35.59	29.27	9.09	
33-36	N	0	3	11	68	98	11	191
	Pct. of Tot.	0.00	0.34	1.24	7.69	11.09	1.24	21.61
	Pct. of Row	0.00	1.57	5.76	35.60	51.31	5.76	
	Pct. of Col.	0.00	4.92	5.50	20.00	39.84	50.00	

TABLE VII (Cont'd)

Reading Comprehension		State Board Test Pool Examination Scores						
		150-249	250-349	350-449	450-549	550-649	650-749	Total
37-40	N	0	0	0	13	24	6	43
	Pct. of Tot.	0.00	0.00	0.00	1.47	2.71	0.68	4.86
	Pct. of Row	0.00	0.00	0.00	30.23	55.81	13.95	
	Pct. of Col.	0.00	0.00	0.00	3.82	9.76	27.27	
Total		15	61	200	340	246	22	884
		1.70	6.90	22.62	38.46	27.83	2.49	100.00

TABLE VIII

COMPARISON OF RAW SCORES ON READING TOTAL AND PERFORMANCE ON STATE BOARD TEST POOL EXAMINATION

Raw Score	N	State Board Test Pool Examination Score			
		Mean	Std. Dev.	Minimum	Maximum
23	2	241.5*	4.9	238	245
24	1	316.0*	-	316	316
25	2	321.0*	35.4	296	346
26	4	364.5*	114.9	207	478
27	4	352.5*	93.3	215	421
28	6	316.2*	73.1	226	403
29	1	314.0*	-	314	314
30	9	337.2*	57.5	271	417
31	11	347.0*	141.2	161	535
32	2	389.5*	3.5	387	392
33	7	403.4*	89.4	280	532
34	7	450.0*	138.2	246	584
35	8	395.2*	78.1	275	491
36	12	402.5*	63.1	290	551
37	15	403.9*	87.8	236	552
38	16	386.1*	53.6	275	485
39	19	416.4*	97.8	199	574
40	14	452.7*	86.4	275	558
41	23	410.1*	84.0	241	558
42	25	442.2*	77.1	260	634
43	24	453.9*	86.1	275	616
44	24	429.7*	89.2	271	592
45	23	452.0*	55.3	377	555
46	24	462.8*	91.0	221	640
47	17	456.4*	74.1	308	588
48	38	479.9*	23.0	239	624
49	33	471.1*	69.5	342	645
50	30	491.6	56.5	378	634
51	39	503.2	79.2	279	663
52	30	480.3*	77.0	316	640
53	36	497.3	79.8	249	659
54	25	497.8	74.0	353	618
55	32	521.8	74.3	342	693
56	32	528.4	66.4	378	659
57	23	518.3	56.7	428	638
58	31	565.3	59.0	420	719
59	28	540.4	65.9	406	663
60	30	531.2	73.0	317	659

TABLE VIII (Cont'd)

Raw Score	N	State Board Test Pool Examination Score			
		Mean	Std. Dev.	Minimum	Maximum
61	32	561.4	58.6	460	691
62	33	563.4	48.4	458	663
63	19	571.3	56.0	454	677
64	27	575.4	69.2	449	709
65	22	551.0	75.0	328	649
66	18	586.0	37.2	532	641
67	8	558.6	73.1	474	678
68	10	617.4	44.1	551	688
69	8	620.9	74.9	536	730
50.95	884	490.75	97.22		

*Below mean of 490.75. Maximum raw score 70.

distribution pattern closely followed that of the separate scores for Reading Vocabulary and Reading Comprehension with the mean score of the State Board Test Pool Examination rising as the raw score increases. All raw scores of 49 or below had a State Board Test Pool Examination mean below that of the total group mean while all raw score levels of 53 or above attained a mean score above the total group mean.

The cross-tabulation data for the Reading Total scores compared to State Board Test Pool Examination are presented in Table IX. The pattern in this table showed that those with scores in the lower range produced a disproportinate share of the failure. Of those 29 persons in the two lower raw score categories 17-23 and 24-30, 17 had scores in the failing columns 150-249 and 250-349 for a 59 percent failure rate. In contrast, only 6 of the 444 subjects scoring 52 or above on Total Reading failed for a success rate of 98.7 percent.

The correlation coefficients for the relationships between the variables Reading Vocabulary, Reading Comprehension, Reading Total, and the State Board Test Pool Examination are presented below:

Variable	No. of Observations	Correlation Coefficient	r^2	Level of Probability
Reading Vocabulary	844	0.60300	0.364	0.0001
Reading Comprehensions	844	0.58684	0.343	0.0001
Reading Total	844	0.64801	0.420	0.0001

An examination of the data presented above revealed that a statistical significant relationship existed at the 0.0001 level of significance, therefore Null Hypotheses No. 2, 3, and 4 were rejected.

TABLE IX

FREQUENCY DISTRIBUTION OF STATE BOARD TEST POOL EXAMINATION SCORES BY RAW SCORES ON TOTAL READING

Total Reading		State Board Test Pool Examination Scores 150-249	250-349	350-449	450-549	550-649	650-749	Total
17-23	N	2	0	0	0	0	0	2
	Pct. of Tot.	0.23	0.00	0.00	0.00	0.00	0.00	0.23
	Pct. of Row	100.0	0.00	0.00	0.00	0.00	0.00	
	Pct. of Col.	13.33	0.00	0.00	0.00	0.00	0.00	
24-30	N	3	12	11	1	0	0	27
	Pct. of Tot.	0.34	1.36	1.24	0.11	0.00	0.00	3.05
	Pct. of Row	11.11	44.44	40.74	3.70	0.00	0.00	
	Pct. of Col.	20.00	19.67	5.50	0.29	0.00	0.00	
31-37	N	5	12	25	16	4	0	62
	Pct. of Tot.	0.57	1.36	2.83	1.81	0.45	0.00	7.01
	Pct. of Row	8.06	19.35	40.32	25.81	6.45	0.00	
	Pct. of Col.	33.33	19.67	12.50	4.71	1.63	0.00	
38-44	N	2	23	67	40	13	0	145
	Pct. of Tot.	0.23	2.60	7.58	4.52	1.47	0.00	16.40
	Pct. of Row	1.38	15.86	47.21	27.59	8.97	0.00	
	Pct. of Col.	13.33	37.70	33.50	11.76	5.28	0.00	
45-51	N	2	9	50	109	33	1	204
	Pct. of Tot.	0.23	1.02	5.66	12.33	3.73	0.11	23.08
	Pct. of Row	0.98	4.41	24.51	53.43	16.18	0.49	
	Pct. of Col.	13.33	14.75	25.00	32.06	13.41	4.55	
52-58	N	1	3	37	94	69	5	209
	Pct. of Tot.	0.11	0.34	4.19	10.63	7.81	0.57	23.64
	Pct. of Row	0.48	1.44	17.70	44.98	33.01	2.39	
	Pct. of Col.	6.67	4.92	18.50	27.65	28.05	22.73	
59-66	N	0	2	10	74	113	10	209
	Pct. of Tot.	0.00	0.23	1.13	8.37	12.78	1.13	23.64
	Pct. of Row	0.00	0.96	4.78	35.41	54.07	4.78	
	Pct. of Col.	0.00	3.28	5.00	21.76	45.93	45.45	

TABLE IX (Cont'd)

Total Reading		State Board Test Pool Examination Scores						
		150-249	250-349	350-449	450-549	550-649	650-749	Total
67-69	N	0	0	0	6	14	6	26
	Pct. of Tot.	0.00	0.00	0.00	0.68	1.58	0.68	2.94
	Pct. of Row	0.00	0.00	0.00	23.08	53.85	23.08	
	Pct. of Col.	0.00	0.00	0.00	1.76	5.69	27.27	
Total		15	61	200	340	246	22	884
		1.70	6.90	22.62	38.46	27.83	2.49	100.00

IV. SPELLING AS A FACTOR

The fifth hypothesis was concerned with the relationship between the scores on the spelling test and performance on the State Board Test Pool Examination. The null hypohtesis was stated as follows:

Ho_5 - There is no statistically significant relationship between the performance of the students on the Spelling section of CAT-19 and their performance on the State Board Test Pool Examination.

Table X compared the raw score on Spelling with the students' scores on the State Board Test Pool Examination. The test scores ranged from a low of one to the maximum possible of 20. The lower raw scores on the test represented only a limited number of observations; however, starting with the first score with several responses the mean score on the State Board Test Pool Examination increased, with only two exceptions, as the raw score increased.

The data comparing Spelling raw scores with State Board Test Pool Examination scores are presented in Table XI by means of the cross-tabulation procedure. With the exception of the raw score range of 1-4 which had limited observations, the lower ranges of raw scores (5-8 and 9-12) contained a higher percent of persons in the lower board scores than their percentage of the total. In contrast, the upper range 17-20 included only 9 percent of the failures (7 out of 96) while they constituted 23.98 percent of the total study.

The correlation coefficient for the relationship between Spelling and the State Board Test Pool Examination is presented below:

TABLE X

COMPARISON OF RAW SCORE ON SPELLING AND PERFORMANCE ON STATE BOARD TEST POOL EXAMINATION

Raw Score	N	State Board Test Pool Examination Score			
		Mean	Std. Dev.	Minimum	Maximum
1	1	531.0	-	531	531
3	1	515.0	-	515	515
4	4	491.0	88.5	404	614
5	7	406.6*	84.2	238	492
6	8	401.8*	108.8	221	562
7	20	435.6*	87.9	290	570
8	28	445.5*	77.0	275	570
9	33	538.5	102.8	246	592
10	39	453.2*	100.0	207	603
11	67	456.3*	98.6	161	640
12	68	483.0*	100.3	196	709
13	82	489.9*	88.6	236	659
14	109	483.8*	100.0	179	677
15	110	497.8	95.4	199	719
16	95	504.0	99.7	215	693
17	89	525.1	93.8	307	730
18	69	530.0	67.9	335	633
19	37	531.0	78.7	310	649
20	17	559.6	57.9	458	691
13.87	884	490.75	97.22		

*Below mean of 490.75. Maximum raw score 20.

TABLE XI

FREQUENCY DISTRIBUTION OF STATE BOARD TEST POOL EXAMINATION SCORES BY RAW SCORES ON SPELLING

		State Board Test Pool Examination Scores						
Spelling		150-249	250-349	350-449	450-549	550-649	650-749	Total
1-4	N	0	0	1	4	1	0	6
	Pct. of Tot.	0.00	0.00	0.11	0.45	0.11	0.00	0.68
	Pct. of Row	0.00	0.00	16.67	66.67	16.67	0.00	
	Pct. of Col.	0.00	0.00	0.50	1.18	0.41	0.00	
5-8	N	2	8	26	19	8	0	63
	Pct. of Tot.	0.23	0.90	2.94	2.15	0.90	0.00	7.13
	Pct. of Row	3.17	12.70	41.27	30.16	12.70	0.00	
	Pct. of Col.	13.33	13.11	13.00	5.59	3.25	0.00	
9-12	N	7	21	58	77	42	2	207
	Pct. of Tot.	0.79	2.38	6.56	8.71	4.75	0.23	23.42
	Pct. of Row	3.38	10.14	28.02	37.20	20.29	0.97	
	Pct. of Col.	46.67	34.43	29.00	22.65	17.07	9.09	
13-16	N	6	24	89	157	107	12	396
	Pct. of Tot.	0.68	2.83	10.07	17.76	12.10	1.36	44.80
	Pct. of Row	1.52	6.31	11.47	39.65	27.02	3.03	
	Pct. of Col.	40.00	40.98	44.50	46.18	43.50	54.55	
17-20	N	0	7	26	83	88	8	212
	Pct. of Tot.	0.00	0.79	2.94	9.39	9.95	0.90	23.98
	Pct. of Row	0.00	3.30	12.26	39.15	41.51	3.77	
	Pct. of Col.	0.00	11.48	13.00	24.41	35.77	36.36	
Total		15	61	200	340	246	22	884
		1.70	6.90	22.62	38.46	27.83	2.49	100.00

Variable	No. of Observations	Correlation Coefficient	r^2	Level of Probability
Spelling	884	0.29580	0.087	0.0001

The examination of the data presented above revealed that a statistically significant relationship existed at the 0.0001 level of significance; therefore, Null Hypothesis No. 5 was rejected.

V. LANGUAGE SCORES AS A FACTOR

The sixth, seventh, and eighth hypotheses were concerned with the relationship between language scores and performance on the State Board Test Pool Examination. The null hypotheses were stated as follows:

Ho_6 - There is no statistically significant relationship between the performance of the student on the language mechanics section of CAT-19 and their performance of the State Board Test Pool Examination.

Ho_7 - There is no statistically significant relationship between the performance of the student on the Language Experience section of CAT-19 and their performance on the State Board Test Pool Examination.

Ho_8 - There is no statistically significant relationship between the performance of the student on the Total Language score of CAT-19 and their performance on the State Board Test Pool Examination.

The comparison of the raw scores on Language Expression with performance on the State Board Test Pool Examination is presented in Table XII. The raw scores ranged from a low of 9 to a high of 38, the maximum score possible. The table revealed that all score levels of

TABLE XII

COMPARISON OF RAW SCORE ON LANGUAGE EXPRESSION AND PERFORMANCE ON STATE BOARD TEST POOL EXAMINATION

Raw Score	N	State Board Test Pool Examination Scores			
		Mean	Std. Dev.	Minimum	Maximum
9	1	207.0*	-	207	207
12	2	415.5*	143.5	314	517
13	2	387.0*	56.9	346	428
15	1	372.0*	-	372	372
16	1	275.0*	-	275	275
17	8	342.0*	120.9	196	491
18	5	411.0*	105.31	290	536
19	12	342.3*	82.4	226	503
20	12	376.0*	114.5	199	536
21	20	442.0*	67.1	316	614
22	27	386.7*	102.5	161	543
23	24	426.6*	727.0	256	614
24	52	442.3*	102.0	179	663
25	52	467.3*	77.7	275	624
26	60	476.1*	84.6	286	663
27	85	453.8*	88.0	275	673
28	63	490.1*	75.8	346	659
29	83	499.8	87.9	249	719
30	74	517.4	78.4	321	663
31	65	524.9	70.0	335	663
32	60	540.9	85.8	275	695
33	37	536.9	67.6	350	659
34	45	545.3	87.7	317	730
35	36	551.8	67.2	394	789
36	33	570.3	60.8	454	693
37	19	575.6	61.4	417	678
38	5	552.0	56.1	484	614
28.47	884	490.75	97.22		

*Below mean of 490.75. Maximum raw score 38.

28 or below averaged below the total group mean of 490.75 and all score levels 29 or above averaged above the group mean. The step-by-step analysis of the data indicated that as the raw score increased the State Board Test Pool Examination mean tended to increase.

The frequency distribution by means of a cross-tabulation procedure is presented in Table XIII. The table shows that the raw-score groups in the low range tend to have a larger percentage of their group falling in the lower column on the State Board Test Pool Examination scores than they represent of the total and the raw score groups in the upper ranges tend to have a larger percentage of their group falling in the upper columns range of the State Board Test Pool Examination. As an example, the raw-score range of 17-22 represents 4.19 percent of the total yet they provided 53.33 percent of the failures in the 150-249 range and 14.75 percent of the failures in the 250-349 range. By contrast the raw score group of 33-36 comprised 17.08 percent of the total yet they provided zero percent of the failure in the 150-249 range. Only one failure occurred out of the 175 persons in the raw score groups of 33-36 and 37-38.

The comparison of raw scores on Language Mechanics with performance on the State Board Test Pool Examination is presented in Table XIV. The raw scores ranged from a low of 5 to a high of 25 (the maximum score possible). The table revealed that all raw score levels 17 and above averaged above the total group mean of 490.75 while all raw score levels 16 or below averaged below the group mean. Generally, as the raw score increased, the mean on the State Board Test Pool Examination increased.

TABLE XIII

FREQUENCY DISTRIBUTION OF STATE BOARD TEST POOL EXAMINATION SCORES BY RAW SCORES ON LANGUAGE EXPRESSION

Language Expression		State Board Test Pool Examination Scores						
		150-249	250-349	350-449	450-549	550-649	650-749	Total
9-12	N	1	1	0	1	0	0	3
	Pct. of Tot.	0.11	0.11	0.00	0.11	0.00	0.00	0.34
	Pct. of Row	33.33	33.33	0.00	33.33	0.00	0.00	
	Pct. of Col.	6.67	1.64	0.00	0.29	0.00	0.00	
13-16	N	0	2	2	0	0	0	4
	Pct. of Tot.	0.00	0.23	0.23	0.00	0.00	0.00	0.45
	Pct. of Row	0.00	50.00	50.00	0.00	0.00	0.00	
	Pct. of Col.	0.00	3.28	1.00	0.00	0.00	0.00	
17-20	N	8	9	11	9	0	0	37
	Pct. of Tot.	0.90	1.02	1.24	1.02	0.00	0.00	4.19
	Pct. or Row	21.62	24.32	29.73	24.32	0.00	0.00	
	Pct. of Col.	53.33	14.75	5.50	2.65	0.00	0.00	
21-24	N	5	15	53	42	7	1	123
	Pct. of Tot.	0.57	1.70	6.00	4.75	0.79	0.11	13.91
	Pct. of Row	4.07	12.20	43.09	34.15	5.69	0.81	
	Pct. of Col.	33.33	24.59	26.50	12.35	2.85	4.55	
25-28	N	0	22	82	100	53	3	260
	Pct. of Tot.	0.00	2.49	9.28	11.31	6.00	0.34	29.41
	Pct. of Row	0.00	8.46	31.54	38.46	20.38	1.15	
	Pct. of Col.	0.00	36.07	41.00	29.41	21.54	13.64	
29-32	N	1	11	38	123	101	8	282
	Pct. of Tot.	0.11	1.24	4.30	13.91	11.43	0.90	31.90
	Pct. of Row	0.35	3.90	13.48	43.62	35.82	2.84	
	Pct. of Col.	6.67	18.03	19.00	36.18	41.06	36.36	
33-36	N	0	1	13	58	71	8	151
	Pct. of Tot.	0.00	0.11	1.47	6.56	8.03	0.90	17.08
	Pct. of Row	0.00	0.66	8.61	38.41	47.02	5.30	
	Pct. of Col.	0.00	1.64	6.50	17.06	28.86	36.36	

TABLE XIII (Cont'd)

Language Expression		State Board Test Pool Examination Scores 150-249	250-349	350-449	450-549	550-649	650-749	Total
37-38	N	0	0	1	7	14	2	24
	Pct. of Tot.	0.00	0.00	0.11	0.79	1.58	0.23	2.71
	Pct. of Row	0.00	0.00	4.17	29.17	58.33	8.33	
	Pct. of Col.	0.00	0.00	0.50	2.06	5.69	9.09	
Total		15	61	200	340	246	22	884
		1.70	6.90	22.62	38.46	27.83	2.49	100.00

TABLE XIV

COMPARISON OF RAW SCORES ON LANGUAGE MECHANICS AND PERFORMANCE ON STATE BOARD TEST POOL EXAMINATION

Raw Score	N	State Board Test Pool Examination Score			
		Mean	Std. Dev.	Minimum	Maximum
5	2	343.5*	193.0	207	480
6	1	404.0*	-	404	404
7	2	445.0*	165.5	328	562
8	9	447.2*	106.9	271	573
9	14	458.1*	76.3	307	567
10	18	406.6*	72.3	275	528
11	16	440.3*	67.8	342	581
12	37	434.2*	87.8	196	577
13	40	428.2*	106.1	179	596
14	50	471.6*	104.1	245	684
15	74	476.3*	88.6	275	645
16	82	458.7*	91.8	161	663
17	66	507.7	94.7	215	730
18	77	504.4	83.6	256	688
19	96	490.8	102.1	239	670
20	88	498.2	88.7	199	677
21	72	514.8	81.8	314	709
22	64	536.9	87.5	260	693
23	52	557.6	76.4	342	719
24	23	568.3	58.0	428	678
25	1	611.0	-	611	611
17.48	884	490.75	97.22		

*Below mean of 490.75. Maximum raw score 25.

The frequency distribution by means of a cross-tabulation procedure is presented in Table XV. The groups in the three low raw score ranges provided a higher percentage in the failure columns 150-249, 250-349 than they comprised of the total study while the groups in the three upper raw score ranges provided a smaller percentage to the failure columns than they comprised of the total. While the persons with 13-16 comprised 27.83 percent of the total group, they provided 46.67 percent of the 150-249 column and 37.70 percent of the 250-349 column. By contrast, the 21-24 raw score group which had 23.87 percent of the total group provided zero percent of the 150-249 column and 11.48 percent of the 250-349 column.

The comparison or raw scores on Total Language with performance on the State Board Test Pool Examination is presented in Table XVI. The raw scores ranged from a low of 14 to a high score of 62, one less than the maximum possible of 63. In general, as the raw score increased the mean on the State Board Test Pool Examination increased. All of the groups with a raw score of 47 or higher scored above the group mean of 490.75 on the State Board Test Pool Examination while all groups with a raw score of 46 or less had a mean score below the total group mean.

The frequency distribution of Total Language score by State Board Test Pool Examination by means of a cross-tabulation procedure is presented in Table XVII. The table shows that the lower four ranges of raw scores had a higher percentage of the scores in the two lower State Board Test Pool Examination columns, 150-249, and 250-349, than they

TABLE XV

FREQUENCY DISTRIBUTION OF STATE BOARD TEST POOL EXAMINATION SCORES BY RAW SCORES ON LANGUAGE MECHANICS

Language Mechanics		State Board Test Pool Examination Scores						
		150-249	250-349	350-449	450-549	550-649	650-749	Total
5-8	N	1	3	3	4	2	0	14
	Pct. of Tot.	0.11	0.34	0.34	0.57	0.23	0.00	1.58
	Pct. of Row	7.14	21.43	21.43	35.71	14.29	0.00	
	Pct. of Col.	6.67	4.92	1.50	1.47	0.81	0.00	
9-12	N	2	11	36	29	7	0	85
	Pct. of Tot.	0.23	1.24	4.07	3.28	0.79	0.00	9.62
	Pct. of Row	2.35	12.94	42.35	34.12	8.24	0.00	
	Pct. of Col.	13.33	18.03	18.00	8.53	2.85	0.00	
13-16	N	7	23	75	95	43	3	246
	Pct. of Tot.	0.79	2.60	8.48	10.75	4.86	0.34	27.83
	Pct. of Row	2.85	9.35	30.49	38.62	17.48	1.22	
	Pct. of Col.	47.67	37.70	37.50	27.94	17.48	13.64	
17-20	N	5	17	64	132	102	7	327
	Pct. of Tot.	0.47	1.92	7.24	14.93	11.54	0.79	36.99
	Pct. of Row	1.53	5.20	19.57	40.37	31.19	2.14	
	Pct. of Col.	33.33	27.87	32.00	38.82	41.46	31.82	
21-24	N	0	7	22	79	91	12	211
	Pct. of Tot.	0.00	0.79	2.49	8.94	10.29	1.36	23.87
	Pct. of Row	0.00	3.32	10.43	37.44	43.13	5.69	
	Pct. of Col.	0.00	11.48	11.00	23.24	36.99	54.55	
25	N	0	0	0	0	1	0	1
	Pct. of Tot.	0.00	0.00	0.00	0.00	0.11	0.00	0.11
	Pct. of Row	0.00	0.00	0.00	0.00	100.00	0.00	
	Pct. of Col.	0.00	0.00	0.00	0.00	0.41	0.00	
Total		15	61	200	340	246	22	884
		1.70	6.90	22.62	38.46	27.83	2.49	100.00

TABLE XVI

COMPARISON OF RAW SCORE ON TOTAL LANGUAGE WITH PERFORMANCE ON STATE BOARD TEST POOL EXAMINATION

Raw Score	N	State Board Test Pool Examination Scores			
		Mean	Std. Dev.	Minimum	Maximum
14	1	207.0*	-	207	207
21	1	314.0*	-	314	314
24	1	346.0*	-	346	346
26	2	377.5*	145.0	275	480
27	5	355.6*	100.5	271	517
28	1	372.0*	-	372	372
29	5	374.0*	144.3	196	491
30	4	442.3*	107.9	264	491
31	4	436.0*	89.2	364	562
32	7	386.3*	88.8	290	502
33	10	398.3*	72.1	245	503
34	14	433.7*	76.5	246	573
35	14	421.9*	90.2	226	521
36	23	410.9*	80.0	239	536
37	21	401.8*	91.7	179	577
38	39	426.8*	92.8	161	614
39	24	457.0*	103.1	215	614
40	36	438.6*	100.5	199	596
41	41	451.5*	86.0	256	592
42	35	477.0*	86.4	296	663
43	31	486.0*	88.1	271	663
44	36	484.0*	101.5	236	640
45	43	493.8	79.3	307	618
46	49	489.6*	81.0	314	684
47	51	509.3*	69.6	377	663
48	60	503.5	88.1	319	659
49	40	504.5	98.7	249	640
50	31	503.4	83.5	342	673
51	37	520.5	96.0	260	730
52	37	532.3	73.2	335	719
53	35	543.6	75.3	317	695
54	26	565.2	58.1	466	644
55	28	523.6	79.2	350	634
56	27	574.7	64.9	458	709
57	17	556.0	73.8	417	691
58	14	577.6	59.0	491	693
59	17	568.2	59.5	454	649
60	8	572.6	26.3	529	603

TABLE XVI (Cont'd)

Raw Score	N	State Board Test Pool Examination Scores Mean	Std. Dev.	Minimum	Maximum
61	8	589.9	58.6	506	678
62	1	560.0	-	560	560
45.95	884	490.75	97.22		

*Below mean of 490.75. Maximum raw score 63.

TABLE XVII

FREQUENCY DISTRIBUTION OF STATE BOARD TEST POOL EXAMINATION SCORES BY RAW SCORES ON TOTAL LANGUAGE

Total Language		State Board Test Pool Examination Scores						
		150-249	250-349	350-449	450-549	550-649	650-749	Total
14-16	N	1	0	0	0	0	0	1
	Pct. of Tot.	0.11	0.00	0.00	0.00	0.00	0.00	0.11
	Pct. of Row	100.00	0.00	0.00	0.00	0.00	0.00	
	Pct. of Col.	6.67	0.00	0.00	0.00	0.00	0.00	
17-23	N	0	1	0	0	0	0	1
	Pct. of Tot.	0.00	0.11	0.00	0.00	0.00	0.00	0.11
	Pct. of Row	0.00	100.00	0.00	0.00	0.00	0.00	
	Pct. of Col.	0.00	1.64	0.00	0.00	0.00	0.00	
24-30	N	2	6	3	7	0	0	18
	Pct. of Tot.	0.23	0.68	0.34	0.79	0.00	0.00	2.04
	Pct. of Row	11.11	33.33	16.67	38.89	0.00	0.00	
	Pct. of Col.	13.33	9.84	1.50	2.06	0.00	0.00	
31-37	N	6	12	45	27	3	0	93
	Pct. of Tot.	0.68	1.36	5.09	3.05	0.34	0.00	10.52
	Pct. of Row	6.45	12.90	48.39	29.03	3.23	0.00	
	Pct. of Col.	40.00	19.67	22.50	7.94	1.22	0.00	
38-44	N	5	27	71	97	39	3	242
	Pct. of Tot.	0.57	3.05	8.03	10.97	4.41	0.34	27.38
	Pct. of Row	2.07	11.16	29.34	40.08	16.12	1.34	
	Pct. of Col.	33.33	44.26	35.50	28.53	15.85	13.64	
45-41	N	1	13	68	124	99	6	311
	Pct. of Tot.	0.11	1.47	7.69	14.03	11.20	0.68	35.18
	Pct. of Row	0.32	4.18	21.86	39.87	31.83	1.93	
	Pct. of Col.	6.67	21.31	34.00	36.47	40.24	27.27	
52-58	N	0	2	13	74	83	12	184
	Pct. of Tot.	0.00	0.23	1.47	8.37	9.39	1.36	20.81
	Pct. of Row	0.00	1.09	7.07	40.22	45.11	6.52	
	Pct. of Col.	0.00	3.28	6.50	21.76	33.74	54.55	

TABLE XVII (Cont'd)

Total Language		State Board Test Pool Examination Scores						
		150-249	250-349	350-449	450-549	550-649	650-749	Total
59-63	N	0	0	0	11	22	0	34
	Pct. of Tot.	0.00	0.00	0.00	1.24	2.49	0.11	3.85
	Pct. of Row	0.00	0.00	0.00	32.35	64.71	2.94	
	Pct. of Col.	0.00	0.00	0.00	3.24	8.94	4.55	
Total		15	61	200	340	246	22	884
		1.70	6.90	22.62	38.46	27.83	2.49	100.00

comprised of the total study. The raw score group of 31-37 comprised 10.52 percent of the total study group yet they included 40 percent of the ones in the 150-249 column and 19.67 percent of the ones in the 250-349 column. On the upper level of State Board Test Pool Examination scores, the same group provided only 1.22 percent of 550-649 column and zero percent of the 650-749 column. By contrast, the raw score group of 52-58 comprised 20.81 percent of the total yet they contributed zero percent of the 150-249 column and only 3.28 percent of the 250-349 column while at the same time they contributed 54.55 percent of the 650-749 column.

The correlation coefficients for the relationships between Language Mechanics, Language Expression, and Total Language and the State Board Test Pool Examination are shown below:

Variable	No. of Observation	Correlation Coefficient	r^2	Level of Probability
Language Mechanics	884	0.35039	0.123	0.0001
Language Expression	884	0.52388	0.275	0.0001
Total Language	884	0.51048	0.260	0.0001

The examination of the data presented above revealed that statistically significant relationships existed at the 0.0001 level of signifcance; therefore, Null Hypotheses No.s 6, 7, and 8 were rejected.

VI. MATHEMATICS AS A FACTOR

The ninth, tenth, and eleventh hypotheses were concerned with the relationship between the scores on the mathematics section of the CAT-19 and performance on the State Board Test Pool Examination. The null hypotheses were stated as follows:

Ho_9 - There is no statistically significant relationship between the performance of the students on the Mathematics Computation section of CAT-19 and their performance on the State Board Test Pool Examination.

Ho_{10} - There is no statistically significant relationship between the performance of the students on the Mathematics Concepts and Application section of CAT-19 and their performance on the State Board Test Pool Examination.

Ho_{11} - There is no statistically significant relationship between the performance of the students on the Total Mathematics score of CAT-19 and their performance on the State Board Test Pool Examination.

The comparison of raw score on Mathematics Computation with performance on the State Board Test Pool Examination is presented in Table XVIII. The raw scores ranged from a low of 3 to a high of 39 (out of a maximum possible of 40). As the raw scores increased, the performance on the State Board Test Pool Examination generally increased with all raw scores of 27 or above having a mean above the total group mean. All raw scores of 22 or below had a mean below the total group mean.

TABLE XVIII

COMPARISON OF RAW SCORES ON MATHEMATICS COMPUTATION AND PERFORMANCE ON STATE BOARD TEST POOL EXAMINATION

Raw Score	N	State Board Test Pool Examination Scores			
		Mean	Std. Dev.	Minimum	Maximum
3	1	393.0*	-	393	393
5	1	277.0*	-	277	277
6	2	474.5*	13.44	465	484
7	1	424.0*	-	424	424
8	5	428.4*	154.1	207	566
9	10	467.4*	73.2	367	603
10	5	410.8*	99.5	323	566
11	9	454.0*	98.5	271	573
12	18	427.4*	94.1	221	551
13	19	486.5*	98.8	264	609
14	21	453.8*	124.8	280	719
15	21	420.8*	111.2	241	590
16	30	456.9*	82.1	275	659
17	27	454.4*	110.2	226	634
18	38	469.3*	94.9	161	638
19	36	489.0*	83.4	244	633
20	39	471.3*	96.7	275	633
21	42	469.5*	103.6	236	640
22	38	471.9*	105.8	199	655
23	38	495.1	73.1	342	641
24	35	493.2	102.6	215	663
25	42	497.9	100.3	196	663
26	37	489.4*	93.7	271	644
27	45	494.4	88.9	239	663
28	51	493.0	83.5	312	663
29	43	500.3	85.4	325	695
30	40	513.5	91.6	179	673
31	40	505.8	97.6	256	637
32	42	522.2	85.3	314	688
33	34	544.6	92.2	296	691
34	15	562.8	90.7	376	709
35	14	525.7	74.8	407	645
36	12	539.7	64.3	428	631
37	12	563.4	91.7	373	730
38	10	537.9	58.4	417	633
39	11	581.0	59.3	458	673
24.20	884	490.75	97.22		

*Below mean of 490.75. Maximum raw score 40.

The frequency distribution by means of a cross-tabulation procedure is presented in Table XIX. The raw score group in the lower range tended to produce a higher percentage of persons scoring in the lower two columns 150-249, 250-349 of the State Board Test Pool Examination than they constituted of the total group. The raw score group of 17-20 constituted only 15.84 percent of the total group yet they providing 33.33 percent of the failures in the 150-249 group while in contrast the 33-36 raw score group comprised 8.84 percent of the total but contributed zero percent to the 150-249 column while provided 27.27 percent of the 650-749 column.

The comparison of raw scores on Mathematics Concepts and Application with performance on the State Board Test Pool Examination is presented in Table XX. The table revealed that as the raw score increased the score on the State Board Test Pool Examination tended to increase. All raw score groups of 25 or higher had a mean higher than the total group mean while with only two exceptions all groups below that level had a mean below the total group mean.

The frequency distribution by means of a cross-tabulation procedure is presented in Table XXI. The raw score groups in the lower score ranges tended to produce a higher percentage of persons in the two lower columns 150-249, 250-349 than they constituted of the total study. The raw score group from 13-16 was 10.52 percent of the total group yet they provided 27.67 percent of the 150-249 column and 16.39 percent of the 250-349 column while providing only 4.55 percent of the 650-749 column. In contrast, the two highest raw score groups 37-40 and 41-44 had no person in the two lowest columns.

TABLE XIX

FREQUENCY DISTRIBUTION OF STATE BOARD TEST POOL EXAMINATION SCORES BY RAW SCORES ON MATHEMATICS COMPUTATION

Mathematics Computation		State Board Test Pool Examination Scores 150-249	250-349	350-449	450-549	550-649	650-749	Total
1-4	N	0	0	1	0	0	0	1
	Pct. of Tot.	0.00	0.00	0.11	0.00	0.00	0.00	0.11
	Pct. of Row	0.00	0.00	100.00	0.00	0.00	0.00	
	Pct. of Col.	0.00	0.00	0.50	0.00	0.00	0.00	
5-8	N	1	2	1	4	1	0	9
	Pct. of Tot.	0.11	0.23	0.11	0.45	0.11	0.00	1.02
	Pct. of Row	11.11	22.22	11.11	44.44	11.11	0.00	
	Pct. of Col.	6.67	3.28	0.50	1.18	0.41	0.00	
9-12	N	1	6	15	13	7	0	42
	Pct. of Tot.	0.11	0.68	1.70	1.47	0.79	0.00	4.75
	Pct. of Row	2.38	14.29	35.71	30.95	16.67	0.00	
	Pct. of Col.	6.67	9.84	7.50	3.82	2.85	0.00	
13-16	N	1	13	29	30	15	3	91
	Pct. of Tot.	0.11	1.47	3.28	3.39	1.70	0.34	10.29
	Pct. of Row	1.10	14.29	31.87	32.97	16.48	3.30	
	Pct. of Col.	6.67	21.31	14.50	8.82	6.10	13.64	
17-20	N	5	9	35	61	30	0	140
	Pct. of Tot.	0.57	1.02	3.96	6.90	3.39	0.00	15.84
	Pct. of Row	3.57	6.43	25.00	43.57	21.43	0.00	
	Pct. of Col.	33.33	14.75	17.50	17.94	12.20	0.00	
21-24	N	4	9	44	57	37	2	153
	Pct. of Tot.	0.45	1.02	4.98	6.45	4.19	0.23	17.31
	Pct. of Row	2.61	5.88	28.76	37.25	24.18	1.31	
	Pct. of Col.	26.67	14.75	22.00	16.76	15.04	9.09	
25-28	N	2	11	38	71	49	4	175
	Pct. of Tot.	0.23	1.24	4.30	8.03	5.54	0.45	19.80
	Pct. of Row	1.14	6.29	21.71	40.57	28.00	2.29	
	Pct. of Col.	13.33	18.03	19.00	20.88	19.92	18.18	

TABLE XIX (Cont'd)

Mathematics Computation		State Board Test Pool Examination Scores 150-249	250-349	350-449	450-549	550-649	650-749	Total
29-32	N	1	9	28	66	56	5	165
	Pct. of Tot.	0.11	1.02	3.17	7.47	6.33	0.57	18.67
	Pct. of Row	0.61	5.45	16.97	40.00	33.94	3.03	
	Pct. of Col.	6.67	14.75	14.00	19.41	22.76	22.73	
33-36	N	0	2	6	30	31	6	75
	Pct. of Tot.	0.00	0.23	0.68	3.39	3.51	0.68	8.48
	Pct. of Row	0.00	2.67	8.00	40.00	41.33	8.00	
	Pct. of Col.	0.00	3.28	3.00	8.82	12.60	27.27	
37-40	N	0	0	3	8	20	2	33
	Pct. of Tot.	0.00	0.00	0.34	0.90	2.26	0.23	3.73
	Pct. of Row	0.00	0.00	9.09	24.24	60.61	6.06	
	Pct. of Col.	0.00	0.00	1.50	2.35	8.13	9.09	
Total		15	61	200	340	246	22	884
		1.70	6.90	22.62	38.46	27.83	2.49	100.00

TABLE XX

COMPARISON OF RAW SCORES ON MATHEMATICS CONCEPTS AND APPLICATIONS WITH PERFORMANCE ON STATE BOARD TEST POOL EXAMINATION

Raw Score	N	State Board Test Pool Examination Scores			
		Mean	Std. Dev.	Minimum	Maximum
4	1	463.0*	-	463	463
6	1	536.0	-	536	536
7	3	362.7*	179.5	226	566
9	2	462.0*	199.4	321	603
10	3	481.0*	23.6	456	503
11	6	414.2*	91.5	277	555
12	10	438.4*	103.3	271	638
13	29	434.6*	108.1	196	600
14	17	478.8*	94.7	280	633
15	18	457.1*	101.8	275	684
16	29	538.5	104.0	179	624
17	31	471.1*	92.5	246	659
18	28	442.5*	105.5	260	693
19	43	451.1*	95.3	265	596
20	39	486.5*	68.8	278	614
21	55	458.0*	81.3	249	617
22	60	501.9	107.5	161	719
23	64	472.8*	85.2	256	659
24	47	476.6*	93.5	279	633
25	43	491.6	85.3	215	634
26	35	513.6	101.0	236	663
27	38	506.3	98.4	239	691
28	33	510.6	85.7	310	659
29	38	493.3	95.1	271	695
30	29	499.4	84.8	308	634
31	32	533.9	94.2	307	673
32	34	534.5	89.7	314	677
33	16	504.1	95.5	296	631
34	21	552.9	69.3	342	645
35	20	546.4	77.1	317	640
36	10	549.1	86.9	346	673
37	11	557.5	75.9	407	670
38	12	549.9	65.8	417	645
39	12	590.6	56.6	528	709
40	4	551.8	60.5	488	631
41	4	545.5	70.4	446	611
42	3	571.0	141.7	458	730

TABLE XX (Cont'd)

Raw Score	N	State Board Test Pool Examination Scores			
		Mean	Std. Dev.	Minimum	Maximum
43	1	649.0	-	649	649
44	2	560.5	50.2	525	596
24.34	884	490.75	97.22		

*Below mean of 490.75. Maximum raw score 45.

TABLE XXI

FREQUENCY DISTRIBUTION OF STATE BOARD TEST POOL EXAMINATION SCORES BY RAW SCORES ON MATHEMATICS CONCEPTS AND APPLICATION

Mathematics Concepts and Applications		State Board Test Pool Examination Scores						
		150-249	250-349	350-449	450-549	550-649	650-749	Total
1-4	N	0	0	0	1	0	0	1
	Pct. of Tot.	0.00	0.00	0.00	0.11	0.00	0.00	0.11
	Pct. of Row	0.00	0.00	0.00	100.00	0.00	0.00	
	Pct. of Col.	0.00	0.00	0.00	0.29	0.00	0.00	
5-8	N	1	1	0	1	1	1	4
	Pct. of Tot.	0.11	0.11	0.00	0.11	0.11	0.11	0.45
	Pct. of Row	25.00	25.00	0.00	25.00	25.00	0.00	
	Pct. of Col.	6.67	1.64	0.00	0.29	0.41	0.00	
9-12	N	0	3	9	5	4	0	21
	Pct. of Tot.	0.00	0.34	1.02	0.57	0.45	0.00	2.38
	Pct. of Row	0.00	14.29	42.86	23.81	19.05	0.00	
	Pct. of Col.	0.00	4.92	4.50	1.47	1.63	0.00	
13-16	N	4	10	32	30	16	1	93
	Pct. of Tot.	0.45	1.13	3.62	3.39	1.81	0.11	10.52
	Pct. of Row	4.30	10.74	34.41	32.26	17.20	1.08	
	Pct. of Col.	26.67	16.39	16.00	8.82	6.50	4.55	
17-20	N	1	17	40	59	22	2	141
	Pct. of Tot.	0.11	1.92	4.52	6.67	2.49	0.23	15.95
	Pct. of Row	0.71	12.06	28.37	41.84	15.60	1.42	
	Pct. of Col.	6.67	27.87	20.00	17.35	8.94	9.09	
21-24	N	5	12	65	90	51	3	226
	Pct. of Tot.	0.57	1.36	7.35	10.18	5.77	0.34	25.57
	Pct. of Row	2.21	5.31	28.76	39.82	22.57	1.33	
	Pct. of Col.	33.33	19.67	32.50	26.47	20.73	13.64	
25-28	N	4	5	26	64	45	5	149
	Pct. of Tot.	0.45	0.57	2.94	7.24	5.09	0.57	16.86
	Pct. of Row	2.68	3.36	17.45	42.95	30.20	3.36	
	Pct. of Col.	26.67	8.20	13.00	18.82	18.29	22.73	

TABLE XXI (Cont'd)

Mathematics Concepts and Applications		State Board Test Pool Examination Scores						
		150-249	250-349	350-449	450-549	550-649	650-749	Total
29-32	N	0	9	22	50	46	6	133
	Pct. of Tot.	0.00	1.02	2.49	5.66	5.20	0.68	15.05
	Pct. of Row	0.00	6.77	16.54	37.59	34.59	4.51	
	Pct. of Col.	0.00	14.75	11.00	14.71	18.70	27.27	
33-36	N	0	4	3	24	35	1	67
	Pct. of Tot.	0.00	0.45	0.34	2.71	3.96	0.11	7.58
	Pct. of Row	0.00	5.97	4.48	35.82	52.24	1.49	
	Pct. of Col.	0.00	6.56	1.50	7.06	14.23	4.55	
37-40	N	0	0	2	13	21	3	39
	Pct. of Tot.	0.00	0.00	0.23	1.47	2.38	0.34	4.41
	Pct. of Row	0.00	0.00	5.13	33.33	53.85	7.69	
	Pct. of Col.	0.00	0.00	1.00	3.82	8.54	13.64	
41-44	N	0	0	1	3	5	1	10
	Pct. of Tot.	0.00	0.00	0.11	0.34	0.57	0.11	1.13
	Pct. of Row	0.00	0.00	10.00	30.00	50.00	10.00	
	Pct. of Col.	0.00	0.00	0.50	0.88	2.03	4.55	
Total		15	61	200	340	246	22	884
		1.70	6.90	22.62	38.46	27.83	2.49	100.00

The comparison of raw scores on the Total Mathematics score with performance on the State Board Test Pool Examination is presented in Table XXII. The test scores range from a low of 14 to a high of 83 (out of a maximum possible of 85). In general, the mean score on the State Board Test Pool Examination increased in relation to the increase in the raw score. With one exception all raw score levels of 60 or more had a mean above the total group mean while the majority of the raw scores below that level had a mean below the group mean.

The frequency distribution by means of a cross-tabulation procedure is presented in Table XXIII. A review of the table revealed that the lower raw score levels had a larger percentage of the persons in the lower columns 150-249, 250-349 of the State Board Test Pool Examination than they comprised of the total study. The raw score group of 24-30 constituted 6.56 percent of the total group yet they provided 20 percent of the 150-249 column and 14.75 percent of the 250-349 column. In contrast, the 67-73 raw score group comprised 6.11 percent of the total but included only 1.64 percent of the 250-349 column and zero percent of the 150-249 column while providing 13.64 percent of the 650-749 column.

The correlation coefficients of the raw scores on the mathematics sections of the CAT-19 and the student performance on the State Board Test Pool Examination are shown below:

TABLE XXII

COMPARISON OF RAW SCORE ON TOTAL MATHEMATICS WITH PERFORMANCE ON STATE BOARD TEST POOL EXAMINATION

Raw Score	N	State Board Test Pool Examination Scores			
		Mean	Std. Dev.	Minimum	Maximum
14	1	393.0*	-	393	393
15	1	566.0	-	566	566
16	1	277.0*	-	277	277
18	1	536.0	-	536	536
19	2	470.0*	19.8	456	484
21	2	390.0*	132.9	296	484
22	6	434.3*	74.9	328	521
23	2	368.0*	137.2	271	465
24	6	358.0*	116.4	207	491
25	6	434.5*	128.9	275	603
26	3	408.7*	102.6	320	521
27	7	435.8*	70.9	342	551
28	12	428.3*	96.5	280	533
29	10	478.2*	98.0	364	684
30	14	438.2*	111.0	245	638
31	14	396.6*	75.5	264	562
32	20	510.9	80.5	299	634
33	14	516.5	96.4	307	659
34	16	419.3*	89.6	221	555
35	7	473.4*	91.6	296	570
36	23	456.7*	114.7	246	719
37	15	407.5*	81.7	275	549
38	21	459.0*	109.0	196	624
39	26	474.4*	91.9	275	603
40	24	470.9*	100.6	161	603
41	23	447.1*	86.0	241	614
42	24	479.3*	90.4	316	618
43	26	469.0*	83.2	238	617
44	16	471.3*	95.4	199	633
45	26	498.2	72.0	319	603
46	28	481.9*	96.5	179	640
47	34	489.3*	99.7	236	693
48	16	495.0	75.3	396	621
49	24	493.1	112.7	215	640
50	25	478.6*	79.2	308	620
51	24	493.4	99.8	315	663
52	26	509.0	79.4	342	640
53	25	530.3	79.3	376	663
54	28	501.5	99.1	239	649
55	33	489.3*	99.2	271	663

TABLE XXII (Cont'd)

Raw Score	N	State Board Test Pool Examination Scores Mean	Std. Dev.	Minimum	Maximum
56	12	553.7	59.2	463	659
57	24	513.8	87.2	307	641
58	14	501.0	90.6	394	695
59	17	471.3*	95.3	310	600
60	17	532.8	81.2	391	691
61	20	523.5	80.5	391	673
62	8	534.9	103.3	376	678
63	13	515.6	74.0	361	609
64	21	510.3	90.0	314	629
65	12	576.3	90.4	317	677
66	11	520.5	112.7	296	631
67	15	535.1	78.4	346	640
68	7	566.9	48.7	467	606
69	8	537.8	60.9	485	645
70	8	549.9	85.9	372	645
71	5	626.0	54.6	562	688
72	5	530.4	82.4	407	607
73	6	587.3	76.6	485	709
74	4	541.5	43.1	484	588
75	3	609.3	57.0	563	673
76	5	558.2	87.8	417	633
77	2	523.0	49.5	488	558
78	8	552.9	52.3	446	611
79	2	645.0	120.2	560	730
80	2	525.0	-	525	525
81	1	458.0	-	458	458
82	1	649.0	-	649	649
83	1	596.0	-	596	596
48.54	884	490.75	97.22		

*Below mean of 490.75. Maximum raw score 85.

TABLE XXIII

FREQUENCY DISTRIBUTION OF STATE BOARD TEST POOL EXAMINATION SCORES BY RAW SCORES ON TOTAL MATHEMATICS

Total Mathematics		State Board Test Pool Examination Scores						
		150-249	250-349	350-449	450-549	550-649	650-749	Total
14-16	N	0	1	1	0	1	0	3
	Pct. of Tot.	0.00	0.11	0.11	0.00	0.11	0.00	0.33
	Pct. of Row	0.00	30.00	33.00	0.00	33.00	0.00	
	Pct. of Col.	0.00	1.64	0.50	0.00	0.41	0.00	
17-23	N	0	3	3	7	0	0	13
	Pct. of Tot.	0.00	0.34	0.34	0.79	0.00	0.00	1.47
	Pct. of Row	0.00	23.08	23.08	53.85	0.00	0.00	
	Pct. of Col.	0.00	4.92	1.50	2.06	0.00	0.00	
24-30	N	3	9	19	18	8	1	58
	Pct. of Tot.	0.34	1.02	2.15	2.04	0.90	0.11	6.56
	Pct. of Row	5.17	15.52	32.76	31.03	13.79	1.72	
	Pct. of Col.	20.00	14.75	9.50	5.29	3.25	4.55	
31-37	N	2	14	37	36	18	2	109
	Pct. of Tot.	0.23	1.58	4.19	4.07	2.04	0.23	12.33
	Pct. of Row	1.83	12.84	33.94	33.03	16.51	1.83	
	Pct. of Col.	13.33	22.95	18.50	10.59	7.32	9.09	
38-44	N	6	8	49	65	32	0	160
	Pct. of Tot.	0.68	0.90	5.54	7.35	3.62	0.00	18.10
	Pct. of Row	3.75	5.00	30.63	40.63	20.00	0.00	
	Pct. of Col.	40.00	13.11	24.50	19.12	13.01	0.00	
45-51	N	3	9	41	72	49	3	177
	Pct. of Tot.	0.34	1.02	4.64	8.14	5.54	0.34	20.02
	Pct. of Row	1.69	5.08	23.16	40.68	27.68	1.69	
	Pct. of Col.	20.00	14.75	20.50	21.18	19.92	13.64	
52-58	N	1	8	29	71	47	6	162
	Pct. of Tot.	0.11	0.90	3.28	8.03	5.32	0.68	18.33
	Pct. of Row	0.62	4.94	17.90	43.83	29.01	3.70	
	Pct. of Col.	6.67	13.11	14.50	20.88	19.11	27.27	

TABLE XXIII (Cont'd)

Total Mathematics		State Board Test Pool Examination Scores						
		150-249	250-349	350-449	450-549	550-649	650-749	Total
59-66	N	0	8	16	42	48	5	119
	Pct. of Tot.	0.00	0.90	1.81	4.75	5.43	0.57	13.46
	Pct. of Row	0.00	6.72	13.45	35.29	40.34	4.20	
	Pct. of Col.	0.00	13.11	8.00	12.35	19.51	22.73	
67-73	N	0	1	3	20	27	3	54
	Pct. of Tot.	0.00	0.11	0.34	2.26	3.05	0.34	6.11
	Pct. of Row	0.00	1.85	5.56	37.04	50.00	5.56	
	Pct. of Col.	0.00	1.64	1.50	5.88	10.98	13.64	
74-80	N	0	0	2	8	14	2	26
	Pct. of Tot.	0.00	0.00	0.23	0.90	1.58	0.23	2.94
	Pct. of Row	0.00	0.00	7.69	30.77	53.85	7.69	
	Pct. of Col.	0.00	0.00	1.00	2.35	5.69	9.09	
81-83	N	0	0	0	1	2	0	3
	Pct. of Tot.	0.00	0.00	0.00	0.11	0.23	0.00	0.34
	Pct. of Row	0.00	0.00	0.00	33.33	66.67	0.00	
	Pct. of Col.	0.00	0.00	0.00	0.29	0.81	0.00	
Total		15	61	200	340	246	22	884
		1.70	6.90	22.62	38.46	27.83	2.49	100.00

Variable	No. of Observation	Correlation Coefficient	r^2	Level of Probability
Math Computation	884	0.29926	0.079	0.0001
Math Concepts and Application	884	0.33593	0.111	0.0001
Total Math	884	0.34676	0.119	0.0001

The examination of the data presented above revealed that statistically significant relationships existed at the 0.0001 level of significance; therefore, Null Hypotheses Nos. 9, 10, and 11 were rejected.

VII. REFERENCE SKILLS AS A FACTOR

The twelfth hypothesis was concerned with the relationship between the score on the Reference Skills section of the CAT-19 and performance on the State Board Test Pool Examination. The null hypothesis was stated as follows:

Ho_{12} - There is no statistically significant relationship between the performance of the student on the Reference Skills section of CAT-19 and their performance on the State Board Test Pool Examination.

The comparison of raw scores on reference skills with performance on the State Board Test Pool Examination is shown in Table XXIV. The raw scores range from a low of 5 to a high of 25 (the maximum score possible). In general, as the raw score increased the State Board Test Pool Examination scores also increased. All of the group with raw scores of 21 or above had a mean above the 500 level while all raw scores below that level had means below the 500 level.

TABLE XXIV

COMPARISON OF RAW SCORES ON REFERENCE SKILLS WITH PERFORMANCE ON STATE BOARD TEST POOL EXAMINATION

Raw Score	N	State Board Test Pool Examination Scores			
		Mean	Std. Dev.	Minimum	Maximum
5	1	491.0	-	491	491
6	1	480.0*	-	480	480
8	3	453.0*	40.9	414	495
9	4	417.0*	129.7	314	599
10	4	425.5*	135.1	264	539
11	4	456.8*	89.5	328	531
12	9	391.8*	130.1	207	551
13	16	433.4*	97.0	196	592
14	22	422.9*	120.5	246	631
15	40	438.9*	85.4	245	684
16	52	456.0*	89.1	199	638
17	64	447.9*	86.6	275	659
18	75	465.4*	84.9	239	645
19	97	485.2*	97.9	179	645
20	105	488.3*	94.8	161	663
21	101	511.3	80.1	260	663
22	104	511.8	96.2	215	719
23	89	535.4	85.7	290	695
24	60	536.9	93.3	271	691
25	27	564.6	94.2	353	730
19.55	878	490.75	97.22		

*Below mean of 490.75. Maximum raw score 25.

The frequency distribution by means of a cross-tabulation procedure is presented in Table XXV. This table reveals that the lower range of raw scores provided a higher percentage of the persons in the lower columns 150-249, 250-349 than they comprised of the total group. By contrast, the persons who scored 21-24 on the raw score comprised 40.32 percent of the total but provided 72.73 percent of the persons in the 650-749 column.

The correlation coefficient for the raw scores on the Reference Skills section of the CAT-19 with the students' performance on the State Board Test Pool Examination is shown below:

Variable	No. of Observation	Correlation Coefficient	r^2	Level of Probability
Reference Skill	878	0.34344	0.118	0.0001

The examination of the data presented above revealed that a statistically significant relationship existed at the 0.001 level of signifcance; therefore, Null Hypothesis No. 12 was rejected.

VIII. TOTAL BATTERY SCORE AS A FACTOR

The thirteenth hypothesis was concerned with the relationship between the Total Battery score on the CAT-19 and performance on the State Board Test Pool Examination. The null hypothesis was stated as follows:

Ho_{13} - There is no statistically significant relationship between the performance of the students on the Total Battery score of CAT-19 and their performance on the State Board Test Pool Examination.

TABLE XXV

FREQUENCY DISTRIBUTION OF STATE BOARD TEST POOL EXAMINATION SCORES BY RAW SCORES ON REFERENCE SKILLS

Reference Skills		State Board Test Pool Examination Scores						
		150-249	250-349	350-449	450-549	550-649	650-749	Total
5-8	N	0	0	1	4	0	0	5
	Pct. of Tot.	0.00	0.00	0.11	0.46	0.00	0.00	0.57
	Pct. of Row	0.00	0.00	20.00	80.00	0.00	0.00	
	Pct. of Col.	0.00	0.00	0.51	1.18	0.00	0.00	
9-12	N	2	5	4	8	2	0	21
	Pct. of Tot.	0.23	0.57	0.46	0.91	0.23	0.00	2.39
	Pct. of Row	9.52	23.81	19.05	38.10	9.52	0.00	
	Pct. of Col.	13.33	8.20	2.02	2.37	0.82	0.00	
13-16	N	5	12	55	39	18	1	130
	Pct. of Tot.	0.57	1.37	6.26	4.44	2.05	0.11	14.81
	Pct. of Row	3.85	9.23	42.31	30.00	13.85	0.77	
	Pct. of Col.	33.33	19.67	27.78	11.54	7.38	4.55	
17-20	N	6	27	94	126	86	2	341
	Pct. of Tot.	0.68	3.08	10.71	14.35	9.79	0.23	38.84
	Pct. of Row	1.76	7.92	27.57	36.95	25.22	0.59	
	Pct. of Col.	40.00	44.26	47.47	37.28	35.25	9.09	
21-24	N	2	17	42	154	123	16	354
	Pct. of Tot.	0.23	1.94	4.78	17.54	14.01	1.82	40.32
	Pct. of Row	0.56	4.80	11.86	43.50	34.75	4.52	
	Pct. of Col.	13.33	27.87	21.21	45.56	50.41	72.73	
25	N	0	0	2	7	15	3	27
	Pct. of Tot.	0.00	0.00	0.23	0.80	1.71	0.34	3.08
	Pct. of Row	0.00	0.00	7.41	25.93	55.56	11.11	
	Pct. of Col.	0.00	0.00	1.01	2.07	6.15	13.64	
Total		15	61	198	338	244	22	878
		1.71	6.95	22.55	38.50	27.79	2.51	100.00

The frequency distribution of the total battery scores as related to State Board Test Pool Examination scores is presented in Table XXVI. The data reveals that as the raw score range in the total battery score increased the scores on the State Board Test Pool Examination increased. Out of the 15 persons falling in the 150-249 column, they all were in the six lower raw score groups which comprised only 41.10 percent of the total group. By contrast, the five highest raw score ranges 181-190 to 221-228 comprised 22.51 percent of the total study but provided only 1.64 percent of those in the 250-349 column and zero percent of the 150-249 column. The same groups provided 59.09 percent of the persons scoring in the 650-749 column and 43.5 percent in the 550-649 column.

From the data cards used to prepare Table XXVI, a study revealed that from the raw score of 175 on the total battery to the top raw score of 228 there was only one person having a failing score on the State Board Test Pool Examination.

There were a total of 246 persons in this category which when calculated into a percentage factor shows a success rate of 99.6 percent success rate on the State Board Test Pool Examination for persons scoring 175 or better on the total battery.

The correlation of the raw score on the Total Battery score with the students' performance on the State Board Test Pool Examination is shown below:

Variable	No. of Observation	Correlation Coefficient	r^2	Level of Probability
Total Battery	884	0.58231	0.339	0.0001

TABLE XXVI

FREQUENCY DISTRIBUTION OF STATE BOARD TEST POOL EXAMINATION SCORES BY RAW SCORES ON TOTAL BATTERY

Total Battery		State Board Test Pool Examination Scores						
		150-249	250-349	350-449	450-549	550-649	650-749	Total
74-82	N	1	0	0	0	0	0	1
	Pct. of Tot.	0.11	0.00	0.00	0.00	0.00	0.00	0.11
	Pct. of Row	100.0	0.00	0.00	0.00	0.00	0.00	
	Pct. of Col.	6.67	0.00	0.00	0.00	0.00	0.00	
83-95	N	0	6	1	0	0	0	7
	Pct. of Tot.	0.00	0.68	0.11	0.00	0.00	0.00	0.79
	Pct. of Row	0.00	85.71	14.29	0.00	0.00	0.00	
	Pct. of Col.	0.00	9.84	0.50	0.00	0.00	0.00	
96-115	N	5	8	13	7	2	0	35
	Pct. of Tot.	0.57	0.90	1.47	0.79	0.23	0.00	3.96
	Pct. of Row	14.29	22.86	37.14	20.00	5.71	0.00	
	Pct. of Col.	33.33	13.11	6.50	2.06	0.81	0.00	
116-127	N	2	11	28	19	5	0	65
	Pct. of Tot.	0.23	1.24	3.17	2.15	0.57	0.00	7.35
	Pct. of Row	3.08	16.92	43.08	29.23	7.69	0.00	
	Pct. of Col.	13.33	18.03	14.00	5.59	2.03	0.00	
128-144	N	5	15	60	55	11	0	146
	Pct. of Tot.	0.57	1.70	6.79	6.22	1.24	0.00	16.52
	Pct. of Row	3.42	10.27	41.10	37.67	7.53	0.00	
	Pct. of Col.	33.33	24.59	30.00	16.18	4.47	0.00	
144-155	N	2	8	37	54	24	2	127
	Pct. of Tot.	0.23	0.90	4.19	6.11	2.71	0.23	14.37
	Pct. of Row	1.57	6.30	29.13	42.52	18.90	1.57	
	Pct. of Col.	13.33	13.11	18.50	15.88	9.76	9.09	
156-160	N	0	6	16	39	18	1	80
	Pct. of Tot.	0.00	0.68	1.81	4.41	2.04	0.11	9.05
	Pct. of Row	0.00	7.50	20.00	48.75	22.50	1.25	
	Pct. of Col.	0.00	9.84	8.00	11.47	7.32	4.55	

TABLE XXVI (Cont'd)

Total Battery		State Board Test Pool Examination Scores 150-249	250-349	350-449	450-549	550-649	650-749	Total
161-170	N	0	3	26	59	34	3	125
	Pct. of Tot.	0.00	0.34	2.94	6.67	3.85	0.34	14.14
	Pct. of Row	0.00	3.03	14.14	34.34	45.45	3.03	
	Pct. of Col.	0.00	4.92	7.00	10.00	18.29	13.64	
171-180	N	0	3	14	34	45	3	99
	Pct. of Tot.	0.00	0.34	1.58	3.85	5.09	0.34	11.20
	Pct. of Row	0.00	3.03	14.14	34.34	45.45	3.03	
	Pct. of Col.	0.00	4.92	7.00	10.00	18.29	13.64	
181-190	N	0	0	3	31	38	2	74
	Pct. of Tot.	0.00	0.00	0.34	3.51	4.30	0.23	8.37
	Pct. of Row	0.00	0.00	4.05	41.89	51.35	2.70	
	Pct. of Col.	0.00	0.00	1.50	9.12	15.45	9.09	
191-200	N	0	1	1	21	36	5	64
	Pct. of Tot.	0.00	0.11	0.11	2.38	4.07	0.57	7.24
	Pct. of Row	0.00	1.56	1.56	32.81	56.25	7.81	
	Pct. of Col.	0.00	1.64	0.50	6.18	14.63	22.73	
201-210	N	0	0	1	16	19	4	40
	Pct. of Tot.	0.00	0.00	0.11	1.81	2.15	0.45	4.52
	Pct. of Row	0.00	0.00	2.50	40.00	47.50	10.00	
	Pct. of Col.	0.00	0.00	0.50	4.71	7.72	18.18	
211-220	N	0	0	0	4	10	2	16
	Pct. of Tot.	0.00	0.00	0.00	0.45	1.13	0.23	1.81
	Pct. of Row	0.00	0.00	0.00	25.00	62.50	12.50	
	Pct. of Col.	0.00	0.00	0.00	1.18	4.07	9.09	
221-228	N	0	0	0	1	4	0	5
	Pct. of Tot.	0.00	0.00	0.00	0.11	0.45	0.00	0.57
	Pct. of Row	0.00	0.00	0.00	20.00	80.00	0.00	
	Pct. of Col.	0.00	0.00	0.00	0.29	1.63	0.00	
Total		15	61	200	340	246	22	884
		1.70	6.90	22.62	38.46	27.83	2.49	100.00

The examination of the data presented above revealed that a statistically significant relationship existed at the 0.0001 level of significance; therefore, Null Hypothesis No. 13 was rejected.

IX. TEST FOR BEST VARIABLE

One of the objectives of the study was to determine which subtest or group of subtests, if any, could best be used as a predictor of success on the State Board Test Pool Examination. After the null hypotheses were tested and rejected, the individual subtest variables of Reading Comprehension, Reading Vocabulary, Spelling, Language Mechanics, Language Expression, Mathematics Computation, Mathematics Concepts/Application, and Reference Skills were subjected to the maximum R^2 test for regression. The variables which were a combination of subtests such as Total Reading were not included in this treatment. This procedure was used to find the best one variable model, the best two variable model, and the best three variable model.

Reading Vocabulary was selected as the best variable model as presented by Table XXVII. The calculated R^2 was 0.36 with an F score of 489.10 which was significant at the 0.0001 level. This selection agrees with the Pearson Product Moment Correlations which showed Reading Comprehension with the highest correlation score (0.60300) of the independent variables.

The best two variable model presented in Table XVIII shows Reading Comprehension entered along with Reading Vocabulary. The addition of the variable Reading Comprehension raised the R^2 from 0.36

TABLE XXVII

THE BEST ONE VARIABLE MODEL BY MAXIMUM R-SQUARE IMPROVEMENT FOR DEPENDENT VARIABLE STATE BOARD TEST POOL EXAMINATION

	Reading Vocabulary				
	DF	Sum of Squares	Mean Square	F	Prob>F
Regression	1	3016519.20	3016519.20	489.10	0.0001
Error	876	5305052.16	6055.99		
Total	877	8321571.37			

R square = 0.36.

TABLE XVIII

THE BEST TWO VARIABLE MODEL BY MAXIMUM R-SQUARE IMPROVEMENT FOR DEPENDENT VARIABLE STATE BOARD TEST POOL EXAMINATION

	Reading Vocabulary, Reading Comprehension				
	DF	Sum of Squares	Mean Square	F	Prob>F
Regression	2	3599160.07	1749580.03	317.45	0.0001
Error	875	4822411.29	5511.32		
Total	877	8321571.37			

R square = 0.42.

of the one variable model to R^2 of 0.42. Reading Comprehension had the second highest correlation score (0.58564) of all the independent subtest scores which agrees with the selection of Reading Comprehension as the second variable.

Language Expression was selected as the third best variable along with Reading Comprehension and Reading Vocabulary as shown in Table XXIX. The addition of the third variable raised the R^2 score only 0.01 from 0.42 to 0.43. The small improvement in the R^2 between the best two and the best three variable models indicated that very little value would be gained by the use of more than two variables.

TABLE XXIX

THE BEST THREE VARIABLE MODEL BY MAXIMUM R-SQUARE IMPROVEMENT FOR DEPENDENT VARIABLE STATE BOARD TEST POOL EXAMINATION

		Reading Vocabulary, Reading Comprehension, Language Expression			
	DF	Sum of Squares	Mean Square	F	Prob>F
Regression	3	3629815.09	1209938.36	225.39	0.0001
Error	874	4691756.27	5368.14		
Total	877	8321571.37			

X. SUMMARY

Chapter IV presented the statistical analysis of the data collected for the study. The major portion of the chapter was devoted to reviewing the data associated with each hypotheses. All thirteen

of the null hypotheses were rejected as a statistically significant relationship was found to exist for each hypothesis. The final portion of this chapter dealt with application of the maximum R^2 procedure to find the best variable model.

CHAPTER V

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

Chapter V includes a review of the study, the findings which resulted from the analyzed data, and the conclusion based upon the data. Included also are recommendations for the study.

I. SUMMARY

The primary objective of the study was to determine the relationship between each of the subtests of the California Achievement Test--Level 19 taken by the Practical Nursing students and their subsequent achievement on the State Board Test Pool Examination and to determine which subtest or group of subtests, if any, could be used as a predictor of success on the State Board Test Pool Examination. A secondary objective was to study the relationship of the age of the students upon their performance on the State Board Test Pool Examination.

The following null hypotheses were developed to be tested by statistical analysis:

Ho_1 - There is no statistically significant relationship between the age of the students and their performance on the State Board Test Pool Examination.

Ho_2 - There is no statistically significant relationship between the performance of the students on the Reading Vocabulary section of CAT-19 and their performance on the State Board Test Pool Examination.

Ho_3 - There is no statistically significant relationship between the performance of the students on the Reading Comprehension section of the CAT-19 and their performance on the State Board Test Pool Examination.

Ho_4 - There is no statistically significant relationship between the performance of the students on the Total Reading Score of CAT-19 and their performance on the State Board Test Pool Examination.

Ho_5 - There is no statistically significant relationship between the performance of the students on the Spelling section of CAT-19 and their performance on the State Board Test Pool Examination.

Ho_6 - There is no statistically significant relationship between the performance of the students on the Language Mechanics section of CAT-19 and their performance on the State Board Test Pool Examination.

Ho_7 - There is no statistically significant relationship between the performance of the students on the Language Expression section of CAT-19 and their performance on the State Board Test Pool Examination.

Ho_8 - There is no statistically significant relationship between the performance of the students on the Total Language Score of CAT-19 and their performance on the State Board Test Pool Examination.

Ho_9 - There is no statistically significant relationship between the performance of the students on the Mathematics Computation

section of CAT-19 and their performance on the State Board Test Pool Examination.

Ho_{10} - There is no statistically significant relationship between the performance of the students on the Mathematics Concepts Application section of CAT-19 and their performance on the State Board Test Pool Examination.

Ho_{11} - There is no statistically significant relationship between the performance of the students on the Total Mathematics score of CAT-19 and their performance on the State Board Test Pool Examination.

Ho_{12} - There is no statistically significant relationship between the performance of the students on the Reference Skills section of CAT-19 and their performance on the State Board Test Pool Examination.

Ho_{13} - There is no statistically significant relationship between the performance of the students on the Total Battery score of CAT-19 and their performance on the State Board Test Pool Examination.

The final population consisted of 884 Practical Nursing students enrolled in an approved program of Practical Nursing in the State of Tennessee and who took the CAT-19 test while enrolled and wrote the State Board Test Pool Examination after graduation.

Statistical analyses were applied to the data to compare the independent variables--age, Reading Vocabulary, Reading Comprehension, Total Reading, Spelling, Language Mechanics, Language Expression, Total

Language, Mathematics Computation, Mathematics Concepts/Application, Total Mathematics Score, Reference Skills, and Total Battery--with performance on the State Board Test Pool Examination. The data were analyzed by Frequency Distribution charts using a cross-tabulation technique, by correlation coefficient calculated by Pearson Product Moment, and selection of Best Variable Model by the Maximum R^2 Improvement Technique.

II. FINDINGS

The major findings of the statistical analyses were:

1. A statistically significant relationship was found between the age of the students and their performance on the SBTPE. The level of performance on the SBTPE tended to increase as the age of the student increased. The age group 17-23 had the highest failure rate (12.32 percent) but also had 76 (or 25.02 percent) with scores above 550 on the SBTPE (including the highest individual score - 730). The age groups above 30 had a combined failure rate of 3.59 percent. The low r^2 (0.041) may be attributable to the wide range of performance within the age groups.

2. Statistically significant relationships were found between the three reading scores [Reading Vocabulary (r^2 0.3647), Reading Comprehension (r^2 0.343), and Total Reading (r^2 0.4207)] and the performance on the SBTPE. The reading scores yielded the highest correlation coefficients of all the subtest groups.

3. Reading Vocabulary were selected as the subtest being the best one variable model (r^2 0.36). Reading Vocabulary and Reading

Comprehension subtests were selected as the best two variable model (r^2 0.42). This finding was consistent with the research studies cited in Chapter II which found a relationship between reading ability and success on a licensing exam.

4. Statistically significant relationships were found between the three language scores [Language Mechanics (r^2 0.123), Language Expression (r^2 0.274), and Total Language (r^2 0.260)] and the performance on the SBTPE. The language scores yielded the second highest correlation coefficients of all the subtest groups.

5. Statistically significant relationships were found for all independent variables and their relationship to success on the State Board Test Pool Examination.

6. Frequency distribution for all variables showed that as the score of the independent variable increased the mean score on the State Board Test Pool Examination generally increased.

7. The r^2's calculated for the independent variable ranged from 0.041 to 0.42 which are in the low to moderate ranges. This indicates that conditions other than the variables tested may be factors to be considered as affecting the performances of the students on the State Board Test Pool Examination.

III. CONCLUSION

The following conclusions were derived from the study:

1. Students in the 17-23 age range as a group will not perform as well on the licensing exam as students above the age range; however,

many individuals within this group will attain high scores on the exam. Students above the age of 30 can be expected to perform as a group at a high level (above 96 percent) of success on the licensing exam.

2. The students' reading ability is the factor having the greatest influence upon the students from among the measurable academic abilities. Students with poor reading skills may have a more difficult time succeeding in the program.

3. Students with low ability in measurable academic abilities can be expected as a group to provide a disproportionate share of the failures while the students with high abilities can be expected as a group to perform at a high level of success.

4. Variables other than those included in the study may be contributing to the student's performance on the State Board Test Pool Examination.

IV. RECOMMENDATIONS

Based upon the findings and conclusions, the following recommendations are presented:

1. Consideration should be given to the use of a reading test as an admission/counseling tool for applicants to schools of Practical Nursing.

2. Consideration should be given to the possibility of providing remedial education to those students with marked deficiencies as measured by CAT-19 or a similar test.

3. A similar research study is needed that would test all students entering the various Practical Nursing classes to determine if the drop out or attrition rate can be attributed to poor academic abilities as measured by an achievement test.

4. Further research is needed to determine if the higher rate of failures among students 17-23 years of age can be identified as to causes in order that schools can provide needed counseling assistance.

5. Research should be conducted to determine if other causes could be contributing to the failures on the State Board Test Pool Examination such as teacher qualifications, reading levels of text-books, or curriculum content.

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APPENDIX

STATE OF TENNESSEE
DEPARTMENT OF EDUCATION
Division of Vocational-Technical Education
200 Cordell Hull Building
Nashville 37219

February 2, 1979

Mr. Robert E. Barnett
1511 Ridgeway Circle
Athens, Tennessee 37303

Dear Mr. Barnett:

I certainly appreciate your interest and concern over our attrition rate and our high State Board failure rate in our Practical Nursing Program. The concern that was discussed in the group meeting about a possible relationship between basic learning skills and achievement on the State Board is an area that needs to be explored. If we could establish a definite relationship then consideration would be given to establishing an entrance requirement into the program.

Since you are involved in a doctoral program, I would like for you to consider the possibility of conducting a research project using a national established exam to determine if there is a relationship between basic learning skills and the State Board Exam. If you do agree to conduct the study my office will give you the necessary support in securing cooperation and participation of programs under my supervision. Please let me know soon if you can conduct the study.

Sincerely yours,

/s/ M. Jean Chapman

M. Jean Chapman
Head State Specialist
Health Occupations Education

MJC:cdj

INDIVIDUAL DATA CARD

Data Card

Age _____ Education _____ State Board Score ____

READING:			SPELL	LANGUAGE:		
Voc	Comp	Total		Mech	Exp	Total
_____	_____	_____	_____	_____	_____	_____

MATH:			TOTAL BATTERY	REF. SKILLS
Comp	Conc	Total		
_____	_____	_____	_____	_____

HOE FORM 104-L
1959
Revised 3/73

State of Tennessee
Department of Education
Field Services and Resources
Health Occupations Education
813 Broadway at Gill
Knoxville, Tennessee 37917

Date

Type of Program

Student Qualifications

School System Address

Name of Hospital Address

Opening Date Instructor

Closing Date

Instructions:

Complete this report and submit two copies to the Regional Supervisor of Health Occupations

(List Alphabetically Students)	Recommended by Advisory Comm.	Age	Place of Residence	Physical	Grade Completed	Date	College Credit	GED Score	Aptitude Test	Male	Female	White	Black	Other
1. Name														
Address														
2. Name														
Address														

VITA

Robert Eugene Barnett was born in Johnson City, Tennessee, on July 11, 1932. He attended elementary school in that city and was graduated from Science Hill High School in June 1950. The following September he entered East Tennessee State College and received a Bachelor of Science Degree in June 1955.

After two years of service in the U.S. Army, he accepted a teaching position as an Industrial Cooperative Teacher with the Bristol Tennessee School System. During this time he completed the requirements for the Master of Science degree in Industrial Education at The University of Tennessee, Knoxville, which he received in August 1964. In 1964 he accepted the position as Superintendent of the Athens State Area Vocational-Technical School, Athens, Tennessee. During this time he entered the Doctoral program at The University of Tennessee and received the Doctor of Education degree with a major in Vocational Technical Education in June 1982.

The researcher is a member of Iota Lambda Sigma, Phi Kappa Phi, Tennessee Vocational Education Association and the American Vocational Association. He is married to the former Deanna Leonard of Johnson City, Tennessee, and they have three children, Roger, Nancy, and Linda.