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AN EVALUATION OF THE GENERAL APTITUDE TEST BATTERY IN PREDICTING SUCCESS IN AREA VOCATIONAL-TECHNICAL CENTERS

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AN EVALUATION OF THE GENERAL APTITUDE TEST BATTERY IN PREDICTING SUCCESS IN AREA VOCATIONAL-TECHNICAL CENTERS

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CHAPTER I

THE PROBLEM

Introduction

The curriculum of numerous Oklahoma high schools has included vocational courses for many years. However, when Congress passed the Vocational Education Act of 1963, PL 88-210, which provided federal funds on a matching basis to construct and operate vocational-technical schools, the concept of these schools and their course offerings demanded new attention. The curriculum varies as much as the world of work. The courses vary from the level of commercial sewing to computer programming.

The area vocational-technical center concept was introduced to Oklahoma when the Congress of the United States passed the Vocational Education Act of 1963, PL 88-210. Specifically, the act provided for training of: (1) high school students; (2) full-time study for persons who have completed or left high school; (3) persons presently employed but who need training or retraining to

achieve stability or advancement in employment; and (4) persons who have academic, socio-economic, or other handicaps that prevent them from succeeding in the regular vocational education program.[1]

Important as the above provisions may be, the provision that had the most influence on Oklahoma's vocational education structure was Section 4, (a) (5) which provided for expenditure of funds for: "Construction of area vocational educational school facilities."[2] Funds appropriated under the act are used on a matching basis in helping to establish and operate Oklahoma's Area Vocational-Technical Centers.

The Vocational Education Act of 1963 provided the state authority and funds to build the first five (5) Area Vocational-Technical Centers:

(1) Tulsa Area Vocational-Technical Center, Tulsa, Oklahoma

(2) Oklahoma City Area Vocational-Technical Center, Oklahoma City, Oklahoma

(3) Southern Oklahoma Area Vocational-Technical Center, Ardmore, Oklahoma

(4) Duncan Area Vocational-Technical Center, Duncan, Oklahoma

(5) O. T. Autry Area Vocational-Technical Center, Enid, Oklahoma

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[1]Oklahoma State Department of Vocational and Technical Education, A New Concept in Vocational and Technical Education in Oklahoma, (Stillwater, 1968), p. 1.

[2]U. S. Congress, The Vocational Education Act, Public Law 88-210, 88th Cong., 1st Sess., 1963.

The first five Area Vocational-Technical Centers were owned and operated by single school districts. This was necessary due to the Rules and Regulations established by the State Board of Vocational and Technical Education and the state laws regulating a school district's expenditure of funds. The Rules and Regulations of the State Board of Vocational and Technical Education state:

> (1) A proposed area school district shall have a total minimum scholastic population of 15,000 or serve a 50 mile radius from the proposed site of the school or one of the schools of the district.
>
> (2) A proposed area school district shall have a minimum net assessed valuation of $40,000,000 after homestead exemptions.[1]

The combination of regulations for Area Vocational-Technical Center construction and state laws on school district expenditures of funds restricted the early development of these centers to the larger school districts.

During July, 1965, The Oklahoma House and Senate passed Joint Resolution No. 530 directing the Secretary of State to refer to the people for their approval or rejection a proposed amendment of Article X of the Constitution of the State of Oklahoma by adding Section 9B. The proposed amendment was submitted to the people as State Question No. 434. It was approved by the people during a

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[1]Oklahoma State Department of Vocational and Technical Education, Rules and Regulations of the State Board of Vocational and Technical Education Governing the Establishment and Operation of Area School Districts for Vocational and/or Technical Education, (Stillwater, 1968), p. 1.

special election on May 24, 1966. The following is Section 9B as adopted by the people of Oklahoma:

> 9B. Area school districts for vocational and technical schools-Tax levy. -(a) Area School districts for vocational and/or technical schools may be established and a levy of not to exceed five (5) mills on the dollar valuation of the taxable property in any area school district so established may be made annually, for the district, when such levy is approved by a majority of the electors of the area school district, voting on the question at an election called for such purpose. Such levy shall be in addition to all other levies authorized by this Constitution, and when approved, shall be made each fiscal year thereafter until repealed by a majority of the electors of the area school district, voting on the question at an election called for such purpose. Any area school district so established shall be considered as a school district for the purposes of Sections 10 and 26 of this Article. The administrative control and direction of the area school district shall be vested in a school board which shall be constituted and empowered as provided by law for school boards of independent school districts.
>
> (b) Upon the establishment of area school districts, such districts are authorized to become indebted separate and apart from the indebtedness of any school district included in the area school district up to five per cent (5%) of the net valuation of taxable property within such area school district for capital improvements including purchasing sites, constructing, purchasing, improving and equipping real property and buildings when such indebtedness is approved by a majority of the electors of the area school district voting on the question in an election called for such purpose.
>
> (c) Until otherwise provided by law, area school districts and the government thereof shall be established in accordance with criteria and procedures prescribed by the State Board for Vocational Education.
>
> (d) The legislature may alter, amend, delete, or add to the provisions of this Section 9B by law.[1]

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[1]Oklahoma Department of Libraries, Constitution of the State of Oklahoma as Amended to January 1, 1968, (St. Paul: West Publishing Co., 1968).

The adoption of Section 9B provided the basis for authorizing the establishment of area school districts, the levy of the necessary tax to operate the schools, permitted area school districts to become indebted for capital improvement and provided for area school districts to elect a governing body.

Under this new structure, the State Department of Vocational and Technical Education has established and placed in operation two Area Vocational-Technical Centers that are truly area owned and governed by a separate Board of Education. The two existing Centers operating under the new Constitutional Provision are:

(1) Tri-County Area Vocational-Technical Center, Bartlesville, Oklahoma

(2) Caddo-Kiowa Area Vocational-Technical Center, Fort Cobb, Oklahoma

During the school year of 1968-69, Oklahoma had seven Area Vocational-Technical Centers training students from numerous school districts. However, this is just a beginning of the tremendous growth of the Area Vocational-Technical Centers. In a continuous process, new districts are being formed and voted by the people of Oklahoma. At the present time, the following new Area Vocational-Technical school districts are in various stages of development:

<u>To Be Funded 1968-69</u>

Central Oklahoma Area Vocational-Technical S.D. #3, Drumright, Oklahoma

Indian Capitol Area Vocational-Technical S.D. #4
Muskogee, Oklahoma

Kiamichi Area Vocational-Technical S.D. #7
Wilburton, Oklahoma

To Be Funded 1969-70

Gordon Cooper Area Vocational-Technical S.D. #5
Shawnee, Oklahoma

Canadian Valley Area Vocational-Technical S.D. #6
El Reno, Oklahoma

To Be Funded 1970-71

Cleveland-McClain-Garvin Counties (Formed 4/23/68)

Comanche County (Formed 4/30/68)

To Be Funded 1971-72

Major-Woods Counties Area (Formed 10/25/68)

Probably a better way to emphasize the growth and expansion of the Area Vocational-Technical School is to give a comprehensive report of the money spent during the last four school years. This is shown in Table 1.

The centers are open to all students. However, residents of the Area Vocational-Technical district have priority on attendance. If the school district in which a student lives is not part of the Area Vocational-Technical district, then the student must pay the tuition set by the area school. All of the Centers operate on the idea that students from the surrounding area will participate.

TABLE 1

EXPENDITURE OF STATE AND FEDERAL FUNDS FOR VOCATIONAL-TECHNICAL CENTERS IN OKLAHOMA FROM 1964-1968

	Fiscal Year 1964-65	Fiscal Year 1965-66	Fiscal Year 1966-67	Fiscal Year 1967-68
Land	$ 22,000	$ 30,000	$ 57,579	$ 85,200
Construction	705,843	1,149,428	939,497	1,779,332
Equipment	187,293	24,970	473,656	667,478
Operation and Administration	6,327	128,555	510,476	1,618,022
Total Expenditure	$ 921,463	$1,332,953	$1,981,208	$4,160,032

Source: Oklahoma State Department of Vocational and Technical Education. A Report of Vocational and Technical Education Allotments and Appropriations Expenditures and Enrollment: A Four Year Period July 1, 1963 - July 30, 1967, (Stillwater, 1968).

Need for the Study

The vocational schools were able to finance more sophisticated technical courses with the increase of funds. At the same time, administrators of vocational education were attempting to remove the stigma of vocational classes being a "dumping ground" for slow students. This combination of factors led to the adoption of somewhat restrictive regulations in student selection. A few administrators and counselors across the state were complaining that in the process of allowing the pendulum to swing so far in

the opposite direction, some of our Vocational-Technical Centers were rejecting students of average ability with exceptional aptitudes in some areas.

On the other end of the continuum, many school administrators, counselors, and teachers visualized vocational-technical education as that portion of the curriculum designed to provide for the less academically talented students. They advocated expansion of the vocational-technical facilities so that the slower students could be removed from the college oriented classes. It is obvious that this group of educators did not understand the concept of modern vocational-technical education.

Modern vocational-technical education will not permit either extreme in selecting potential students. To obtain maximum efficiency in vocational-technical training, the counselor must utilize the most scientific and professional approach available. The seven Vocational-Technical Schools have their own entrance requirements. They vary between schools and also, within a school according to the nature of the course under consideration. The following is a summary of entrance requirements as stated in their brochures or from correspondence with their counselors:

ARDMORE (Southern Oklahoma Area Vocational-Technical Center)

Students will be admitted to most courses on the

basis of interest, academic ability, aptitude and performance in past school work. Some courses have specific requirements and prerequisites which also must be met. No student will be accepted unless he has met the prescribed prerequisites and has a reasonable opportunity of succeeding in the program of his choice.

BARTLESVILLE (Tri-County Area Vocational-Technical School)

Juniors and Seniors, generally who show vocational interest and aptitude are eligible for enrollment in the program, subject to the approval of the parents, home high school and Tri-County School.

DUNCAN (Duncan Area Vocational-Technical Center)

Pupils will be admitted to vocational and technical courses on the basis of their interest, academic ability, and their aptitude and performances in their past school work. Only those persons who can profit from the instruction will be admitted to the school. Since the instruction in vocational and technical education is specialized in nature, a strong academic and related program must be provided in the home high school.

ENID (O. T. Autry Area Vocational-Technical Center)

(1) Must be enrolled in home high school and attending school,

(2) Must have a passing average grade,

(3) Must be classified at least as a sophomore in high school,

(4) Must be recommended by principal or counselor in regards to attitude.

FORT COBB (Caddo-Kiowa Area Vocational-Technical Center)

Students will be admitted on the basis of their interest, aptitude, and academic ability. They must be recommended by their home school.

OKLAHOMA CITY (Oklahoma City Area Vocational-Technical Education Center)

(1) The counselor of the sending school must recommend the student.

(2) Past grade average is considered.

(3) There will be an individual interview with the vocational-technical counselor.

(4) He must meet specific requirements of the desired course of study.

TULSA (Tulsa Area Vocational-Technical Center)

Tulsa lists the following items for consideration in selecting students:

(1) Vocational objective

(2) Educational plan

(3) Interest

(4) Grades and test scores

(5) Attendance

(6) Counselor's recommendation

(7) Personal appearance

(8) Activities

In addition to the above requirements, some of the Area Centers have requirements for specific courses such as: "C" average, 60 words per minute in typing, algebra, etc.

The above information suggests that the administrators and counselors were conducting themselves in a professional manner in the selection of their students. Four of the schools use the word "aptitude" in their statement of entrance requirements. However, the criteria for determining the student's aptitudes are vague or non-existent.

With the rapid growth of Area Vocational-Technical districts, an increased number of school districts will face the problem of selecting the students who can benefit most from the various courses of study. To give some idea of the magnitude of the administrative decisions and counseling involved in directing students into the vocational and technical courses, there were one hundred and sixteen (116) schools sending students to the seven operating centers this past year. Table 2 is a breakdown of the number of schools sending students and the number of courses offered to high school students at each center.

In addition, some of the smaller sending schools do not have counselors to assist in the placement of students. In the next three years there will probably be a minimum of seven additional Area Vocational-Technical

Centers in operation. This increase of Area Centers will involve many school districts, administrators and counselors. The factors involved in appropriate placement of students in the Area Vocational-Technical Centers continue to grow. Is it possible to develop guide lines to assist the many administrators involved?

TABLE 2

THE NUMBER OF FEEDER SCHOOLS AND COURSES OF STUDY AT EACH VOCATIONAL-TECHNICAL CENTER

Area Vocational-Technical Center	Number of Schools Sending Students to the Center	Number of Courses Offered to High School Students
Tulsa	20	25
Oklahoma City	21	21
Southern Oklahoma	14	13
Duncan	14	11
O. T. Autry	27	17
Tri-County	8	10
Caddo-Kiowa	12	11

Since there is a difference of opinion on who should take vocational classes, there was a need for this study which evaluates the predictive factor of the General Aptitude Test Battery in indicating the students who will successfully complete vocational training. Should the results of the pilot research prove the test to be effective, it would serve as a valuable instrument in counseling students in the high schools of Oklahoma as well as in other states with similar vocational training problems.

Purpose of the Study

In view of the need for a better method of selecting students for the Area Vocational-Technical Centers, an investigation was undertaken to determine the usefulness of the General Aptitude Test Battery in predicting the students' probable success in vocational or technical training. Considered in this investigation were a number of factors that are pertinent to the utilization of the GATB such as: the Occupational Aptitude Pattern norms, Specific Occupations norms, 9th Grade norms, 10th Grade norms, and Adult norms.

Statement of the Problem

The problem of this study was to determine the validity of the General Aptitude Test Battery as an instrument for identifying the students who will be successful in vocational or technical training in selected Oklahoma Area Vocational-Technical Centers during the school year of 1968-69.

The following null hypotheses were formulated to evaluate the problem of the study:

HO_1 There is no correlation between the General Aptitude Test Battery's Occupational Aptitude Pattern Norms prediction of a student's vocational success in a specific occupation and the student's success determined by a grade of "C" or better in the corresponding course of study in an Area Vocational-Technical Center.

HO_2 There is no correlation between the General Aptitude Test Battery's Specific Occupations Norms prediction of a student's vocational success in a

specific occupation and the student's success determined by a grade of "C" or better in the corresponding course of study in an Area Vocational-Technical Center.

HO_3 There is no correlation between the General Aptitude Test Battery's Occupational Aptitude Pattern Adult Norms prediction of a student's vocational success in a specific occupation and the student's success determined by a grade of "C" or better in the corresponding course of study in an Area Vocational-Technical Center.

HO_4 There is no correlation between the General Aptitude Test Battery's Occupational Aptitude Pattern 10th Grade Norms prediction of a student's vocational success in a specific occupation and the student's success determined by a grade of "C" or better in the corresponding course of study in an Area Vocational-Technical Center.

HO_5 There is no correlation between the General Aptitude Test Battery's Occupational Aptitude Pattern 9th Grade Norms prediction of a student's vocational success in a specific occupation and the student's success determined by a grade of "C" or better in the corresponding course of study in an Area Vocational-Technical Center.

HO_6 There is no correlation between the General Aptitude Test Battery's Specific Occupations Adult Norms prediction of a student's vocational success in a specific occupation and the student's success determined by a grade of "C" or better in the corresponding course of study in an Area Vocational-Technical Center.

HO_7 There is no correlation between the General Aptitude Test Battery's Specific Occupations 10th Grade Norms prediction of a student's vocational success in a specific occupation and the student's success determined by a grade of "C" or better in the corresponding course of study in an Area Vocational-Technical Center.

HO_8 There is no correlation between the General Aptitude Test Battery's Specific Occupations 9th Grade Norms prediction of a student's vocational success in a specific occupation and the student's success determined by a grade of "C" or better in the corresponding course of study in an Area Vocational-Technical Center.

Assumptions

This investigation was based on the following assumptions:

(1) Individuals have aptitudes which are somewhat independent of general intelligence but exist as a real dimension of their innate ability.

(2) The General Aptitude Test Battery (GATB) is capable of identifying the following aptitudes: verbal, numerical, spatial, form perception, clerical perception, motor coordination, finger dexterity and manual dexterity.

(3) Counselors are capable of administering the GATB properly and the students will do their best as they take this test battery.

(4) Students will try to succeed when enrolled in vocational-technical classes.

(5) Teachers of vocational classes are capable of providing a reliable evaluation of the student's success in training.

(6) The students entering Vocational-Technical Centers in the fall of 1968 would be similar to the vocational-technical students in future years.

Delimitations

The delimitations of this investigation were as follows:

(1) The sample was drawn from the seven Area Vocational-Technical Centers in Oklahoma, during the 1968-69 school year.

(2) Only students who remained in the vocational classes for at least one semester were considered in the evaluation.

(3) Only occupations with norms developed in the occupational aptitude pattern in the Section II: Norms or the specific occupations in Section IV: Norms were considered in the evaluation.

Definition of Terms

Area Vocational-Technical Center is a vocational-technical school that enrolls students from a number of participating independent school districts. The primary purpose of an Area Center is to provide vocational and technical education which cannot practically be offered in a comprehensive high school. The Area Center serves as an extension of the participating high school with the students attending the Area Center for a half-day and the other half-day being spent at the home high school. Credits earned at the Area Center become a part of the student's official transcript and apply toward graduation from his home high school. Courses of study offered are one and two years in length depending upon the particular specialized area.

Feeder School is a high school that schedules some of its regularly enrolled students to participate in a vocational or technical course of study in an Area Vocational-Technical Center on a half-day basis. In most areas, the feeder school provides transportation from the high school to the Area Vocational-Technical Center.

Vocational or Technical Course of Study is a planned sequence of classroom and laboratory experiences in an Area Vocational-Technical Center designed to prepare students for a specialized field of work such as: computer programming, auto mechanics, drafting, etc. Courses of

study offered are one and two years in length depending upon the particular specialized area.

General Aptitude Test Battery is the United States Employment Service's Test Battery, B-1002, Form B, consisting of 12 tests which measure 9 aptitudes found to be important for successful performance in a wide variety of occupations. Of the 12 tests, 8 are paper and pencil tests and 4 are apparatus tests. The 9 aptitudes measured by the GATB are: intelligence, verbal, numerical spatial, form perception, clerical perception, motor coordination, finger dexterity and manual dexterity.

Predictive Factor is the occupational norm established in terms of minimum qualifying scores for each of the significant aptitudes measured, which in combination predicts future job performance. For any given occupation, cutting scores are set only for those aptitudes which contribute to the prediction of performance of the job. To predict success in a particular occupation or occupational aptitude pattern, an individual's aptitude scores must be equal to or greater than minimum cutting scores. The multiple cutoff method requires that each aptitude be evaluated separately and the significant aptitudes must all receive qualifying scores. If any of the scores is below the minimum cutoff score, the predictive factor indicates a doubt in the individual's ability to perform the job.

Successful Student in a Vocational or Technical Course of Study is a student who completes one semester of vocational or technical training with a grade of "C" or better.

Population and Sample to Be Used

The study population was from seven Area Vocational-Technical Centers in Oklahoma. There were 116 feeder schools sending students to participate in the Area Vocational-Technical Centers. The feeder schools varied in size from the very large metropolitan high school with over 3,000 students to the small rural high school with less than 100 students.

The GATB was administered to 2,408 students at the beginning of the fall semester during the 1968-69 school year. The final sample used in the study consisted of 1,581 students for the OAP norms and 1,621 students for the Specific Occupations norms. The number of students qualifying to be included in the final sample was determined by the following criteria established for the study:

(1) The student must be enrolled in the Vocational-Technical Center for the first time in the 1968 fall semester.

(2) The student must complete the first semester of work with a grade other than "Incomplete."

(3) The student must pursue a vocational-technical course of study that has norms developed for the occupational aptitude patterns in the Section II: Norms or the specific occupations in the Section IV: Norms.

Procedures Used in the Study

The GATB was administered to all first year students enrolled in the seven Oklahoma Area Vocational-Technical Centers during the fall semester of 1968-69. The testing was done by a team of specialists from the Oklahoma Employment Security Commission and the Guidance and Counseling Division of the Oklahoma State Department of Education.

The test results were scored, converted, and recorded on the GATB profile cards. The results were double checked to insure accuracy in the information. Using the multiple cutoff technique, the students' test results were evaluated by the OAP norms and the Specific Occupations norms. This processing produced a prediction of success or failure in the vocational-technical course of study for each student.

The student's first semester grade in his vocational or technical course of study was obtained from the Area Vocational-Technical Center. The grade results were translated into success for students making "C" or better and failure for students making "C-" or less.

The two variables, the GATB norms' prediction of success or failure, and the students' semester grades expressed as success or failure, were presented in 2 x 2 contingency tables for the total sample and each subsample. The frequencies were used to compute the phi coefficient and equivalent chi square for each table. The size of the chi square statistic was used to accept or reject the null hypotheses.

Organization of the Remainder of the Dissertation

Chapter I was concerned with the background information, need for the study, statement of the problem, assumptions, limitations, definition of terms, sample population, and procedure used in the study. Chapter II will report a review of the related literature. Chapter III describes the design and methodology of the study with emphasis on the basic plan, description of the Area Vocational-Technical Centers and the student population, the instrument used in the study, data collection procedure, and statistical procedure used. Chapter IV presents 45 2 x 2 contingency tables with the corresponding analysis of data. A summary of findings, conclusions, and recommendations are presented in Chapter V.

CHAPTER II

REVIEW OF THE LITERATURE

Development of Aptitude Tests

In this chapter a review was made of the literature related to research on the utilization of aptitude tests to predict success in training. When we consider the many years of man's recorded history of education, the concept of objectively scored tests is relatively a new approach. Only since 1900 has real progress been made in this area. Thorndike and Hagen[1] suggested that psychological and educational measurement evolved through three distinct stages in its development: (1) The period from about 1900 to 1915 was the exploration and initial development of methods; (2) The period from 1915 to 1930 is called the "boom" when enthusiastic followers produced numerous new tests; and (3) The period of 1930 to the present has been one of critical evaluation, of taking stock, of broadening techniques and delimiting interpretations, of integrating the lessons of the half century into

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[1]Robert L. Thorndike and Elizabeth Hagen, Measurement and Evaluation in Psychology and Education (New York: John Wiley and Sons, Inc., 1955), pp. 5-6.

a balanced and reasonable approach to the appraisal of human behavior.

The first large scale use of an aptitude test was during World War I. The Army Alpha test was designed to assist in classifying the large number of recruits to weed out men whose ability was too low for military service and to select individuals for positions of leadership. The test proved to be very successful and was widely used in the armed forces.

The military services have continued to develop aptitude test batteries to assist in selecting and classifying new recruits. During the early years of World War II, the Army General Classification Test was used for this purpose.

In more recent years, the U. S. Army has been using the Army Qualification Battery (AQB), the U. S. Navy has been using the Short Basic Test Battery (SBTB), and the U. S. Air Force has been using the Airman Qualifying Examination (AQE). However, beginning with the school year of 1968-69, all military services will utilize the results of one aptitude battery, the Armed Services Vocational Aptitude Battery (ASVAB).[1] The ASVAB consists of the following nine component tests: (1) coding speed, (2) word knowledge, (3) arithmetic reasoning, (4) tool knowledge,

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[1]U. S. Department of Defense, High School Counselors Manual: Armed Services Vocational Aptitude Battery, pp. 2-3.

(5) space perception, (6) mechanical comprehension, (7) shop information, (8) automotive information, and (9) electronic information.

Research on the ASVAB has demonstrated that several tests used in combination yield better predictions of capabilities than tests used singly.[1] The component tests are combined into composites of two or more tests called aptitude areas and a single overall score is computed for each area. The aptitude area is a predictor of success in a number of jobs which are similar in nature and for which the same set of tests is used in selection. Within each aptitude area, each of the military services uses different minimum qualifying scores for specific military occupations.

During the years from World War I to World War II and up to the present, the civilian educators have pursued a vigorous development of new tests and research on their validity. In Patterson's[2] review of the literature, he cited two studies made in 1922 that produced results which have not been duplicated in the numerous research studies that followed. These studies by Bird and Cowdery concluded that vocational classes were suitable for slow

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[1] Ibid., pp. 4-5.

[2] C. H. Patterson, "Predicting Success in Trade and Vocational Courses: Review of the Literature," Educational and Psychological Measurement, XVI, No. 3 (Autumn, 1956), pp. 352-400.

students. Bird[1] conducted one of the first studies to determine the correlation between success in machine shop training and mental ability. The study sample was 25 junior high school boys enrolled in machine shop in grades 7 to 9. Bird concluded that such classes offer an exceptional opportunity for those who at present are misfits in the traditional subjects.

In the same year, Cowdery[2] studied 578 boys, ages 12-19, assigned to 22 different trades. The correlations between intelligence and ratings of performance were low, both positive and negative, and not significant. For this result, Cowdery concluded that persons of limited mental ability can perform some vocational trade skills more efficiently than those of high intelligence, provided proper supervision is given.

Aptitude Test Battery Prediction Studies

During the 1950's a number of studies[3] were completed on the predictive value of the GATB in the areas of

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[1]V. A. Bird, "A Study in the Correlation of General Intelligence and Progress in Learning Machine Shop Work as Related to the Problems of Educational Guidance," Industrial Education Magazine, XXIV, (1922), pp. 67-69.

[2]K. M. Cowdery, "Measures of General Intelligence as Indices of Success in Trade Learning," Journal of Applied Psychology, VI, (1922), pp. 311-330.

[3]U. S. Department of Labor, Manual for the General Aptitude Test Battery, Section III: Development (October, 1967), pp. 157-169.

engineering, journalism, psychology, agriculture, chemical technology, nursing, speech, English, medicine, pharmacy, architecture, and social studies. Most of the studies were concerned with predicting success in college programs.

Jex and Sorenson[1] studied 776 men and 515 women in the 1948 freshman class at the University of Utah. The study was designed to discover the relationship between the GATB scores and subsequent general college success. The test scores were correlated with first quarter grade point averages. The results indicated that with this substantial population sample, some of the correlations were not only statistically significant but comparatively large. The authors concluded that the test showed considerable promise as a quick, easily obtained predictor of college success.

Samuelson[2] investigated the GATB's value in predicting success of trade students in the Salt Lake Area Vocational School. The sample consisted of a total of 137 male students over sixteen years of age who were distributed among six training departments. The multiple

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[1]F. B. Jex and A. Garth Sorenson, "GATB Scores as Predictors of College Grades," Personnel and Guidance Journal, XXXI, No. 5, (February, 1953), pp. 259-297.

[2]Cecil O. Samuelson, "The General Aptitude Test Battery in Predicting Success of Vocational School Students," Journal of Educational Research, L, (November, 1956), pp. 175-182.

correlation technique was used in estimating the value of the aptitude scores in predicting the criterion. All of the multiple correlations were statistically significant except those of welding and diesel mechanics for which the sample was too small. The conclusion was that the GATB was a substantial aid in the prediction of student success in the Salt Lake Area Vocational School.

Sharp and Pickett[1] utilized GATB scores to study the most important aptitudes and cutoff scores for predicting success in college fields of study such as: engineering, business administration, education, and physical education. The sample of students consisted of 262 college juniors, seniors, and some students who had been graduated the previous June. The students' cumulative grade point averages (gpa) were correlated with the nine aptitudes of the GATB. Many correlations between various aptitude scores and gpa were significantly greater than zero but none exceeded .50. The authors concluded that aptitude scores from the GATB are fair predictors of success in college, and that training influenced GATB test scores.

Doppelt, Seashore and Odgers[2] conducted a study

[1]H. C. Sharp and L. M. Pickett, "The General Aptitude Test Battery as a Predictor of College Success," Educational and Psychological Measurement, XIX, No. 4 (1959), pp. 617-622.

[2]Jerome E. Doppelt, Harold G. Seashore and John G. Odgers, "Validation of the Differential Aptitude Test for Auto Mechanics and Machine Shop Students," The Personnel and Guidance Journal, XXXVII, No. 9 (May, 1959), pp. 648-655.

of the relationship between scores on the Differential Aptitude Test and ratings of students in vocational courses. Seven Ohio schools participated in the study. The sample population was 285 eleventh grade students. Correlations were computed for each grade level, auto mechanics and machine shop. The study indicated that the prediction of success in machine shop was most accurate when the sum of the scores of three tests were used: abstract reasoning, space relations, and mechanical reasoning. The prediction of over-all accomplishments of auto mechanics students was not satisfactory.

Ingersoll and Peters[1] investigated the use of the General Aptitude Test Battery for identification and counseling of students in vocational and academic classes in Ohio secondary schools. Freshmen and sophomore grade point averages were the criteria used to determine the predictive ability of the aptitudes of the GATB. In this study, frequency distributions of the GATB aptitude scores were developed for 4,000 ninth and tenth grade boys and girls; means and standard deviations were also computed in the development of norms for twenty-one Ohio high schools; and a multiple regression analysis was performed using the GATB aptitude scores as the independent variable. The findings

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[1]Ralph W. Ingersoll and Herman J. Peters, "Predictive Indices of the GATB," Personnel and Guidance Journal, XLIV, No. 9 (May, 1966), pp. 931-937.

indicated the GATB aptitudes in the ninth grade gave some indication of subsequent achievement. In the tenth grade sample, the GATB aptitudes predicted achievement significantly in almost every instance in the academic area. A by-product of the study indicated that very few of the students in the schools studied were provided vocational and commercial courses of study.

Floyd[1] investigated the value of the Scholastic Aptitude Test (SAT) in predicting college success. The study sample was approximately 650 students in a southern church-related female college. The results indicated that students who make higher scores on the SAT have a better chance of graduating from college. In addition, the information revealed that over half of the students with scores of 699 or below failed or were excluded with no opportunity to return.

Reviews of Aptitude Testing

In 1956, Patterson[2] published his review of the literature related to predicting success in trade and vocational courses. The review was organized primarily on a chronological basis starting in the early 1920's and continuing on to 1956. He concluded that it should

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[1]William A. Floyd, "A Longitudinal Study of the Scholastic Aptitude Test as a Predictor of College Success," The School Counselor, XIV, No. 3 (January, 1967), pp. 138-142.

[2]Patterson, "Predicting Success," pp. 352-400.

be possible to select a battery of tests which would combine to yield fair predictions of success in trade school training in any public or private school. As for the combination of tests, he suggested that they would probably consist of a verbal intelligence test, a test of mechanical information or experience, a test of spatial ability, and possibly an interest test. The literature in his review left some doubt as to the value of motor ability tests in predicting success in trade courses. However, with an increase in skills required for today's vocational courses, the relationship between intelligence and success in trade courses becomes more significant.

A review of the literature by Ghiselli[1] in 1966 covered the period from World War I to 1966. The data on adults revealed that for all occupations, the average of the validity coefficient for training criteria is .30, and for proficiency criteria it is .19. The results led to the conclusion that while tests can predict success in general occupational trainability, they are far less useful in the prediction of general occupational proficiency. It was also noted that two or more different types of tests would have even greater validity

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[1]Edwin E. Ghiselli, The Validity of Occupational Aptitude Tests (New York: John Wiley and Sons, Inc., 1966), p. 115.

of prediction. In addition, the findings produced a great deal of doubt about the value of predictive power of motor ability tests.

Prediger, Waple and Nusbaum[1] reviewed 1,200 correlations in thirty-eight studies appearing in the period 1954-1967. The studies were all involved in predicting the success of high school level vocational education programs. They were summarized for ten predictor categories and eleven vocational program areas. The results produced the following points of interest: (1) there was considerable variation in the level of correlation obtained for a given predictor within a given vocational area; (2) the predictability of success appeared to be much greater in some vocational areas than in others; (3) the level of relationship obtained in vocational areas typically taken by girls was substantially higher than that found in areas typically taken by boys; (4) the effectiveness of a given predictor varied from area to area; (5) the I.Q. was one of the two best predictors in only three of the eleven areas; (6) and, again in this review, the results suggested that perceptual speed and manual dexterity contribute relatively little to the prediction of success in the areas surveyed. An additional

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[1]Dale J. Prediger, Charles C. Waple, and Gerald R. Nusbaum, "Predictors of Success in High School Level Vocational Education Programs: A Review, 1954-1967," Personnel and Guidance Journal, XLVII, No. 2 (October, 1968), pp. 137-145.

observation was that in a vast majority of the studies, the Pearson product-moment coefficient was used. This followed with the suggestion that the correlation coefficient gives no indication as to what the minimal level of competence might be.

The authors followed up with a recommendation that expectancy tables or regression equations be developed for predicting success. To facilitate this work, a national center for validation of aptitude tests was proposed. The function of such a center would be to: (1) serve as a central processing agency, (2) accumulate, summarize and periodically publish the results of studies, (3) help schools develop their own validation procedures, and (4) explore and apply new approaches to the prediction problem.

Recent Research

An unpublished Doctor's Dissertation, "Determining the Usefulness of the General Aptitude Test Battery in Predicting Student Success," was completed by Howard W. Traxler[1] at the University of Denver in 1966. This study was conducted at Des Moines Technical High School with a total sample of 669 students enrolled in twenty-four different vocational courses. The Pearson

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[1]Howard W. Traxler, "Determining the Usefulness of the General Aptitude Test Battery in Predicting Student Success" (Unpublished Doctoral Dissertation, University of Denver, 1966).

product-moment correlation method was used with GATB data and the criteria for success which were grades in English, social studies, core area, and over-all grade point averages. The study concluded that the GATB was a useful counseling tool because of the high positive correlations computed between the aptitude measured and academic success as indicated by grades. The study showed a greater predictive validity in core areas in which success was more dependent upon manual than verbal ability.

An unpublished Doctor's Dissertation, "Predicting Success in Vocational-Technical Programs in Community Colleges Using the General Aptitude Test Battery," was completed by Thomas W. Sullivan[1] at Colorado State College in 1967. The study sample consisted of 354 students enrolled in vocational-technical programs at Columbia Community College. A multiple regression analysis was used to treat the data. Prediction equations were determined for the total vocational-technical program and for each of the specific vocational-technical areas. In addition, the data revealed that the GATB was an effective screening instrument for the vocational-technical program, intelligence was the best single predictor,

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[1]Thomas W. Sullivan, "Predicting Success in Vocational-Technical Programs in Community Colleges Using the General Aptitude Test Battery," (Unpublished Doctoral Dissertation, Colorado State College, 1967).

and the GATB scores indicated that those students who were enrolled in vocational-technical programs could have been equally as successful in most academic programs.

Kapes[1] completed a study at Pennsylvania State University in 1968. The sample of the study consisted of ninety-two tenth grade boys enrolled in the Altoona Area Vocational-Technical School. The students were enrolled in fourteen different shop courses. Due to the small number of students, the fourteen shop areas were combined into three relatively homogeneous groupings. Multiple regression analysis was used on each of the groups and the total sample. The GATB's validity of prediction was greater when the three groupings were used separately and less when the groupings were combined. The study also indicated the GATB manipulative aptitudes (motor coordination, finger dexterity, manual dexterity) made a significant contribution to the validity of the GATB for predicting shop achievement.

Droege[2] reported a summary of all available data that related to the question of the validity of aptitude

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[1]Jerome T. Kapes, "The Validity of the GATB for Predicting Shop Achievement in Secondary Level Vocational-Technical Education" (Unpublished Master's Thesis, Pennsylvania State University, 1968).

[2]Robert C. Droege, "Validity of USES Aptitude Test Batteries for Predicting MDTA Training Success," The Personnel and Guidance Journal, XLVI, No. 10 (June, 1968), pp. 984-989.

test batteries for predicting success in the Manpower Development and Training Act (MDTA) programs. The Specific Aptitude Test Battery (SATB) was used in the study. The article was based on data from 875 MDTA trainees in twelve courses of study. The phi validity coefficient was used to statistically analyze the SATB's prediction and the instructors rating. In ten of twelve samples the operational test norms showed significant cross validity. The results provided evidence that the SATB has validity for making predictions of success of MDTA training candidates.

Doerr and Ferguson[1] utilized the Daily Vocational Test (DVT) and the Minnesota Vocational Interest Inventory (MVII) to study 982 second semester junior and senior boys enrolled in vocational-technical courses in five Missouri high school districts during the 1966-67 school year. The results of the study supported the author's hypothesis that secondary school vocational-technical school students enrolled in various trade and industrial courses have measurably different aptitudes and interests. In addition, the research produced sufficient information for the authors to conclude that discriminant equations can be generated which will aid in

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[1]J. Joseph Doerr and John L. Ferguson, "The Selection of Vocational-Technical Students," The Vocational Guidance Quarterly, XVII, No. 1 (September, 1968), pp. 27-32.

classification of vocational-technical students according to group resemblance by using aptitude and interest variables. Therefore, it was recommended that the multiple discriminate function statistic could be considered an appropriate technique to aid in guidance and classification of secondary school vocational-technical students.

The University of Minnesota is presently conducting a six year research project funded by the United States Office of Education with the Vocational Act of 1963, 4-C funds. Dr. David J. Pucel[1] is the project director and Dr. Howard F. Nelson is the principal investigator of the Area School Student Selection Project. The objective of the project is to identify criteria which will be useful in the selection and counseling of post-high school students with respect to specific vocational-technical curricula. The project plan is divided into four overlapping phases: (1) testing, (2) keeping accurate records, (3) follow-up study, and (4) analysis of the data and writing the final report. Approximately 16,000 students were tested before July, 1968. The following tests are being utilized in the study: (1) the written portions of the GATB, (2) The

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[1]David J. Pucel, "Vocational Student Counseling and Selection," Area School Student Selection Project, Department of Industrial Education, (University of Minnesota, July, 1968).

Minnesota Vocational Interest Inventory, (3) The Sixteen Personality Factors Questionnaire, (4) The Minnesota Importance Questionnaire, and (5) The Vocational Development Inventory. The project staff hopes to produce sufficient quantities of data on successful graduates to develop norms and expectancy tables for the various vocational-technical curricula for each of the tests as well as a master counseling plan.

Summary

The early studies by Bird[1] and Cowdery[2] suggested that students of low ability could do satisfactory work in shop classes. However, subsequent research has failed to verify their results. In fact, most of the following studies have indicated that the intelligence factor is the best one predictor of success in vocational classes. The contradicting results in these studies may be due to the early concept of trade classes as compared to the modern vocational-technical curriculum.

In the more recent reviews of the literature, Ghiselli[3] and Prediger[4] concluded that the manual dexterity, finger dexterity and motor coordinates had a

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[1]Bird, "A Study in the Correlation," pp. 67-69.

[2]Cowdery, "Measures of General Intelligence," pp. 311-330.

[3]Ghiselli, Occupational Aptitude Tests, p. 115.

[4]Prediger, "Predictors of Success," pp. 137-145.

very low validity in predicting success in vocational classes. While in the same period of time, studies by Traxler[1] and Kapes[2] indicated that motor coordination aptitude, finger dexterity and manual dexterity made a significant contribution to the validity of the GATB prediction of success.

The idea of expectancy tables and formulas for predicting educational success has been suggested by some of the more recent research writers such as Pucel,[3] Kapes,[4] Sullivan,[5] and Prediger.[6] In theory, expectancy tables and formulas should go a long way in solving the problem of refining prediction. However, when we consider the student-counselor ratio and the average counselor's dislike of complicated gimmicks, the emphasis on research should be to find a simple but effective predictor of educational success.

Obviously, there is a great deal to be learned about the use of tests in predicting success. Probably the one point on which the researchers consistently agree in the literature is that tests are of value in

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[1]Traxler, "Determining the Usefulness."

[2]Kapes, "The Validity of the GATB."

[3]Pucel, "Vocational Student Counseling."

[4]Kapes, "The Validity of the GATB."

[5]Sullivan, "Programs in Community Colleges."

[6]Prediger, "Predictors of Success," pp. 137-145.

predicting student success in a course of study. With this in mind, it is appropriate to recall a statement made by Humphreys, Traxler and North:

> . . . there is general agreement that researchers might spend less time on constructing new tests of aptitudes or proficiencies and more time on establishing the degree of relationship between performance on existing tests and success in various occupations.[1]

Many authorities in the Education profession such as Carroll,[2] Hoyt,[3] and Super[4] agree that the GATB is the best available test for vocational counseling. The norms are current and are continually being improved. The test utilizes a multiple cutoff technique which makes it simple for counselors to apply the norms in evaluating a student's probable chance of success in numerous occupations. Therefore, this study was an attempt to expand knowledge of the GATB's predictive validity when it is to be used to counsel students entering a course of study in Area Vocational-Technical Centers in Oklahoma.

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[1]Anthony J. Humphreys, Arthur E. Traxler, and Robert D. North, Guidance Services (Chicago: Science Research Associates, Inc., 1960), pp. 225-226.

[2]John B. Carroll, The Sixth Mental Measurements Yearbook, Edited by Oscar K. Buros (Highland Park: The Gryphon Press, 1965), p. 771.

[3]K. B. Hoyt, "A Challenge to Vocational Guidance: The Specialty Student," The Vocational Guidance Quarterly, II, No. 3 (Spring, 1963), pp. 192-198.

[4]D. E. Super and J. O. Crites, Appraising Vocational Fitness, 2nd Edition (New York: Harper and Row, 1962), p. 330.

CHAPTER III

DESIGN AND METHODOLOGY OF THE STUDY

The purpose of this chapter is to describe: (1) The basic plan for the study; (2) The Area Vocational-Technical Centers and the student population; (3) The instrument used; (4) The procedure in data collection; and (5) The statistical procedures used in the study.

Basic Plan

The major purpose of this study was to determine the validity of the General Aptitude Test Battery's predictive factor in identifying the students who will be successful in vocational or technical training in selected Oklahoma Area Vocational-Technical Centers.

A search of the literature revealed that a majority of the studies used the Pearson product-moment coefficient of correlation. The research provided educators with the fact that aptitude test scores and success in courses of study are related. However, just knowing there is a positive correlation is not enough. The administrators and school counselors need to know more specifically when to recommend or not recommend a course of study for an

individual student. The major problem with which the study was concerned was the lack of agreement among educators on what criteria should be used to select students for a vocational-technical course of study. The basic plan was to obtain GATB data on all new students entering the Oklahoma Area Vocational-Technical Centers, collect the students' grades at the end of the first semester and compute the validity coefficient between the student's success determined by grades and the GATB prediction of success.

The first step in the study was to obtain permission from the administrators to test the students entering the Area Vocational-Technical Centers. This was accomplished by first requesting permission from Dr. Francis Tuttle, Director, Oklahoma State Department of Vocational-Technical Education. Dr. Tuttle's office forwarded the request to Mr. Dale A. Hughey, State Coordinator, Area Vocational-Technical Education. Mr. Hughey granted permission for the study in a letter on November 8, 1967. The second step was to obtain permission from the Director of each of the seven Area Vocational-Technical Centers. This was accomplished by personal contact with each of the Directors.

On August 19 and 20, 1968, a two-day workshop was held at Oklahoma State University, Stillwater, Oklahoma. The meeting was attended by State Department vocational

education supervisory staff personnel, State Department of Education guidance and counseling personnel, counselors from the Area Vocational-Technical Centers and assistant directors from the Area Vocational-Technical Centers. The workshop program included an orientation to the plan of this study. The discussion covered such topics as the GATB, the testing schedule, the need for the study, and the method of evaluating results.

To insure uniform procedure in the testing of the students of all the Area Vocational-Technical Centers, Mr. Walter M. Rapp, Chief of Local Office Operations, Oklahoma Employment Security Commission, was contacted by letter on August 1, 1968, to request assistance in the testing program. The request for assistance was granted by Mr. James Page, Assistant Chief of Local Office Operations. The result was a team of three testing specialists being assigned to the project. Mr. Delbert C. Hudson, Program Supervisor, was in charge of the testing team and he was assisted by Mr. Donald P. Russell and Mr. William D. Dillard.

In addition to the Oklahoma Employment Security Commission's testing team of three men, the Guidance and Counseling Division of the State Department of Education provided three or four professional personnel at each testing session to assist with the testing. The following Assistant Directors of Guidance and Counseling participated

in the testing program: Mrs. Mary Ann Wood, Mrs. Iris Bruce, Mr. Merle Collins, Mr. Murl Venard and Mr. Charles Sandmann. This combination provided a team of five or six testing specialists at each session. It is assumed that this procedure provided a valid test for all of the students tested.

Beatrice J. Dvorak, Chief of Occupational Test Development, in the United States Department of Labor, was contacted by letter to request information on recent research utilizing the GATB. She responded by sending literature on the latest developmental studies on the GATB and enclosed the addresses of six men considering similar research. Information was received from four of the six men. The information varied from a review of the literature to a six year project funded by the United States Office of Education. The material obtained from this group of men was included in the review of the literature and was invaluable in planning this study.

Description of Area Vocational-Technical Centers and Population

Subjects utilized in this study were selected from the seven Oklahoma Area Vocational-Technical Centers in operation during the school year of 1968-69.

Two of the Area Centers are located in major metropolitan areas of Oklahoma with populations over 300,000. The majority of the students are from large high schools

with an urban orientation. Both communities are considered to be major centers of commerce with manufacturing industries that employ thousands of workers. Many of the jobs require a knowledge of technical skills which gives a tremendous emphasis to vocational-technical education. In most cases, there are jobs for the graduating students.

Four of the Area Centers are located in cities of approximately 20,000 to 40,000 population. In this group of Area Centers, the students have a diversity of school experiences and backgrounds. Some of the students are from urban communities and some are from rural areas. The size of the feeder high school varies from large to very small. Where some of these students have parents working in modern industry, many others have no concept of the potential of vocational-technical training. In each of the four communities there is one or more modern industry requiring numerous technical skills. These industries have been a catalytic force in promoting the Area Vocational-Technical Centers.

One Area Center is located in a community of approximately 700 people. The students participating in the training are all from small communities. The largest community sending students has a population of approximately 7,000. Therefore, the participating students are from feeder high schools that are medium to small in size. Probably this Area Vocational-Technical Center is the most

unique in terms of the student population. Most of the students training in this Area Center are training for jobs not available in the community at the present time. The individual student must look forward to moving to a new community, commuting a long distance to work, or hope that the new supply of trained technical manpower will attract new industry to the community.

To conduct a study with a student sample from only one of the Area Vocational-Technical Centers would not be sufficient. The size of the feeder high schools and the socio-economic factor would invalidate the results for future use. In order to adapt the results of the study to all of Oklahoma, the study population was selected from all seven Area Centers.

The number of students tested was greater than the final sample used. In order to avoid biasing the study with the effect of training on aptitude scores, the final sample was selected from students without previous vocational-technical training. The following criteria were used in selecting the sample:

(1) The student must have been enrolled in the Area Vocational-Technical Center for the first time in the 1968 fall semester.

(2) The student must have completed the first semester of work with a grade other than "Incomplete."

(3) The student must have pursued a vocational-technical course of study that has norms developed for the occupational aptitude patterns in the Section II: Norms or the specific occupation in the Section IV: Norms.

In addition to the extreme difference in the size and socio-economic environment of the feeder high schools, the Area Vocational-Technical Centers vary in size according to student enrollment and the number of courses of study offered. Table 3 gives the enrollment of the Area Vocational-Technical Centers.

TABLE 3

STUDENT ENROLLMENT IN THE AREA VOCATIONAL-TECHNICAL CENTERS

Area Vocational-Technical Center	High School Students	Post High School Students
Tulsa	712	107
Oklahoma City	569	0
Southern Oklahoma	335	34
Duncan	292	21
O. T. Autry	537	68
Tri-County	325	50
Caddo-Kiowa	263	0

Instrument for the Study

The development and standardization of the aptitude tests through the study of employed industrial workers was initiated by the United States Employment Service in 1935.[1] The original edition of the General Aptitude Test Battery, popularly known as the GATB, was published in

[1]Max F. Baer and Edward C. Roeber, Occupational Information (Chicago: Science Research Associates, Inc., 1964), p. 98.

1947 by the United States Employment Service.[1] The basic assumption underlying the GATB is that a large variety of tests can be condensed to several factors and that numerous occupations can also be clustered into groups according to similarities in the abilities required to perform the job. This makes it feasible to test many of a person's aptitudes in a comparatively short time and to interpret his scores in terms of a wide range of occupations.

The GATB Form B of B-1002[2] was utilized in this study. The battery consists of twelve tests which produce nine aptitude scores found to be important in successful performance in the numerous jobs studied by the United States Employment Service (USES). Of the twelve tests, eight are paper-and pencil tests and the other four are apparatus tests. The written tests appear in three booklets: Book I contains parts one through four; Book II contains parts five through seven; and Book III contains part eight. Two of the apparatus tests (parts nine and ten) involve the use of the USES Pegboard; the other two apparatus tests (parts eleven and twelve) involve the use of the USES Finger Dexterity Board. Approximately two and one half hours of testing time is required to administer

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[1]Beatrice J. Dvorak, "The General Aptitude Test Battery," Personnel and Guidance Journal, XXXV, No. 3 (November, 1956), pp. 145-154.

[2]U. S. Department of Labor, Section III: Development, p. 13.

the complete battery.

The Manual for the General Aptitude Test Battery Section II: Norms gives the following definitions for the nine aptitudes measured by the GATB:

G - Intelligence. General learning ability. The ability to "catch on" or understand the instructions and underlying principles; the ability to reason and make judgments. Closely related to doing well in school. Measured by Part Three (Three-Dimensional Space), Part Four (Vocabulary), and Part Six (Arithmetic Reason).

V - Verbal Aptitude. The ability to understand meaning of words and to use them effectively. The ability to comprehend language, to understand relationships between words and to understand meanings of whole sentences and paragraphs. Measured by Part Four (Vocabulary).

N - Numerical Aptitude. Ability to perform arithmetic operations quickly and accurately. Measured by Part Two (Computation) and Part Six (Arithmetic Reason).

S - Spatial Aptitude. Ability to think visually of geometric forms and to comprehend the two-dimensional representation of three-dimensional objects. The ability to recognize the relationship resulting from the movement of objects in space. Measured by Part Three (Three-Dimensional Space).

P - Form Perception. Ability to conceive pertinent detail in objects or in pictorial or graphic material. Ability to make visual comparisons and discriminations and see slight differences in shapes and shadings of figures and widths and lengths of lines. Measured by Part Five (Tool Matching) and Part Seven (Form Matching).

Q - Clerical Perception. Ability to perceive pertinent detail in verbal or tabular material. Ability to observe differences in copy, to proofread words and numbers, and to avoid perceptual errors in arithmetic computation. Measured by Part One (Name Comparison).

K - Motor Coordination. Ability to coordinate eyes and hands or fingers rapidly and accurately in making precise movements with speed. Ability to make a movement response accurately and swiftly. Measured by Part Eight (Mark Making).

F - Finger Dexterity. Ability to move the fingers, and manipulate small objects with fingers, rapidly or accurately. Measured by Part Eleven (Assemble) and Part Twelve (Disassemble).

M - Manual Dexterity. Ability to move the hands easily and skillfully. Ability to work with the hands in placing and turning motions. Measured by Part Nine (Place) and Part Ten (Turn).[1]

The initial norms[2] of the GATB were based on a sample of 519 employed workers. This small sample clouded the GATB norms with doubt during the early years of its use. However, in 1953 the norms were developed on a selected sample of 4,000 which was stratified to obtain proportional occupational representation of the general working population. The new norms were not substantially different from the initial norms. Any criticism of the norms can be discounted by the fact that the norms are continually being revised by the United States Employment Service as additional information is collected.

Carroll made the following comment in regard to criticism of the test:

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[1]U. S. Department of Labor, Manual for the General Aptitude Test Battery Section II: Norms, Occupational Aptitude Pattern Structure (Washington: June, 1966), p. 1.

[2]U. S. Department of Labor, Section III, p. 17.

> The publication, in October, 1962 of Section 3 of the General Aptitude Test Battery, with the title Development, certainly goes far in satisfying these complaints. This publication of 217 pages plus numerous fold-out tables is a rich source of information about all aspects of the GATB, including history, methods of construction, item analysis, and factor analysis studies, development of norms, intercorrelations of tests, validity studies for numerous occupations, reliability and effects of practice, effect of training, effect of aging, and the use of the test.[1]

In addition, Carroll made the following observation:

> New validity data are being collected continually, in both concurrent and longitudinal designs. In light of the studies, the Occupational Aptitude Pattern structure is revised periodically.[2]

The aptitude scores of the GATB are expressed in terms of standard scores with a mean of 100 and a standard deviation of 20 for the adult norms. The standard score is convenient in that performance on GATB tests can be compared and treated statistically without reference to the original raw score. Providing for the factor of maturity, the 9th and 10th grade mean is less than 100. For example, the 9th grade G - Score (Intelligence) of 93 is equivalent to the adult G - Score of 100; and the 10th grade G - Score of 96 is equivalent to the adult G - Score of 100.[3]

Probably the most unique feature of the GATB is

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[1]Carroll, Mental Measurements Yearbook, p. 771.

[2]Ibid.

[3]U. S. Department of Labor, Section II, pp. 5-6.

the relationship between test aptitude scores and the necessary aptitudes to perform specific jobs. This is accomplished by a job analysis[1] of the occupation under study. The first step in the analysis of the job is to obtain information concerning the duties performed by workers in the occupation. The second step is determination of a suitable criterion of job success with which test scores can be compared. With the job analysis and the minimum scores for success, the USES developed 36 Occupational Aptitude Patterns (OAP) which encompass 850 occupations.[2] An OAP consists of the three most significant aptitudes and the cutting scores on these aptitudes were established as minimum scores for the family or group of occupations having similar aptitude requirements. The OAP's are formed by developing specific norms for an occupation and then grouping the occupation to the family of occupations to which it is most closely related.

In addition to the OAP's in Section II: Norms, the USES provides norms for the Specific Aptitude Test Battery (SATB).[3] The norms are listed in terms of minimum cutting scores on each of the aptitudes found to be significant for the specific occupation. The test development

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[1]U. S. Department of Labor, Section III, p. 43.

[2]U. S. Department of Labor, Section II, p. 9.

[3]U. S. Department of Labor, General Aptitude Test Battery, Section IV: Norms, Specific Occupations (Washington: May, 1966).

studies on these specific occupations were used for the development of the OAP norms for families of occupations. However, in some cases the aptitudes are not congruent with any of the OAP's and, therefore, must be listed as a specific norm for a single occupation. The specific norms do not restrict the number of significant aptitude areas to three. In some jobs, four aptitudes are considered necessary for evaluation.

The OAP's and Specific Occupations both use the multiple cutting-score method in establishing norms. The multiple cutoff method involves a combination of GATB aptitudes with associated cutting scores. To obtain a prediction of success, the examinee must attain aptitude scores that equal or exceed the cutting scores on the OAP or specific norm. General Aptitude Test Battery Section III: Development describes the advantage of such a technique as follows:

> A very practical advantage of using multiple cutting scores norms for a specific occupation is the relative ease with which such norms can be applied to an applicant's aptitude scores. There is no necessity for substituting scores in an involved multiple regression equation; all that is required is to note whether or not the applicant's scores on the aptitudes included in the norms meet the minimum scores established for the occupation in question.[1]

The GATB was originally developed to determine the occupational potentialities of adults in, or about to enter, the labor market. However, the USES recognized the

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[1]U. S. Department of Labor, Section III, p. 143.

need of the lower high school grades in the spring of 1958 and initiated a series of three large scale longitudinal studies to increase the usefulness of the GATB as a tool for counseling in the ninth and tenth grades. The study involved the testing of students in the ninth, tenth, and eleventh grades and following up with a retesting of the same students in the twelfth grade. The three studies are described in Section III: Development as follows:

> The first of the three studies was concerned with obtaining the longitudinal data on effects of maturation on aptitude scores. The purpose of the second study was to obtain data on validity of GATB aptitude scores for predicting academic success in high school. The purpose of the third study was to determine the validity of GATB aptitude scores and occupational aptitude patterns for predicting success in College and occupations two years after high school.[1]

The first study[2] with a final sample of 26,708 high school students resulted in proof that an individual's aptitude scores increase with maturity. The stability coefficients were highest for the eleventh grade sample and lowest for the ninth grade sample. As a result of the studies, the USES discovered that the aptitude norms could not be used without modification with students in the lower high school grades because of the effects of growth on the aptitude scores during the high school years.

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[1] U. S. Department of Labor, Section III, p. 259.

[2] Robert C. Droege, "GATB Longitudinal Maturation Study," Personnel and Guidande Journal, XLIV, No. 9 (May, 1966), pp. 919-930.

To make the aptitude norms useful for counseling ninth and tenth grade students, the adult minimum scores were converted to tentative equivalent ninth and tenth grade minimum scores in 1959.[1] A follow-up study completed in 1966 resulted in a revision of the 1959 ninth and tenth grade norms. The current ninth and tenth grade GATB norms for the OAP's are available in General Aptitude Test Battery Section II: Norms, Occupational Aptitude Pattern Structure.

Chapter 16[2] of the Manual for the General Aptitude Test Battery Section III: Development describes four studies on the effect of training on aptitude scores. In two of the studies conducted at College level an increase in the numerical aptitude scores was significant. However, in the two studies of machinist and clerk-stenographer, the authors concluded that training does not affect the aptitude scores.

The GATB is considered by many to be useful in the counseling of persons who are about ready to enter the labor market, those who are considering an occupational change to some field of work in which they have had no previous work experience and those who are considering

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[1]Robert C. Droege, "GATB Norms for Lower High School Grades," Personnel and Guidance Journal, XXXIX, No. 1 (September, 1960), pp. 30-36.

[2]U. S. Department of Labor, Section III, pp. 217-219.

vocational training. On this subject Hoyt[1] concluded that the only aptitude test battery now ready for use in vocational counseling is the GATB.

Data Collection

The GATB was administered to all new students entering the seven Oklahoma Area Vocational-Technical Centers on the following dates: Caddo-Kiowa Area Vocational-Technical School (August 27, 28, 29), Southern Oklahoma Area Vocational-Technical Center (September 3, 4, 5), O. T. Autry Vocational-Technical Center (September 9, 10, 11), Oklahoma City Vocational-Technical Center (September 16, 17), Tulsa Area Vocational-Technical Center (September 23, 24, 25), Duncan Area Vocational-Technical Center (September 25, 26, 27), and Tri County Area Vocational-Technical School (October 30, 31). The Tri-County Area Vocational-Technical School was originally scheduled for testing on October 2, 3, and 4. However, due to a construction delay in the new buildings, testing was not convenient until the last of October.

Two of the Area Vocational-Technical centers, Caddo-Kiowa and Tri-County, were under construction when school started in September. In both situations, the students attended classes in churches, old business buildings or local schools. This arrangement required

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[1]Hoyt, "A Challenge to Vocational Guidance," pp. 192-198.

an extra effort on the part of the administrator to organize adequate testing facilities. Fort Cobb High School provided facilities to test the Caddo-Kiowa Area Vocational-Technical Center. However, there was still a problem of transporting the students from the dispersed classrooms. The Tri-County Area Vocational-Technical Center testing was delayed to permit use of the new building.

The testing was accomplished by dividing the teams of testing specialists into two sections. Half of the team administered the written test in groups of 20 to 120. The group size preferred and most often organized was approximately 60 students. In most instances, the size of the group was dictated by the facilities available for testing. If the size of the group being tested was too large for the testing team, additional proctors were recruited from the staff members of the Area Vocational-Technical Center.

The time required to administer the written test was approximately two hours. The actual time the students remained in the written session was usually longer due to giving the students a short break between Booklet I and Booklet II and obtaining additional information needed in the study. During the same session as the written test, the following information was obtained from each student: name of student, name of the Area Vocational-Technical

Center, name of the feeder school, sex, grade level, race, course of study enrolled in at the Area Vocational-Technical Center, and the number of years enrolled in the course of study. The information on race was requested by the Oklahome Employment Security Commission and will not be used in the study.

Administering the apparatus test of manual dexterity and finger dexterity was accomplished by dividing the remaining test specialists into two groups. In most cases no more than 20 finger dexterity boards were set up in one room for testing and in an adjacent room 20 peg boards to test manual dexterity were assembled. The approximate time required to test with one board is 20 minutes. Each of the apparatus testing rooms scheduled 20 students. At the end of the first test, the two groups exchanged students by moving to the adjacent room. The arrangement facilitated the testing of 40 students in approximately 40 minutes. When the schedules were appropriately planned, at least 120 students were administered the apparatus test each morning and afternoon with an expected goal of 240 for the day.

The students attend the Area Vocational-Technical Centers only during the morning or afternoon. Therefore, to complete the total GATB test, two mornings or two afternoons were required. This was convenient in that the group taking the written test and the group taking the apparatus

test were exchanged each day which divided the testing load evenly.

The decision of which students should be tested was left up to the administrator of the local Area Vocational-Technical Center. The result was that two of the Area Centers tested only the new students enrolled for the 1968-69 fall semester. Five of the Area Centers requested that all of the students be tested. Due to factors such as students who were absent one day during the testing session or those who had physical disabilities which restricted total testing, some of the students did not complete the test battery. Table 4 is an analysis of the students tested.

TABLE 4

DISTRIBUTION OF STUDENTS INCLUDED IN THE TESTING PROGRAM

Area Vocational-Technical Center	10th Grade	11th Grade	12th Grade	Post High School	Total	Test Battery Not Complete
Tulsa	0	287	141	0	428	31
Oklahoma City	0	128	5	0	133	20
Southern Oklahoma	0	129	180	6	315	13
Duncan	49	79	111	7	246	44
O. T. Autry	79	161	242	89	571	31
Tri-County	4	110	164	64	342	12
Caddo-Kiowa	11	83	116	0	210	12
Total	143	977	959	166	2,245	163

The majority of the courses of study in the Area Vocational-Technical Centers are one and two years in length depending upon the particular specialized area. The courses of study are intended primarily for juniors, seniors, and post high school students. However, Table 4 indicates that four of the Area Centers have a total of 143 students in the 10th grade. The policy toward enrolling 10th grade students differs from Area Center to Area Center as the variation in the number of students in each Area Center indicates. The administrators and counselors usually approach the problem by considering what is best for the individual student.

The test results were scored, converted and placed on the profile cards by the Guidance and Counseling Division of the Oklahoma State Department of Education and the Employment Security Commission. The results were double checked to insure accuracy in the information.

The next step in the study was to investigate the GATB Section II: Norms and GATB Section IV: Norms to determine how many of the vocational or technical courses of study offered in the Area Vocational-Technical Centers have norms available for prediction of occupational success. In most of the courses of study, the norms are in both the Occupational Aptitude Pattern Structure and Specific Occupations. However, in some courses of study the norms have been developed only for the Specific

Occupations. Courses of study such as Horticulture did not have norms in Section II: Norms or Section IV: Norms and, therefore, were omitted from the study. The norms used in this study were compiled and are included in the Appendix.

The USES has developed GATB norms for the 9th grade, 10th grade and adults. According to Section III: Development,[1] the 9th grade norms should be applied to 9th grade, the 10th grade norms should be applied to the 10th grade; and the adult norms should be applied to the 11th grade, 12th grade and adults. However, the students were tested in September and the results should be the same as testing in May of 1968. Therefore, for the purpose of this study, the 10th grade students were evaluated on the 9th grade norms; the 11th grade students were evaluated on the 10th grade norms; and the 12th grade and post high school students were evaluated on the adult norms.

With GATB scores on the students and the appropriate norms available, the next step in the study was to evaluate each student's chances for vocational success by using the multiple cutoff technique. This was accomplished by comparing the minimum scores of the three significant aptitude areas established by the USES and the aptitude scores obtained by the individual student. To qualify, the examinee must attain aptitude scores that are equal to or

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[1]U. S. Department of Labor, Section III, p. 259.

greater than the minimum cutting scores in the General Aptitude Test Battery Section II: Norms (Occupational Aptitude Pattern), or the General Aptitude Test Battery Section IV: Norms (Specific Occupations). For the courses of study that had norms in both the Occupational Aptitude Patterns and Specific Occupations, the predicted chance of success was evaluated for both.

The student's first semester grade in his course of study was obtained from the Area Vocational-Technical Center. The students were classified as successful in the course of study if the semester grade was "C" or better. The students were classified as unsuccessful in the course of study if the semester grade was "C-" or less.

Statistical Procedure

The experimental design of the study was a validity generalization design and a validity extension design. Droege[1] defined a validity generalization design as one in which a test battery is developed on a sample from one population and its effectiveness is tested against the same type of criterion on a second sample from a different population. The GATB was developed on a sample from the adult working population. The 12th grade students are evaluated with the same criteria, adult norms, but are not

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[1]Robert C. Droege, "Validity of USES Aptitude Test Batteries for Predicting MDTA Training Success," Personnel and Guidance Journal, XLVI, No. 10 (June, 1968), p. 989.

really adults in the working population. Therefore, part of the study utilizes the same criteria and a different population which classifies it as a validity generalization design.

Droege[1] defined a validity extension design as the same as a validity generalization design except that the criteria as well as the population differ. In this study, the 10th grade students were evaluated with 9th grade norms and the 11th grade students were evaluated with 10th grade norms. Norms are different from the adult norms; and, also, the population of 10th grade students and 11th grade students is different from the adult working population. Therefore, this section of the study utilizes the different criteria and a different population which classifies it as a validity extension design.

The Phi Ø coefficient was used for data analysis in this study. The two variables, the GATB norms' prediction of success or failure and the student's semester grade expressed as success or failure, are considered to be dichotomous. According to Koenker,[2] the phi Ø coefficient is used to find the relationship between two variables both of which are assumed to be discontinuous or truly dichotomous.

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[1] Ibid.

[2] Robert H. Koenker, Simplified Statistics (Bloomington: McKnight & McKnight Publishing Co., 1961), p. 81.

Guilford[1] stated that a test of the null hypothesis can be made through phi's relationship to chi square. In addition, he affirms that if chi square X^2 is significant in a fourfold table, the corresponding phi coefficient is significant. Therefore, the procedure followed in this study was to compute the phi coefficient by use of a 2 x 2 contingency table such as Table 5.

TABLE 5

A 2 x 2 CONTINGENCY TABLE FROM WHICH A PHI COEFFICIENT IS COMPUTED

Grade Results	GATB Norm Prediction		
	Success	Failure	Total
Success	a	b	a+b
Failure	c	d	c+d
Total	a+c	b+d	N

The tabulated results from the contingency table were substituted into the following formula:[2]

$$\phi = \frac{ad - bc}{\sqrt{(a+b)\,(a+c)\,(b+d)\,(c+d)}}$$

The computed phi coefficient was used to derive the corresponding chi square by means of the following

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[1] J. P. Guilford, Fundamental Statistics in Psychology and Education (New York: McGraw-Hill Book Co., 1965), p. 335.

[2] Ibid., p. 334.

formula:[1]

$$X^2 = N \phi^2$$

The resulting chi square was examined in a chi square table to determine the standard of significance with 1 degree of freedom. The size of the chi square statistic indicated whether to accept or reject the hypothesis. The hypothesis was rejected when the value of the obtained chi square was larger than the .05 level of significance in the chi square table; the hypothesis was accepted when the value of the obtained chi square was smaller than the .05 level of significance in the chi square table.

The degrees of freedom (df) can be computed for a contingency table of any size by the following formula when r is the number of rows and k is the number of columns:[2]

$$df = (r-1)(k-1)$$

In this study with a four-cell table with an r of 2 and a k of 2, the computed degrees of freedom equal to 1.

Walker and Lew[3] stated that the Yate's correction should be applied to the numerator of phi coefficient whenever it is needed for the numerator of chi square. Guilford[4] stated that when we apply chi square to a problem with 1 degree of freedom and when any cell frequency is

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[1] Ibid., p. 334. [2] Ibid., p. 236.

[3] Helen M. Walker and Joseph Lew, Statistical Inference (New York: Holt, Rinehart and Winston, 1953), p. 273.

[3] Guilford, Fundamental Statistics, p. 335.

less than 10, we should apply a modification known as Yate's correction for continuity. Therefore, in this study the Yate's correction for continuity was applied to the phi coefficient when any cell frequency was less than 10. The Yate's correction consists of subtracting .5 from the two numbers giving the largest product in the numerator and adding .5 to the two numbers giving the smallest product in the numerator of the formula.

The literature warned the researcher that the distribution of marginal frequencies in a 2 x 2 contingency table must be taken into account in judging the appropriateness of the phi coefficient. None of the authorities gave a definite rule to follow when evaluating the marginal ratio. However, Mueller and Schuessler[1] stated that in any social inquiry there is no escape from unequal and even disproportionate subsamples. In the writer's opinion, the statement would hold true for any real experimental inquiry and the unequal marginal totals are to be expected. Mueller and Schuessler[2] also suggested that if the researcher had any misgivings about the validity of his obtained phi coefficient, he could always quote his entire tiny table for the information of his reader. Therefore, to avoid any misunderstanding of this study, the 2 x 2

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[1]John H. Mueller, and Karl F. Schuessler, Statistical Reasoning in Sociology (Boston: Houghton, Mifflin Company, 1961), p. 225.

[2]Ibid., p. 255.

contingency tables were presented for every subsample.

In addition to the problem of small cell frequency and marginal totals, the size of the sample was considered when computing the phi coefficient. Siegel[1] gave the following guide lines to follow when using the 2 x 2 contingency table:

(1) When $N > 40$, use Chi square corrected for continuity.

(2) When N is between 20 and 40, the X^2 test may be used if all expected frequencies are 5 or more. If the smallest expected frequency is less than 5, use the Fisher test.

(3) When $N < 20$, use the Fisher Test in all cases.

In this study, the subsamples that were less than 20 were computed by the Fisher exact probability test. The following formula was used to compute Fisher's exact probability:

$$P = \frac{(a+b)!\ (c+d)!\ (a+c)!\ (b+d)!}{N!\quad a!\quad b!\quad c!\quad d!}$$

Utilizing the data in the 2 x 2 contingency for each subsample, the percent of correct predictions by the GATB norms was computed by the following formula:

$$\text{Percent (\%)} = \frac{a+d}{N}$$

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[1]Sidney Siegel, Nonparametric Statistics for the Behavioral Science (New York: McGraw-Hill Book Company, Inc., 1956), p. 110.

CHAPTER IV

ANALYSIS OF DATA

The purpose of this study was to determine the validity of the General Aptitude Test Battery as an instrument for identifying the students who will be successful in vocational or technical training in seven Oklahoma Area Vocational-Technical Centers. Results of the analyses of the data utilized in this investigation are presented in this chapter. A summary, conclusions and recommendations based on these results are presented in Chapter V.

These data were the results of utilizing a 2 x 2 contingency table and computing the phi coefficient to measure the degree of relationship between two dichotomous variables, the GATB's prediction of a student's success or failure and the student's semester grade which indicates success or failure. The phi coefficient was converted to an equivalent chi square which was used to test the null hypothesis. In this study, a significant phi coefficient is one that has an equivalent chi square which is significant at the .05 level.

The GATB was administered to 2,408 students enrolled in seven Oklahoma Area Vocational-Technical Centers.

However, the final sample used in the study was 1,581 students in the OAP norms and 1,621 students in the Specific Occupations norms. The number of students meeting the criteria to be included in the study was reduced by the following factors:

(1) Only students enrolling in the vocational or technical class for the first time during the fall semester of 1968 were included. Therefore, the second and third year students were omitted from the study. This was done to remove the stigma of the effect of training on aptitude scores.

(2) There were 54 Commercial Art, 7 Horticulture, 22 Photography and 19 Power Mechanic students omitted because the United States Department of Labor had not developed norms for these particular jobs.

(3) The original group of 2,408 students tested was reduced by approximately 171 drop-outs. The term drop-out is used because the students were enrolled in the Area Vocational-Technical Centers at the beginning of the semester and the first semester grades did not report a mark for this group of students. In some cases, the student's name appeared on the roll sheet followed by a designation of "dropped." In some cases, the student's name just failed to appear on the report. It is assumed this group dropped from school completely or decided to return to the traditional curriculum of their home school.

It is interesting to note that of this group of drop-outs, the students who were predicted to be successful and the number predicted to be failures by the GATB norms were about equal in number.

(4) There was a total of 2,408 students participating in the testing program. However, due to a number of factors such as students being absent part of the time during the testing sessions, 163 students did not complete the 12 subtests and, therefore, only part of the 9 aptitude scores were available. If any one of the three significant aptitude scores specified for an area of study was missing, it was impossible to evaluate the students. In some cases the incomplete test battery did contain the three significant aptitude scores necessary to predict the student's success. The factor of incomplete tests produced a variance in the sample size in the Occupational Aptitude Pattern Structure and the Specific Occupations.

A secondary concern of the study involved determining whether the norms for the Occupational Aptitude Pattern Structure or the norms for the Specific Occupations would be the most valuable in counseling students about to enter the Area Vocational-Technical Centers.

The analysis of data was organized in the following order:

(1) The null hypotheses HO_1 and HO_2 were used to evaluate the degree of relationship between the GATB's prediction factor and training success for the total sample of first year students in the Oklahoma Area Vocational-Technical Centers.

(2) The null hypotheses HO_3 and HO_6 were used to evaluate the degree of relationship between the GATB's prediction factor and training success for the subsample of students evaluated under adult norms in the Oklahoma Area Vocational-Technical Centers.

(3) The null hypotheses HO_4 and HO_7 were used to evaluate the degree of relationship between the GATB's prediction factor and training success for the subsample of students evaluated under the 10th grade norms in the Oklahoma Area Vocational-Technical Centers.

(4) The null hypotheses HO_5 and HO_8 were used to evaluate the degree of relationship between the GATB's prediction factor and training success for the subsample of students evaluated under the 9th grade norms in the Oklahoma Area Vocational-Technical Centers.

(5) The null hypotheses HO_1 and HO_2 were used to evaluate the degree of relationship between the GATB's prediction factor and training success for the subsample of students in each of the specific areas of study in the Oklahoma Area Vocational-Technical Centers.

The Total Sample

The total sample consisted of all those students who were enrolled in the seven Oklahoma Area Vocational-Technical Centers for the first time during the fall of 1968 who took the GATB test and remained in school to receive a first semester grade.

To test this sample with both the Occupational Aptitude Pattern (OAP) norms and the Specific Occupations norms required two contingency tables and the corresponding null hypothesis. Table 6 shows the results of the OAP norms prediction and grade results as frequencies in each

cell. The sample in Table 6 was tested by null hypothesis HO_1.

TABLE 6

OAP NORMS PREDICTION AND GRADE RESULTS FOR THE TOTAL SAMPLE*

Grade Results	OAP Norms Prediction		
	Success	Failure	Total
Success	864	453	1317
Failure	87	177	264
Total	951	630	1581

*For an understanding of Tables 6-50, the reader should refer to Table 5. In relation to Table 5, cell (a) is that group of students who were predicted to be successful by the GATB and were successful according to grade criteria. Cell (b) is that group of students who were predicted to be failures by the GATB but who were successful according to grade criteria. Cell (c) is that group of students who were predicted to be successful by the GATB but were failures according to grade criteria. Cell (d) includes those students who were predicted to be failures by the GATB and were failures according to grade criteria.

An analysis of Table 6 reveals that the OAP's predicted success for 951 students and failure for 630 students. The first semester grades indicated 1,317 students were successful and 264 students were failures. The correct predictions by the OAP norms in the total sample were equal to 66 percent. The phi coefficient was computed to be equal to .2487 and the equivalent chi square was equal to 97.796. Consulting the table of chi square

with one degree of freedom, it is found that the .01 level of probability is 6.635. Since the obtained value of 97.796 was greater than 6.635, the null hypothesis HO_1 was rejected at the .01 level of significance.

Table 7 shows the results of the Specific Occupations norms prediction and grade results as frequencies in each cell. The sample in Table 7 was tested by null hypothesis HO_2.

TABLE 7

SPECIFIC OCCUPATIONS NORMS PREDICTION AND GRADE RESULTS FOR THE TOTAL SAMPLE

Grade Results	Specific Occupations Norms Predictions		
	Success	Failure	Total
Success	855	491	1346
Failure	87	188	275
Total	942	679	1621

An analysis of Table 7 reveals that 40 more students were included in the Specific Occupations sample. This was due to some courses of study having only Specific Occupations norms. The correct predictions by the Specific Occupations norms in the total sample were equal to 64 percent. The phi coefficient was computed to be equal to .2426 and the equivalent chi square was equal to 95.404. With one degree of freedom, the chi square of 95.404 was

significant beyond the .01 level (6.635) and, therefore, the null hypothesis was rejected at the .01 level of significance.

The Adult Norms

The adult norms were applied to all 12th grade and post high school students. According to the United States Department of Labor the 11th grade students should also be included under the adult norms. However, due to the early testing in September and the "summer lag factor," the 11th grade students were not included under the adult norms.

Table 8 shows the frequencies in each cell of the OAP norms predictions and the grade results for the subsample of students evaluated with adult norms. The subsample in Table 8 was tested by the null hypothesis HO_3.

TABLE 8

OAP NORMS PREDICTIONS AND GRADE RESULTS FOR THE ADULT SUBSAMPLE

Grade Results	OAP Norms Predictions		
	Success	Failure	Total
Success	417	222	639
Failure	30	63	93
Total	447	285	732

An examination of Table 8 reveals that the right hand margin indicates 639 students were successful according to grades and 93 were failures. The bottom margin indicates the OAP norms predicted 447 would be successful and 285 would fail. In this subsample, the correct predictions by the OAP norms were equal to 66 percent.

To test the null hypothesis, the phi coefficient was computed by formula and equaled to .2254. The equivalent chi square was equal to 37.189. The obtained chi square was greater than 6.635 and, therefore, the null hypothesis HO_3 was rejected at the .01 level of significance.

Table 9 gives the frequencies in each cell of the Specific Occupations norms predictions and grade results for the subsample of students evaluated under the adult norms. The subsample in Table 9 was tested by null hypothesis HO_6.

TABLE 9

SPECIFIC OCCUPATIONS NORMS PREDICTION AND GRADE RESULTS FOR THE ADULT SUBSAMPLE

Grade Results	Specific Occupations Norms Prediction		
	Success	Failure	Total
Success	432	272	704
Failure	31	78	109
Total	463	350	813

Table 9 shows a total of 813 students in the subsample of adult students evaluated by the Specific Occupations norms. This number is 81 greater than the adults evaluated by the OAP norms in Table 8. However, this increase did not produce any major proportional changes in the cells. According to the table, the correct predictions by the Specific Occupations norms in this subsample were equal to 63 percent. To test the null hypothesis HO_6, the phi coefficient was computed to be equal to .2266 and the equivalent chi square was equal to 41.746. The obtained chi square was much larger than 6.635 and, therefore, the null hypothesis was rejected at the .01 level of significance.

The 10th Grade Norms

The 10th grade norms were applied to all 11th grade students included in the sample. The subsample of 977 students in the 11th grade was the largest subsample tested. In the future, the number of 11th grade students will probably make up the majority of the students entering Oklahoma's Area Vocational-Technical Centers.

Table 10 shows the frequencies in each cell of the results of the OAP 10th grade norms prediction of success and the students' success determined by first semester grades. The OAP 10th grade norms were tested by null hypothesis HO_4.

TABLE 10

OAP NORMS PREDICTION AND GRADE RESULTS FOR THE 11th GRADE SUBSAMPLE

Grade Results	OAP Norms Prediction		
	Success	Failure	Total
Success	405	209	614
Failure	43	81	124
Total	448	290	738

According to Table 10, a total of 738 students were evaluated with 10th grade norms. The number evaluated is 139 less than the total 11th grade students. The difference in the number tested and the number evaluated is due to such factors as incomplete test scores, no norms available to evaluate some areas of study, and some 11th grade students who are in their second year of study in the Area Vocational-Technical Centers. The number of correct predictions by the OAP 10th grade norms were equal to 66 percent. To test the null hypothesis HO_4, the phi coefficient was computed to be equal to .2091. The equivalent chi square was equal to 30.912. The obtained value of chi square was greater than the .01 level of probability (6.635) and, therefore, the null hypothesis was rejected at the .01 level of significance.

Table 11 gives the results of the Specific Occupations 10th grade norms prediction of success and the

students' success determined by first semester grades. The subsample in Table 11 was tested by the null hypothesis HO_7.

TABLE 11

SPECIFIC OCCUPATIONS NORMS PREDICTION AND GRADE RESULTS FOR THE 11th GRADE SUBSAMPLE

Grade Results	Specific Occupations Norms Prediction		
	Success	Failure	Total
Success	385	196	581
Failure	50	76	126
Total	435	272	707

According to Table 11, the number of correct predictions by the Specific Occupations 10th grade norms were equal to 65 percent. To test the null hypothesis HO_7, the phi coefficient was computed to be equal to .2091 and the equivalent chi square was equal to 30.912. The obtained chi square was much larger than 6.635 and, therefore, the null hypothesis was rejected at the .01 level of significance.

The 9th Grade Norms

The 9th grade norms were used to evaluate all 10th grade students tested in the study. This subsample consisted of only 143 students. However, this subsample was sufficient to provide a test of the norms.

Table 12 shows the frequencies in each cell for the results of the OAP 9th grade norms prediction of success and the students' success determined by first semester grades. The subsample in Table 12 was tested by null hypothesis HO_5.

TABLE 12

OAP NORMS PREDICTION AND GRADE RESULTS FOR THE 10th GRADE SUBSAMPLE

Grade Results	OAP Norms Prediction		
	Success	Failure	Total
Success	42	22	64
Failure	14	33	47
Total	56	55	111

An analysis of Table 12 reveals that only 111 students were evaluated by the OAP 9th grade norms. The frequencies in the marginal totals indicate that this subsample produced a desirable split. The number of correct predictions by the OAP 9th grade norms were equal to 68 percent. To test the null hypothesis HO_5, the phi coefficient was computed to be equal to .3542 and the equivalent chi square was equal to 13.926. The obtained chi square was greater than 6.635 and, therefore, the null hypothesis was rejected at the .01 level of significance.

Table 13 shows the frequencies in each cell of the results of the Specific Occupations 9th grade norms

prediction of success and the students' success determined by first semester grades. The subsample in Table 13 was tested by the null hypothesis HO_8.

TABLE 13

SPECIFIC OCCUPATIONS NORMS PREDICTION AND GRADE RESULTS FOR THE 10th GRADE SUBSAMPLE

Grade Results	Specific Occupations Norms Prediction		
	Success	Failure	Total
Success	38	23	61
Failure	6*	34	40
Total	44	57	101

*Yates' correlation used in computation.

Table 13 reveals that 101 students were evaluated by the Specific Occupations 9th grade norms. The difference in the number of students evaluated by the OAP norms and the Specific norms was 11. The marginal totals in this subsample approached an equal split which is desirable when using the phi coefficient. The correct predictions in this subsample were equal to 71 percent. To test the null hypothesis HO_8, the phi coefficient was computed to be equal to .4461 and the equivalent chi square was equal to 20.100. The obtained chi square was greater than 6.635 and, therefore, the null hypothesis was rejected at the .01 level of significance.

Specific Areas of Study

According to the total sample, 1,581 students were evaluated by the OAP norms and 1,612 students were evaluated by the Specific Occupations norms. The students were enrolled in 30 different areas of study. The United States Department of Labor had not developed norms for four of the areas of study involved and, therefore, these subsamples were not evaluated. The four areas omitted were Commercial Art, Horticulture, Photography and Power Mechanics. Of the remaining 26 areas of study, the subsamples were large enough in 19 areas of study to permit testing the hypothesis with the phi coefficient and equivalent chi square. The subsamples in four areas of study were too small to permit utilization of the phi coefficient and required use of Fisher's exact probability test. Computation of the probability was impossible in three areas of study due to extreme distribution in the cell frequencies. In the three subsamples not computed, the entire group of students received a successful grade of "C" or better.

The three subsamples not tested were Sheet Metal, Dental Office Assistant, and Medical Office Assistant. The Sheet Metal subsample consisted of only 4 students and included 50 percent correct predictions by both norms. The Medical Office Assistant subsample included 30 students in the OAP norms with 76 percent correct predictions and

31 students in the Specific Occupations norms with 66 percent correct predictions. The Dental Office Assistant subsample included 27 students in OAP norms with 85 percent correct predictions and 28 students in the Specific Occupations norms with 57 percent correct predictions.

In this section, the specific areas of study were presented in alphabetic order. A majority of the areas of study included both the OAP norms and the Specific norms. However, some areas consisted of only the Specific norms or the OAP norms. Each subsample consisted of students evaluated by the 9th grade norms, 10th grade norms, and adult norms. Therefore, the null hypotheses HO_1 and HO_2 were used to test the specific areas of study. Tables 14 through 50 show the frequencies in each cell of the 2 x 2 contingency for each area of study.

TABLE 14

AIR CONDITIONING AND REFRIGERATION SUBSAMPLE

Grade Results	OAP Norms Prediction		
	Success	Failure	Total
Success	59	27	86
Failure	6*	14	20
Total	65	41	106

*Yates' correction used in computation.

The correct predictions by the OAP norms in Table 14 were equal to 69 percent. To test the null

hypothesis HO_1, the phi coefficient was computed to be equal to .2854 and the equivalent chi square was equal to 8.634. The obtained chi square was greater than 6.635 and, therefore, the null hypothesis HO_1, pertaining to Refrigeration Mechanic OAP norms was rejected at the .01 level of significance.

The correct predictions in Table 15 were equal to 68 percent. To test the null hypothesis HO_1, the phi coefficient was computed to be equal to -.047 and the equivalent chi square was equal to .130. The obtained chi square was less than 3.841 and, therefore, failed to reach the required .05 level of significance. The null hypothesis HO_1, pertaining to Aircraft and Engine Mechanics OAP norms was accepted.

TABLE 15

AIRCRAFT MECHANICS SUBSAMPLE

Grade Results	OAP Norms Prediction		
	Success	Failure	Total
Success	38	14	53
Failure	5*	2*	7
Total	43	16	59

*Yates' correction used in computation.

The correct predictions in Table 16 were equal to 56 percent. To test the null hypothesis HO_2, the phi coefficient was computed to be equal to .1111 and the

equivalent chi square was equal to .728. The obtained chi square was less than 3.841 and, therefore, failed to reach the required .05 level of significance. The null hypothesis HO_2, pertaining to Aircraft and Engine Mechanics Specific Occupation norms was accepted.

TABLE 16

AIRCRAFT MECHANICS SUBSAMPLE

Grade Results	Specific Occupation Norms Prediction		
	Success	Failure	Total
Success	28	24	52
Failure	2*	5*	7
Total	30	29	59

*Yates' correction used in computation.

In Table 17, the sample size of 11 required the utilization of the Fisher exact probability test. In addition to the problem of a small sample, the marginal totals were extremely unequal. The correct predictions in this subsample were equal to 72 percent. The Fisher exact probability was computed to be equal to .836. Since the obtained probability was greater than the required level of significance (.05), the null hypothesis HO_2, pertaining to Electrical-Appliance Serviceman Specific Occupation norms was accepted.

TABLE 17

APPLIANCE REPAIR SUBSAMPLE

Grade Results	Specific Occupation Norms Prediction		
	Success	Failure	Total
Success	8	1	9
Failure	2	0	2
Total	10	1	11*

*Computed by the Fisher exact probability test.

The correct predictions in Table 18 were equal to 52 percent. To test the null hypothesis HO_1, the phi coefficient was computed to be equal to .1034 and the equivalent chi square was equal to 1.508. The obtained chi square was less than 3.841 and, therefore, failed to reach the required (.05) level of significance. The null hypothesis HO_1, pertaining to Auto Body Repairman OAP norms was accepted.

TABLE 18

AUTO BODY REPAIR SUBSAMPLE

Grade Results	OAP Norms Prediction		
	Success	Failure	Total
Success	58	59	117
Failure	8*	16	24
Total	66	75	141

*Yates' correction used in computation.

The correct predictions in Table 19 were equal to 68 percent. To test the null hypothesis HO_2, the phi coefficient was computed to be equal to .1701 and the equivalent chi square was equal to 4.108. The obtained chi square was greater than 3.481 and, therefore, the null hypothesis HO_2, pertaining to Auto Body Repairman Specific Occupation norms was rejected at the .05 level of significance.

TABLE 19

AUTO BODY REPAIR SUBSAMPLE

Grade Results	Specific Occupation Norms Prediction		
	Success	Failure	Total
Success	85	32	117
Failure	13	12	25
Total	98	44	142

The correct predictions in Table 20 were equal to 66 percent. To test the null hypothesis HO_1, the phi coefficient was computed to be equal to .2823 and the equivalent chi square was equal to 12.831. The obtained chi square was greater than 6.635 and, therefore, the null hypothesis HO_1, pertaining to Automobile Mechanic OAP norms was rejected at the .01 level of significance.

The correct predictions in Table 21 were equal to 65 percent. To test the null hypothesis HO_2, the phi

TABLE 20

AUTOMOBILE MECHANICS SUBSAMPLE

Grade Results	OAP Norms Prediction		
	Success	Failure	Total
Success	83	45	128
Failure	10	23	33
Total	93	68	161

coefficient was computed to be equal to .2469 and the equivalent chi square was equal to 9.510. The obtained chi square was greater than 6.635 and, therefore, the null hypothesis HO_2, pertaining to Automobile Mechanic Specific Occupation norms was rejected at the .01 level of significance.

TABLE 21

AUTOMOBILE MECHANICS SUBSAMPLE

Grade Results	Specific Occupation Norms Prediction		
	Success	Failure	Total
Success	80	44	124
Failure	11	21	32
Total	93	68	161

The correct predictions in Table 22 were equal to 54 percent. To test the null hypothesis HO_1, the phi coefficient was computed to be equal to .224 and the

equivalent chi square was equal to 6.121. The obtained chi square was greater than 5.412 and, therefore, the null hypothesis HO_1, pertaining to Stenographer OAP norms was rejected at the .02 level of significance.

TABLE 22

BUSINESS AND OFFICE EDUCATION SUBSAMPLE

Grade Results	OAP Norms Prediction		
	Success	Failure	Total
Success	52	54	106
Failure	2*	14	16
Total	54	68	122

*Yates' correction used in computation.

The correct predictions in Table 23 were equal to 68 percent. To test the null hypothesis HO_2, the coefficient was computed to be equal to .3036 and the equivalent chi square was equal to 10.969. The obtained chi square

TABLE 23

BUSINESS AND OFFICE EDUCATION SUBSAMPLE

Grade Results	Specific Occupation Norms Prediction		
	Success	Failure	Total
Success	68	35	103
Failure	3*	13	16
Total	71	48	119

*Yates' correction used in computation.

was greater than 6.635 and, therefore, the null hypothesis HO_2, pertaining to Stenographer Specific Occupation norms was rejected at the .01 level of significance.

The correct predictions in Table 24 were equal to 70 percent. To test the null hypothesis HO_1, the phi coefficient was computed to be equal to .29 and the equivalent chi square was equal to 4.541. The obtained chi square was greater than 3.841 and, therefore, the null hypothesis HO_1, pertaining to Carpentry OAP norms was rejected at the .05 level of significance.

TABLE 24

CARPENTRY SUBSAMPLE

Grade Results	OAP Norms Prediction		
	Success	Failure	Total
Success	29	11	40
Failure	5*	9*	14
Total	34	20	54

*Yates' correction used in computation.

The correct predictions in Table 25 were equal to 70 percent. To test the null hypothesis HO_2, the phi coefficient was computed to be equal to .2687 and the equivalent chi square was equal to 3.899. The obtained chi square was greater than 3.851 and, therefore, the null hypothesis HO_2, pertaining to Carpentry Specific Occupation norms was rejected at the .05 level of significance.

TABLE 25

CARPENTRY SUBSAMPLE

Grade Results	Specific Occupation Norms Prediction		
	Success	Failure	Total
Success	27	13	40
Failure	3*	11	14
Total	30	24	54

*Yates' correction used in computation.

The correct predictions in Table 26 were equal to 44 percent. The Fisher exact probability was computed to be equal to .61. Since the obtained probability was greater than the required level of significance (.05), the null hypothesis HO_1, pertaining to Computer Programming OAP norms was accepted.

TABLE 26

COMPUTER PROGRAMMING SUBSAMPLE

Grade Results	OAP Norms Prediction		
	Success	Failure	Total
Success	1	10	11
Failure	0	7	7
Total	1	17	18*

*Computed by the Fisher exact probability text.

The correct predictions in Table 27 were equal to 61 percent. The Fisher exact probability was computed to be equal to .199. Since the obtained probability was greater than the required level of significance (.05), the null hypothesis HO_2, pertaining to Computer Programming Specific Occupation norms was accepted.

TABLE 27

COMPUTER PROGRAMMING SUBSAMPLE

Grade Results	Specific Occupation Norms Prediction		
	Success	Failure	Total
Success	5	6	11
Failure	1	6	7
Total	6	12	18*

*Computed by the Fisher exact probability test.

The correct predictions in Table 28 were equal to 86 percent. The extreme inequality of marginal totals raises a question of doubt as to the value of the phi coefficient in this table. To test the null hypothesis HO_1, the phi coefficient was computed to be equal to .0101 and the equivalent chi square was equal to .008. The obtained chi square was less than 3.841 and, therefore, failed to reach the required .05 level of significance. The null hypothesis HO_1, pertaining to Cosmetology OAP norms was accepted.

TABLE 28

COSMETOLOGY SUBSAMPLE

Grade Results	OAP Norms Prediction		
	Success	Failure	Total
Success	69	8*	77
Failure	3*	1*	4
Total	72	9	81

*Yates' correction used in computation.

The correct predictions in Table 29 were equal to 81 percent. The extreme inequality of marginal totals raised a question of doubt as to the value of the phi coefficient in this table. To test the null hypothesis HO_2, the phi coefficient was computed to be equal to -.022 and the equivalent chi square was equal to .035. The

TABLE 29

COSMETOLOGY SUBSAMPLE

Grade Results	Specific Occupation Norms Prediction		
	Success	Failure	Total
Success	65	12	77
Failure	3*	1*	4
Total	68	13	81

*Yates' correction used in computation.

obtained chi square was less than 3.841 and, therefore, failed to reach the required .05 level of significance.

The null hypothesis HO_2, pertaining to Cosmetology Specific Occupation norms was accepted.

The correct predictions in Table 30 were equal to 76 percent. To test the null hypothesis HO_1, the phi coefficient was computed to be equal to .2 and the equivalent chi square was equal to 1.96. The obtained chi square was less than 3.841 and, therefore, failed to reach the required .05 level of significance. The null hypothesis HO_1, pertaining to Diesel Engine Mechanics OAP norms was accepted.

TABLE 30

DIESEL MECHANICS SUBSAMPLE

Grade Results	OAP Norms Prediction		
	Success	Failure	Total
Success	35	9*	44
Failure	2*	3*	5
Total	37	12	49

*Yates' correction used in computation.

The correct predictions in Table 31 were equal to 81 percent. To test the null hypothesis HO_2, the phi coefficient was computed to be equal to .0205 and the equivalent chi square was equal to .02. The obtained chi square was less than 3.841 and, therefore, failed to reach the required .05 level of significance. The null hypothesis

HO_2, pertaining to Diesel Engine Mechanics Specific Occupation norms was accepted.

TABLE 31

DIESEL MECHANICS SUBSAMPLE

Grade Results	Specific Occupation Norms Prediction		
	Success	Failure	Total
Success	37	6*	43
Failure	3*	1*	4
Total	40	7	47

*Yates' correlation used in computation.

The correct predictions in Table 32 were equal to 42 percent. To test the null hypothesis HO_2, the phi coefficient was computed to be equal to .0566 and the equivalent chi square was equal to .368. The obtained chi square was less than 3.841 and, therefore, failed to reach the required .05 level of significance. The null

TABLE 32

DRAFTING SUBSAMPLE

Grade Results	Specific Occupation Norms Prediction		
	Success	Failure	Total
Success	27	61	88
Failure	6*	21	27
Total	33	82	115

*Yates' correction used in computation.

hypothesis HO_2, pertaining to Draftsman Specific Occupation norms was accepted.

The correct predictions in Table 33 were equal to 56 percent. To test the null hypothesis HO_1, the phi coefficient was computed to be equal to .355 and the equivalent chi square was equal to 9.704. The obtained chi square was greater than 6.635 and, therefore, the null hypothesis pertaining to Electronic Technician OAP norms was rejected at the .01 level of significance.

TABLE 33

ELECTRONIC TECHNICIAN SUBSAMPLE

Grade Results	OAP Norms Prediction		
	Success	Failure	Total
Success	21	34	55
Failure	0*	22	22
Total	21	56	77

*Yates' correction used in computation.

The correct predictions in Table 34 were equal to 62 percent. To test the null hypothesis HO_2, the phi coefficient was computed to be equal to .3292 and the equivalent chi square was equal to 8.345. The obtained chi square was greater than 6.635 and, therefore, the null hypothesis HO_2, pertaining to Electronic Technician Specific Occupation norms was rejected at the .01 level of significance.

TABLE 34

ELECTRONIC TECHNICIAN SUBSAMPLE

Grade Results	Specific Occupation Norms Prediction		
	Success	Failure	Total
Success	29	26	55
Failure	3*	19	22
Total	32	45	77

*Yates' correction used in computation.

The correct predictions in Table 35 were equal to 47 percent. The Fisher exact probability was computed to be equal to .5410. Since the obtained probability was greater than the required level of significance (.05), the null hypothesis HO_2, pertaining to Farm Equipment Mechanics Specific Occupation norms was accepted.

TABLE 35

FARM MACHINE REPAIR SUBSAMPLE

Grade Results	Specific Occupation Norms Prediction		
	Success	Failure	Total
Success	2	8	10
Failure	2	7	9
Total	4	15	19*

*Computed by the Fisher exact probability test.

The correct predictions in Table 36 were equal to 42 percent. To test the null hypothesis HO_1, the phi

coefficient was computed to be equal to .1532 and the equivalent chi square was equal to 1.291. The obtained chi square was less than 3.841 and, therefore, failed to reach the required .05 level of significance. The null hypothesis HO_1, pertaining to Cook OAP norms was accepted.

TABLE 36

FOOD SERVICE SUBSAMPLE

Grade Results	OAP Norms Prediction		
	Success	Failure	Total
Success	18	32	50
Failure	0*	5*	5
Total	18	37	55

*Yates' correction used in computation.

The correct predictions in Table 37 were equal to 48 percent. To test the null hypothesis HO_2, the phi

TABLE 37

FOOD SERVICE SUBSAMPLE

Grade Results	Specific Occupation Norms Prediction		
	Success	Failure	Total
Success	21	28	49
Failure	0*	5*	5
Total	21	33	54

*Yates' correction used in computation.

coefficient was computed to be equal to .1893 and the equivalent chi square was equal to 1.935. The obtained chi square was less than 3.841 and, therefore, failed to reach the .05 level of significance. The null hypothesis HO_2, pertaining to Cook Specific Occupation norms was accepted.

The correct predictions in Table 38 were equal to 76 percent. To test the null hypothesis HO_2, the phi coefficient was computed to be equal to .4535 and the equivalent chi square was equal to 4.319. The obtained chi square was greater than 3.841 and, therefore, the null hypothesis HO_2, pertaining to Nurse's Aid Specific Occupation norms was rejected at the .05 level of significance.

TABLE 38

HEALTH SERVICES SUBSAMPLE

Grade Results	Specific Occupation Norms Prediction		
	Success	Failure	Total
Success	9*	4*	13
Failure	1*	7*	8
Total	10	11	21

*Yates' correction used in computation.

The correct predictions in Table 39 were equal to 68 percent. To test the null hypothesis HO_1, the phi coefficient was computed to be equal to .1002 and the

equivalent chi square was equal to .853. The obtained chi square was less than 3.841 and, therefore, failed to reach the required .05 level of significance. The null hypothesis HO_1, pertaining to Machinist I OAP norms was accepted.

TABLE 39

MACHINE SHOP SUBSAMPLE

Grade Results	OAP Norms Prediction		
	Success	Failure	Total
Success	51	13	64
Failure	14	7*	21
Total	65	20	85

*Yates' correction used in computation.

The correct predictions in Table 40 were equal to 72 percent. To test the null hypothesis HO_2, the phi coefficient was computed to be equal to .3192 and the

TABLE 40

MACHINE SHOP SUBSAMPLE

Grade Results	Specific Occupation Norms Prediction		
	Success	Failure	Total
Success	48	15	63
Failure	9*	14	23
Total	57	29	86

*Yates' correction used in computation.

equivalent chi square was equal to 8.762. The obtained chi square was greater than 6.635 and, therefore, the null hypothesis HO_2, pertaining to Machinist I Specific Occupation norms was rejected at the .01 level of significance.

The correct predictions in Table 41 were equal to 58 percent. To test the null hypothesis HO_1, the phi coefficient was computed to be equal to .0488 and the equivalent chi square was equal to .119. The obtained chi square was less than 3.841 and, therefore, failed to reach the required .05 level of significance. The null hypothesis HO_1, pertaining to Offset-Press Man OAP norms was accepted. In the subsample of Offset Printing students, the OAP norms and Specific Occupations norms were identical. Therefore, the Offset Printing students were reported by OAP norms only.

TABLE 41

OFFSET PRINTING SUBSAMPLE

Grade Results	OAP Norms Prediction		
	Success	Failure	Total
Success	25	18	43
Failure	3*	4*	7
Total	28	22	50

*Yates' correction used in computation.

The correct predictions in Table 42 were equal to 83 percent. To test the null hypothesis HO_2, the phi coefficient was computed to be equal to .382 and the equivalent chi square was equal to 7.004. The obtained chi square was greater than 6.635 and, therefore, the null hypothesis HO_2, pertaining to Licensed Practical Nurse Specific Occupation norms was rejected at the .01 level of significance.

TABLE 42

PRACTICAL NURSING SUBSAMPLE

Grade Results	Specific Occupation Norms Prediction		
	Success	Failure	Total
Success	36	7*	43
Failure	1*	4*	5
Total	37	11	48

*Yates' correction used in computation.

The correct predictions in Table 43 were equal to 78 percent. The Fisher exact probability was computed to be equal to .85. Since the obtained probability was greater than the required level of significance (.05), the null hypothesis HO_2, pertaining to Sewing Services Specific Occupation norms was accepted.

The GATB did not have norms specifically for Small Engine Repair. However, some of the Area Vocational-Technical Centers were using the Small Engine Repair class

TABLE 43

SEWING SERVICES SUBSAMPLE

Grade Results	Specific Occupation Norms Prediction		
	Success	Failure	Total
Success	14	3	17
Failure	1	0	1
Total	15	3	18*

*Computed by the Fisher exact probability test.

as a prerequisite to the Auto Mechanics course of study. Therefore, the OAP Auto Mechanics norms were used to evaluate Small Engine Repair.

The correct predictions in Table 44 were equal to 69 percent. To test the null hypothesis HO_1, the phi coefficient was computed to be equal to .3181 and the equivalent chi square was equal to 5.970. The obtained chi square was greater than 5.412 and, therefore, the

TABLE 44

SMALL ENGINE REPAIR SUBSAMPLE

Grade Results	OAP Norms Prediction		
	Success	Failure	Total
Success	28	7*	35
Failure	11	13	24
Total	39	20	59

*Yates' correction used in computation.

null hypothesis HO_1, pertaining to Automobile Mechanics OAP norms was rejected at the .02 level of significance.

The correct predictions in Table 45 were equal to 76 percent. To test the null hypothesis HO_1, the phi coefficient was computed to be equal to .2032 and the equivalent chi square was equal to 8.093. The obtained chi square was greater than 6.635 and, therefore, the null hypothesis HO_1, pertaining to Key-Punch Operator OAP norms was rejected at the .01 level of significance.

TABLE 45

UNIT RECORD SUBSAMPLE

Grade Results	OAP Norms Prediction		
	Success	Failure	Total
Success	138	34	172
Failure	13	11	24
Total	151	45	196

The correct predictions in Table 46 were equal to 60 percent. To test the null hypothesis HO_2, the phi coefficient was computed to be equal to .0943 and the equivalent chi square was equal to 1.690. The obtained chi square was less than 3.841 and, therefore, failed to reach the required .05 level of significance. The null hypothesis HO_2, pertaining to Key-Punch Operator Specific Occupation norms was accepted.

TABLE 46

UNIT RECORD SUBSAMPLE

Grade Results	Specific Occupation Norms Prediction		
	Success	Failure	Total
Success	102	67	169
Failure	9*	12	21
Total	111	79	190

*Yates' correction used in computation.

The correct predictions in Table 47 were equal to 72 percent. To test the null hypothesis HO_1, the phi coefficient was computed to be equal to .3856 and the equivalent chi square was equal to 5.353. The obtained

TABLE 47

VOCATIONAL-ELECTRONICS SUBSAMPLE

Grade Results	OAP Norms Prediction		
	Success	Failure	Total
Success	15	6*	21
Failure	4*	11	15
Total	19	17	36

*Yates' correction used in computation.

chi square was greater than 3.841 and, therefore, the null hypothesis HO_1, pertaining to Radio-Television Service and Repairman OAP norms was rejected at the .05 level of

significance.

The correct predictions in Table 48 were equal to 72 percent. To test the null hypothesis HO_2, the phi coefficient was computed to be equal to .4044 and the equivalent chi square was equal to 5.887. The obtained chi square was greater than 5.412 and, therefore, the null hypothesis HO_2, pertaining to Radio-Television Service and Repairman Specific Occupation norms was rejected at the .02 level of significance.

TABLE 48

VOCATIONAL-ELECTRONICS SUBSAMPLE

Grade Results	Specific Occupation Norms Prediction		
	Success	Failure	Total
Success	14	7*	21
Failure	3*	12	15
Total	17	19	36

*Yates' correction used in computation.

The correct predictions in Table 49 were equal to 61 percent. To test the null hypothesis HO_1, the phi coefficient was computed to be equal to .1482 and the equivalent chi square was equal to 2.899. The obtained chi square was less than 3.841 and, therefore, failed to reach the required .05 level of significance. The null hypothesis HO_1, pertaining to Welding (combination) OAP norms was accepted.

TABLE 49

WELDING SUBSAMPLE

Grade Results	OAP Norms Predictions		
	Success	Failure	Total
Success	71	48	119
Failure	4*	9*	13
Total	75	57	132

*Yates' correction used in computation.

The correct predictions in Table 50 were equal to 67 percent. To test the null hypothesis HO_2, the phi coefficient was computed to be equal to .1296 and the equivalent chi square was equal to 2.234. The obtained chi square was less than 3.841 and, therefore, failed to reach the required .05 level of significance. The null hypothesis HO_2, pertaining to Welding (Combination) Specific Occupation norms was accepted.

TABLE 50

WELDING SUBSAMPLE

Grade Results	Specific Occupation Norms Prediction		
	Success	Failure	Total
Success	82	39	121
Failure	5*	7*	12
Total	87	46	133

*Yates' correction used in computation.

Summary

For the purposes of analysis, the results of the GATB predictions and grade results were presented in 45 tables followed by a computation of the probability for these tabulated frequencies. The phi coefficient was significant at the .01 level for the following major subsets of the GATB norms: OAP, Specific Occupations, Adult, 10th grade, and 9th grade. Thirty specific areas of study were represented in the group of students tested. However, the GATB did not have norms in 4 of the specific areas of study. In 3 other specific areas of study, the grade results indicated success for all students. Therefore, the analysis was completed on only 23 specific areas of study. Twelve of the 23 specific areas of study were significant at the required level. Of the remaining 11 specific areas of study that were "not significant," 4 consisted of small subsamples of less than 20 students and, therefore, required the utilization of the Fisher exact probability. Unequal marginal totals in some of the 11 "not significant" specific areas of study raised a question of doubt as to the value of the computed phi coefficient.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The problem of this study was to determine the validity of the General Aptitude Test Battery as an instrument for identifying the students who will be successful in vocational or technical training in Area Vocational-Technical Centers. A secondary objective of the study was to determine which of the GATB norms, OAP or Specific Occupations, had the greatest predictive value for students attending the Area Vocational-Technical Centers.

The first step in the study was to test the students in the seven Oklahoma Area Vocational-Technical Centers. This testing was completed during the first two months of the 1968-69 school year. Data were collected from 2,408 students in the seven Area Centers. The final sample used in the study was reduced to 1,621 students (Specific Occupations norms total sample). The final sample resulted when the established criteria were applied to the original sample of 2,408 students. The GATB tests were hand scored and the results were evaluated by the OAP norms and Specific Occupations norms. This processing produced a prediction of success or failure in the

vocational-technical course of study for each student.

The student's first semester grades were obtained from the seven participating Centers during January and February of 1969. The grade results were translated into success for students making "C" or better and failure for students making "C-" or less.

With the two dichotomous variables, the information was tabulated in 2 x 2 contingency tables. The resulting frequencies were used to compute the phi coefficients and the equivalent chi squares. The chi squares were used to evaluate the following null hypotheses:

HO_1 There is no correlation between the General Aptitude Test Battery's Occupational Aptitude Pattern norms prediction of a student's vocational success in a specific occupation and the student's success determined by a grade of "C" or better in the corresponding course of study in an Area Vocational-Technical Center.

HO_2 There is no correlation between the General Aptitude Test Battery's Specific Occupations norms prediction of a student's vocational success in a specific occupation and the student's success determined by a grade of "C" or better in the corresponding course of study in an Area Vocational-Technical Center.

HO_3 There is no correlation between the General Aptitude Test Battery's Occupational Aptitude Pattern adult norms prediction of a student's vocational success in a specific occupation and the student's success determined by a grade of "C" or better in the corresponding course of study in an Area Vocational-Technical Center.

HO_4 There is no correlation between the General Aptitude Test Battery's Occupational Aptitude Pattern 10th grade norms prediction of a student's vocational success in a specific occupation and the student's success determined by a grade of "C" or

better in the corresponding course of study in an Area Vocational-Technical Center.

HO_5 There is no correlation between the General Aptitude Test Battery's Occupational Aptitude Pattern 9th grade norms prediction of a student's vocational success in a specific occupation and the student's success determined by a grade of "C" or better in the corresponding course of study in an Area Vocational-Technical Center.

HO_6 There is no correlation between the General Aptitude Test Battery's Specific Occupations adult norms prediction of a student's vocational success in a specific occupation and the student's success determined by a grade of "C" or better in the corresponding course of study in an Area Vocational-Technical Center.

HO_7 There is no correlation between the General Aptitude Test Battery's Specific Occupations 10th grade norms prediction of a student's vocational success in a specific occupation and the student's success determined by a grade of "C" or better in the corresponding course of study in an Area Vocational-Technical Center.

HO_8 There is no correlation between the General Aptitude Test Battery's Specific Occupations 9th grade norms prediction of a student's vocational success in a specific occupation and the student's success determined by a grade of "C" or better in the corresponding course of study in an Area Vocational-Technical Center.

Summary of Findings

The null hypotheses, HO_1 and HO_2, for the total samples were rejected at the .01 level of significance. Therefore, these findings indicated that the observed association in the sample was not a result of chance but represented a genuine correlation between the GATB norms predictions and the grade results.

In the subsample of adult norms, the null hypotheses

HO_3 and HO_6, were rejected at the .01 level of significance. Therefore, these findings indicated that the observed association in the subsample was not a result of chance but represented a genuine correlation between the GATB adult norms predictions and the grade results.

For the subsample of 10th grade norms, the null hypotheses HO_4 and HO_7, were rejected at the .01 level of significance. Therefore, these findings indicated that the observed association in the subsample was not a result of chance but represented a genuine correlation between the GATB 10th grade norms predictions and the grade results.

The null hypotheses HO_5 and HO_8, for the 9th grade subsample were rejected at the .01 level of significance. Therefore, the findings indicated that the observed association in the subsample was not a result of chance but represented a genuine correlation between the GATB 9th grade norms predictions and grade results.

Of the 17 specific areas of study tested with the OAP norms, the null hypothesis HO_1 was rejected for the following 8 areas: Air Conditioning (.01 level), Auto Mechanics (.01 level), Business and Office Education (.02 level), Carpentry (.05 level), Electronics (.01 level), Small Engine Repair (.02 level), Unit Record (.01 level), and Vocational Electronics (.05 level). The rejection of the null hypothesis indicated that there was a real

correlation between the OAP norms predictions and the grade results in these 8 areas of study.

In the remaining 9 areas of study tested with the OAP norms, the obtained chi square failed to reach the required .05 level of significance and, therefore, the null hypothesis HO_1 was accepted. These findings indicated that there was no correlation between the OAP norms predictions and the grade results in the following areas of study: Aircraft Mechanics, Auto Body Repair, Computer Programming, Cosmetology, Diesel Mechanics, Food Service, Machine Shop, Offset Printing, and Welding.

The Specific Occupations norms were used in testing the null hypothesis in 20 specific areas of study. The null hypothesis HO_2, was rejected from the following 9 areas: Auto Body Repair (.05 level), Auto Mechanics (.01 level), Business and Office Education (.01 level), Carpentry (.05 level), Electronics (.01 level), Health Services (.05 level), Machine Shop (.01 level), Practical Nursing (.01 level), and Vocational Electronics (.02 level). Therefore, these findings indicated that the observed associations in the subsample were not a result of chance but represented a genuine correlation between the Specific Occupations norms predictions and the grade results.

The chi square for the remaining 11 specific areas of study evaluated with the Specific Occupations norms

failed to reach the required .05 level of significance and, therefore, the null hypothesis HO_2 was accepted. The null hypothesis HO_2 was accepted for the following areas of study: Aircraft Mechanics, Appliance Repair, Computer Programming, Cosmetology, Diesel Mechanics, Drafting, Farm Machinery Repair, Food Services, Sewing Services, Unit Record, and Welding. These findings indicated that there was no correlation between the Specific Occupations norms predictions and the grade results for this group of specific areas of study.

The 23 specific areas of study evaluated in this study produced 12 areas that had a genuine correlation between the GATB norms and grade results. Some variation in the norms success of prediction was evident. The Auto Body subsample indicated a significant correlation when the Specific Occupations norms were utilized but no correlation with the OAP norms. The Machine Shop subsample indicated a significant correlation when the Specific Occupations norms were utilized but no correlation with the OAP norms. The Unit Record subsample indicated a significant correlation when the OAP norms were utilized but no correlation with the Specific Occupations norms.

The percent of correct predictions by the GATB norms varied from 42 percent to 86 percent. The data revealed that a high rate of correct predictions did not necessarily produce a significant chi square. In the

subsample of Electronics and OAP norms, the chi square was significant at the .01 level and the correct predictions were only equal to 56 percent. The subsample of Cosmetology with OAP norms produced correct predictions of 86 percent but the chi square failed to reach the required .05 level of significance.

An examination of the tables revealed that some of the marginal totals were extremely unequal. In the Appliance Repair subsample, 8 of the 11 students were predicted successful and were successful in cell (a). The Cosmetology OAP subsample had a frequency of 69 students out of a total of 81 in the success-success cell (a). The Dental Office Assistant subsample resulted in 23 of the 27 students falling into the success-success cell (a). Diesel Mechanics subsample had 37 of its 47 students in the success-success cell (a). Sewing Services had 14 of the 18 students fall in cell (a). The Medical Office Assistant OAP subsample had 23 of the 30 students in cell (a). None of this group of subsamples produced significant correlations. However, the percent of correct predictions by the subsamples was extremely high.

In some of the specific areas of study a surprisingly small number of students were predicted to be successful according to the GATB norms. In Computer Programming, the OAP norms predicted that 17 of the 18 students would be failures. The Computer Programming Specific Occupations

norms predicted failure for 12 of the 18 students. The subsample of Drafting students predicted 82 failures and only 33 successful students. The Electronics OAP subsample predicted that 56 of the 76 students would be failures. In the Farm Machinery Repair subsample, the Specific Occupations norms predicted that 15 of the 19 students would fail. The Food Services OAP norms predicted failure for 37 of the 55 students in the subsample. However, in a majority of the subsamples, the number of students predicted to be successful was greater than the number of predicted failures.

The findings indicated that in a majority of the subsamples, a large percentage of the students who were predicted to be failures were actually successful according to the grade criteria. Cell (b) was consistently larger than the expected frequency.

The largest sample was the total sample with Specific Occupations norms. Analysis of Table 7 revealed that of 1,621 students evaluated, the norms predicted 942 would be successful and 679 would be failures. The grade results indicated 1,346 were successful and 275 were failures according to the grade criteria. These findings indicated that about 83 percent of the vocational-technical students in the seven Centers were receiving grades of "C" or better. Also, the findings indicated that the GATB predicted that about 59 percent of the students tested should be successful.

Conclusions

Based upon the findings of this study, the following conclusions were drawn:

1. The GATB OAP norms (adult, 10th grade and 9th grade) have validity for making predictions of achieving success in training for those students enrolling in the seven participating Oklahoma Area Vocational-Technical Centers.

2. The GATB Specific Occupations norms (adult, 10th grade, and 9th grade) have validity for making predictions of achieving success in training for those students enrolling in the seven participating Oklahoma Area Vocational-Technical Centers.

3. The GATB was not equally valid in predicting success in all the specific areas of study.

4. The Specific Occupations norms have validity for making predictions of achieving success in training for the following specific areas of study: Auto Body Repair, Automobile Mechanics, Business and Office Education, Carpentry, Electronics, Health Services, Machine Shop, Practical Nursing, and Vocational Electronics.

5. The OAP norms have validity for making predictions of achieving success in training for the following specific areas of study: Air Conditioning, Auto Mechanics, Business and Office Education, Carpentry, Electronics, Small Engine Repair, Unit Record, and Vocational Electronics.

6. The OAP norms and Specific Occupations norms were equally valid in predicting success in training.

7. Student placement was so expertly done in some specific areas of study that it was impossible to get a meaningful evaluation by the phi coefficient due to the unequal marginal tables.

8. The large percentage of students failing to qualify as a predicted success according to the GATB norms in Computer Programming, Drafting, Farm Machinery Repair, and Food Services indicated that the U. S. Department of Labor norms are not an appropriate standard for student admission, or that the Area Vocational-Technical Centers' basis for selection of students is not adequate.

9. The percent of students (83%) receiving grades indicative of success in relation to the GATB norms prediction of success (59%) indicated that the students were working beyond their ability when judged by the GATB or the grading system is inclined to be generous.

10. According to the GATB norms, a majority of the specific areas of study offered in the seven Oklahoma Area Vocational-Technical Centers require students with average or above average intelligence.

Recommendations

1. The study revealed that the GATB norms had validity for making predictions of training success. It is recommended that all students enrolling in the Oklahoma

Area Vocational-Technical schools be required to take the GATB and receive appropriate follow-up counseling as a prerequisite to enrollment.

2. The seven Area Vocational-Technical Centers in operation during the school year of 1968-69 were enrolling students from 116 feeder schools and some of these feeder schools are too small to have a counselor. It is highly recommended that the State Department of Vocational and Technical Education employ a trained counselor for each Area Vocational-Technical Center. A portion of the counselor's duties would entail administering the GATB to schools that do not have a counselor and to follow-up with appropriate counseling.

3. There was an extremely small number of predictions of success by the GATB norms in the following specific areas of study: Computer Programming, Drafting, Farm Machinery Repair, and Food Services. It is recommended that the administrators of the Area Vocational-Technical Centers examine their criteria for selection of students in these areas. If the administrators are satisfied with their selection procedure after a thorough study, it is recommended that the GATB norms are not appropriate and should not be used in these specific areas of study.

4. The study revealed that students are permitted to enroll in some Area Centers when they are 10th grade

students and the largest group enroll when they are 11th grade students. It is recommended that the GATB 9th grade norms be utilized to provide early vocational counseling in the junior high school.

5. GATB norms were not available for the following specific areas of study: Commercial Art, Horticulture, Photography, and Power Mechanics. It is recommended that the Guidance Division of the Oklahoma State Department of Education and the Oklahoma Employment Security Commission explore the possibility of cooperative research in Oklahoma to develop norms for one or more of these areas of study.

6. A number of factors such as: subsamples that were too small, an extremely high percentage of correct predictions but insignificant phi coefficients, and excessive inequalities in marginal totals, raise a question of doubt as to the results in some of the specific areas of study. It is recommended that further research be continued in the specific areas of study utilizing the 2 x 2 contingency table and the phi coefficient.

7. The study revealed that in the largest sample, Specific Occupation norms, 83 percent of the students received grades of "C" or better while the GATB norms predicted success for about 59 percent. Due to the present grading system, and assuming this practice will continue, it is recommended that a grade of "B" or better should be used as the cirteria for success in future research

utilizing the GATB norms and the phi coefficient.

8. Of the 26 specific areas of study evaluated by the GATB norms, the required G score (intelligence) was 90 or above in 19 of the areas of study on either the OAP or Specific Occupations norms. It is recommended that the Oklahoma Area Vocational-Technical Centers expand their curriculum to include areas of study that would meet the needs of the less academically minded students. This expansion might include such areas as Filling Station Attendant, Stock Clerk, Construction Equipment Operator, and Electronics Assembler.

9. The seven Area Vocational-Technical Centers enrolled students from 116 local feeder schools. Some of the feeder schools were small and benefit from the fact that participating schools are allowed to add the credits offered at the Area Vocational-Technical Center to their accreditation standards. In effect, this arrangement protects small schools that could not normally maintain the required minimum number of units for accreditation and encourages their operation. It is recommended that the Area Vocational-Technical Centers accept this as an additional reason for serving a broad educational purpose for the high school student.

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APPENDIX

OCCUPATIONAL APTITUDE PATTERNS AND SPECIFIC OCCUPATION NORMS FOR COURSES OFFERED IN OKLAHOMA'S AREA VOCATIONAL-TECHNICAL CENTERS

Air Conditioning and Refrigeration

(Refrigeration Mechanic - 637.281) OAP - 10

	Adult	Grade 10	Grade 9
G =	95	91	88
S =	95	94	91
M =	85	79	76

Aircraft Mechanics

(Aircraft and Engine Mechanic - 621.281) OAP - 24

	Adult	Grade 10	Grade 9
N =	85	80	79
S =	95	94	91
F =	80	75	72

Specific Occupation Norm (S-111)

	Adult	Grade 10	Grade 9
V =	85	83	80
N =	95	90	88
S =	100	99	96
F =	85	80	77

Appliance Repair

(Electrical-Appliance Serviceman = 827.281)

Specific Occupation Norm (S-181)

	Adult	Grade 10	Grade 9
G =	100	96	93
N =	85	80	79
S =	100	99	96

Automobile Body Repair

(Automobile-Body Repairman - 807.381) OAP - 10

	Adult	Grade 10	Grade 9
G =	95	91	88
S =	95	94	91
M =	85	79	76

Automobile-Body Repair (Cont'd)

Specific Occupation Norm (S-313)

	Adult	Grade 10	Grade 9
S =	85	84	82
P =	90	86	82
M =	90	84	81

Automobile Mechanics

(Automobile Mechanic = 620.281) OAP - 11

	Adult	Grade 10	Grade 9
G =	95	91	88
S =	85	84	82
F =	75	70	67

Specific Occupation Norm (S-43)

	Adult	Grade 10	Grade 9
G =	85	81	79
S =	85	84	82
F =	85	80	77

Business and Office Education

(Stenographer - 202.388) OAP - 36

	Adult	Grade 10	Grade 9
G =	105	101	98
Q =	100	96	92
K =	90	84	78

Specific Occupation Norm (S-10)

	Adult	Grade 10	Grade 9
G =	95	91	88
P =	100	97	92
Q =	100	96	92
K =	100	94	88

Carpentry

(Carpenter - 860.381) OAP - 25

	Adult	Grade 10	Grade 9
N =	80	75	74
S =	90	89	87
M =	80	74	71

Specific Occupation Norm (S-11)

	Adult	Grade 10	Grade 9
G =	85	81	79
N =	80	75	74
S =	90	89	87
M =	80	74	71

Computer Programming

(Programmer, Business - 020.188) OAP - 1

	Adult	Grade 10	Grade 9
G =	125	120	117
N =	115	109	107
S =	115	113	110

Specific Occupation Norm (S-314)

	Adult	Grade 10	Grade 9
G =	115	111	107
V =	105	101	97
N =	110	104	103
S =	105	104	101

Cosmetology

(Cosmetologist - 332.271) OAP - 21

	Adult	Grade 10	Grade 9
G =	80	76	74
P =	90	86	82
K =	80	74	68

Cosmetology (Cont'd)

Specific Occupation Norm (S-71)

	Adult	Grade 10	Grade 9
G =	80	76	74
V =	85	83	80
P =	90	86	82
K =	75	69	64

Dental Assistant

(Dental Assistant - 079.378) OAP - 25

	Adult	Grade 10	Grade 9
N =	80	75	74
S =	90	89	87
M =	80	74	7

Specific Occupation Norm (S-202)

	Adult	Grade 10	Grade 9
G =	90	86	83
S =	90	89	87
Q =	95	91	87
F =	90	85	82

Diesel-Engine Mechanics

(Diesel-Engine Mechanic, Automobile - 625.281) OAP - 11

	Adult	Grade 10	Grade 9
G =	95	91	88
S =	85	84	82
F =	75	70	67

Specific Occupation Norm (S-387)

	Adult	Grade 10	Grade 9
G =	90	86	83
S =	90	89	87
Q =	90	86	83

Drafting

(Draftsman, Structural - 005.281)

Specific Occupation Norm (S-266)

	Adult	Grade 10	Grade 9
G =	115	111	107
N =	105	100	98
S =	115	113	110

Electronics

(Electronic Technician - 003.181) OAP - 3

	Adult	Grade 10	Grade 9
G =	110	106	102
V =	105	101	97
N =	105	100	98

Specific Occupation Norm (S-293)

	Adult	Grade 10	Grade 9
G =	115	111	107
V =	95	92	89
N =	100	94	93
S =	100	99	96

Farm Machinery Repair

(Farm Equipment Mechanic I - 624.281)

Specific Occupation Norm (S-331)

	Adult	Grade 10	Grade 9
G =	95	91	88
S =	90	89	87
F =	90	85	82

Food Service

(Cook - 313.381) OAP - 10

	Adult	Grade 10	Grade 9
G =	95	91	88
S =	95	94	91
M =	85	79	76

Specific Occupation Norm (S-238)

	Adult	Grade 10	Grade 9
G =	90	86	83
S =	95	94	91
M =	85	79	76

Health Service

(Nurse's Aid - 355.878)

Specific Occupation Norm (S-282)

	Adult	Grade 10	Grade 9
G =	80	76	74
V =	80	78	76
K =	85	79	73

Machine Shop

(Machinist I - 600.280) OAP - 25

	Adult	Grade 10	Grade 9
N =	80	75	74
S =	90	89	87
M =	80	74	71

Specific Occupation Norm (S-12)

	Adult	Grade 10	Grade 9
G =	90	86	83
N =	85	80	79
S =	90	89	87
M =	80	74	71

Medical Office Assistant

(Medical Assistant - 079.368) OAP - 9

	Adult	Grade 10	Grade 9
G =	95	91	88
N =	90	85	83
Q =	95	91	87

Specific Occupation Norm (S-237)

	Adult	Grade 10	Grade 9
G =	85	81	79
V =	105	101	97
N =	80	75	74
Q =	95	91	87

Offset Printing

(Offset-Press Man - 651.782) OAP - 10

	Adult	Grade 10	Grade 9
G =	95	91	88
S =	95	94	91
M =	85	79	76

Specific Occupation Norm (S-240)

	Adult	Grade 10	Grade 9
G =	90	86	83
S =	90	89	87
P =	90	86	82
M =	80	74	71

Practical Nursing

(Nurse, Licensed Practical - 079.378)

Specific Occupation Norm (S-270)

	Adult	Grade 10	Grade 9
G =	90	86	83
V =	90	88	84
Q =	90	86	83
K =	90	84	78

Sewing Service

(Sewing Services - 785.381) OAP - 26

	Adult	Grade 10	Grade 9
S =	85	84	82
P =	90	86	82
F =	85	80	77

Specific Occupation Norm (S-59)

	Adult	Grade 10	Grade 9
S =	85	84	82
P =	90	86	82
F =	85	80	77

Sheet Metal

(Sheet Metal Worker - 804.281) OAP - 16

	Adult	Grade 10	Grade 9
G =	90	86	83
S =	85	84	82
P =	85	81	76

Specific Occupation Norm (S-82)

	Adult	Grade 10	Grade 9
G =	80	76	74
S =	90	89	87
P =	85	81	76
M =	95	89	86

Unit Record

(Key-Punch Operator - 213.582) OAP - 9

	Adult	Grade 10	Grade 9
G =	95	91	88
N =	90	85	83
Q =	95	91	87

Unit Record (Cont'd)

Specific Occupation Norm (S-180)

	Adult	Grade 10	Grade 9
G =	85	81	79
N =	85	80	78
Q =	90	86	83
F =	95	90	87

Vocational Electronics

(Radio-Television Service & Repairman - 720.281) OAP - 24

	Adult	Grade 10	Grade 9
N =	85	80	79
S =	95	94	91
F =	80	75	72

Specific Occupation Norm (S-113)

	Adult	Grade 10	Grade 9
N =	95	90	88
S =	105	104	101
F =	80	75	72

Welding

(Welder, Combination - 812.884) OAP - 27

	Adult	Grade 10	Grade 9
S =	80	80	77
F =	90	85	82
M =	85	79	76

Specific Occupation Norm (S-126)

	Adult	Grade 10	Grade 9
S =	85	84	82
F =	85	80	77
M =	80	74	71