SELECTION AND ADMITTANCE OF ELECTRONICS STUDENTS TO THE HONOLULU TECHNICAL SCHOOL

By

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TECHNICAL SCHOOL

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CHAPTER I

INTRODUCTION TO THE PROBLEM

For many years scholastic aptitude testing has been used to predict how well the student will succeed in school. The scholastic aptitude test attempts to measure the student's capacity for success in school both in subject matter and in adaptation. Capacity cannot be measured directly, therefore this so-called intelligence testing is based upon inference and assumptions. The assumption is that if opportunities for development and motivation have been equal, mental ability --- what the individual knows and can do on intellectual tasks --- will vary with capacity. Since ability can not be measured directly, what is actually measured is performance. In effect then, by measuring performance, ability is inferred, from which capacity is inferred.[1]

In the past two decades, a great deal of energy has been expended in an effort to provide means of predicting academic success at the college level. It is evident that the results of these efforts have assisted the counselors and schools. However, the problem of predicting success of technical and vocational school students has received relatively little attention. Also, predictive studies concerning certain groups of students are few in number. Perhaps the reasons that contribute to this condition are: (1) Apparently few technical and

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[1]Alfred Schwartz and Stuart C. Tiedeman, Evaluating Student Progress In the Secondary School (New York, 1957), p. 279.

vocational schools utilize any selection procedure in selecting and admitting applicants. (2) Technical schools, unlike colleges, have few staff members who are capable of doing the necessary research or who are interested in doing it. Those of the staff who are capable and interested are usually overburdened with other duties. (3) The majority of the private technical schools are not concerned with selection and admission procedures. Instead, they are more concerned with increasing the enrollment. (4) The majority of the students who file applications with the technical schools are unable to master academic subjects, and therefore those schools are not able to make any positive selection.[2]

At the present time there are no standards or criteria commonly used by the various technical schools operating under the Department of Education in Hawaii. The Honolulu Technical School requires a year of high school algebra, and employs the Differential Aptitude Test Battery (D.A.T.B.) scores as the criterion for selecting and admitting students to the electronic program. Because of improper selection practices, from 35 to 55 per cent of those who enter the course fail to qualify for entrance into the advanced electronics courses. Much more accurate and reliable criteria, therefore, must be developed in order to conduct a more efficient program and insure success for most of the students entering the electronic program.

It is inexcusably wasteful, psychologically and economically, to permit students who are not qualified or sufficiently endowed with the proper aptitudes to enroll in the technical school knowing that they

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[2] C. H. Patterson, "Predicting Success In Trade and Vocational School Courses," Educational Psychological Measurement, Vol. 16, No. 3, p. 353.

must later be dropped. The incompetents in the beginning class slow down the pace of instruction and progress of the entire group. Needless to say, the instructor must devote additional time and effort to the unqualified, to the neglect of the better students. In the meantime, the needs of the qualified students are not being adequately met, and their potentials go unchallenged. From an economic view point, the community will suffer a loss of a productive year of employment.

Thus, a more efficient selection practice is of an immediate concern. The unqualified student is admitted full of hope and surely at some sacrifice in money or earning power, and then later he is given the notice of academic deficiency. This is not in the best interest of the student and detrimental to the educational system. Such waste should not be tolerated and it is doubtful if the educational community will permit this situation to continue indefinitely. While a few may be stimulated to further effort, many students will suffer from the stamp of failure. All of this disappointment and anguish could have been avoided if the unqualified students had not been subjected to this experience in the beginning. Generally, it is not merely the individual who suffers; most of their families are also disappointed. Some failing students may develop inferiority complexes. It should be possible to find out less painfully whether one is qualified to enroll in an electronics class in the technical school. At the same time, an improved selection process should make it possible to obtain a greater number of successful students with the same number of applicants.

Review of Related Literature

A review of related literature is necessary before the problem can be crystalized, because it provides the investigator with background material to establish the need for a particular kind of research. The present review is limited primarily to studies concerning electronics and electricity at the Trade and Industrial and Technical Institute level.

With the coming of World War II, the military services as well as industries needed skilled tradesmen and technicians. With the help of psychologists, both the Army and Navy developed selection programs for their training courses. With the Army General Classification Test score as the basis of selection, the Army reported .24 to .69 correlations in various trade and technical courses. The range of the sample varied from 99 to 3081.

> Stuitt[3] reports correlations between six tests of the Navy Basic Test Battery and final grades in various Naval Training Schools. The tests were: General Classification Test, Reading Test, Arithmetical Reasoning Test, Mechanical Aptitude Test, Mechanical Knowledge Test-Mechanical Score, and Mechanical Knowledge Test-Electrical Score. Unlike the Army G.C.T. the Navy G.C.T. did not include arithmetical and block counting items but verbal items only. Validities ranged from .22 to .50 against grades in Basic Engineering, Electrical, and Aviation Mechanical Courses.[4]

Lawshe and Thornton[5] studied the problem of identifying the potentially successful individuals from a group of trainees enrolled in a 15 week electricity course at the Purdue Naval Training School. The

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[3]D. B. Stuitt (Ed.) Personnel Research and Test Development in the Bureau of Naval Personnel. Princeton: Princeton University Press, 1947.

[4]C. H. Patterson, "Predicting Success in Trade and Vocational School Courses: Review of the Literature," Educational and Psychological Measurement, XVI (1956), p. 367.

[5]C. H. Lawshe and G. R. Thornton, "A Test Battery for Identifying Potentially Successful Naval Electrical Trainees," Journal of Applied Psychology, XXVII (1943), pp. 399-406.

criterion was the grade point average earned during the training period. The tests used were:[6] Mechanical Aptitude Test (Test A), General Classification Test (Test B), English Test (Test C), Arithmetic Test (Test D), Spelling Test (Test E), 15 minute Mental Alertness Test (Test F), Reading Simple Measurements and Solving Simple Arithmetic Test (Test G), Practical Electrical Information Test (Test H).

With the exception of Test F all the tests were administered to the 587 trainees. Only 197 of the total number were administered the F test. The correlations for the tests in the order given above were .441, .401, .353, .356, .208, .662, and .660. The battery was cross validated for a new group of 200 trainees and the correlation between the predicted grades and actual grade point average was .82.

Frandsen and Hadley[7] report on predicting achievement in a radio training school operated by Utah State Agricultural College for the Navy and Marine Crops. The Mental Ability Test, U.S.A.C. Mathematic Ability Test, a Junior High School Electricity Information Test, Information in Industrial Mathematics Test, and Information in Electricity Test were given to the six classes ranging from 95 to 116 men. Achievement for the various courses were measured by weekly tests. Correlations between the test scores and achievement in the mathematics, electricity, radio laboratory, and average achievement were .73, .65, .54, and .68 respectively. The correlations indicated practically no relationship between the

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[6]The names of the tests were withheld in the Lawshe and Thornton report in compliance with the request of the U.S. Navy.

[7]A. N. Frandsen and J. M. Hadley, "The Prediction of Achievement In a Radio Training School," Journal of Applied Psychology, XXVII (1943), pp. 303-310.

interest questionaire and achievement.

Levine[8] distinguishes the differences between aptitude test and achievement test and elaborates on how one major type of achievement test may supplement conventional aptitude tests in practical problems.

> The distinction between the aptitude tests and achievement tests tend to break down conceptually to differences in degree or relative emphasis. The motivated learning measured by achievement tests is generally more restricted in scope but more sharply aligned with the criterion to be predicted in a practical situation. Aptitude tests, on the other hand, predict to wider range of criteria. In a practical prediction problem, aptitude tests may be compared to the course adjustment on a microscope and achievement tests to the fine adjustment.[9]

The author illustrates this by going through an example problem of selecting electronics personnel for the U.S. Navy. He also states that:

> In general the higher the validity or predictive efficiency of the tests, the lower the cutting score that can be set without any reduction in qualitative input into the school. Therefore an increase in the predictive efficiency of the selection tests has the effect of increasing the number of men who become available for the electronics schools without any corresponding increase in the attrition rate which should otherwise result from lowering the selection standards.[10]

The sub-scores in the General Classification Test (verbal reasoning and arithmetic test) yields a coefficient of approximately .60 with final grades in the U.S. Navy's Electronics Technician School. However, with the development of the Electronics Technician Selection Tests, the gain in validity increased to .75. Levine estimated that the new selection standards increased the number of men available for electronics technician training by about 20 per cent without lowering the average quality

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[8]Abraham S. Levine, "Aptitude Versus Achievement Tests as Predictors of Achievement," Educational and Psychological Measurement, Autumn, 1958, pp. 517-525.

[9]Ibid., p. 518.

[10]Ibid., p. 522.

of input or the percentage of men dropped from the school.

The results of the studies surveyed varied somewhat, but in general the studies reported positive results for most tests used. Some of the factors that contributed to the fluctuations were: (1) Inadequate sample size, (2) Inadequate criteria, (3) Sample biased in one respect or another, and (4) The range in talent in the sample varied.

Despite the limitations listed above, the results were surprisingly encouraging both in their consistency and in the magnitude of the relationships found. As a result, the studies indicate that it should be possible to select a battery of tests which would combine to yield a mean of predicting success in technical and vocational programs. Since the exact nature of such a battery will vary depending upon the level of training and possibly upon the nature of the course, the tests results and tests used are not directly applicable to this study.

Statement of the Problem

The problem in this study is to determine the validity of the D.A.T.B. scores and high school algebra grades against a criterion of first year grade point average (G.P.A.) at the Honolulu Technical School. Another major interest of this study is to determine the extent to which D.A.T.B. scores and high school algebra grades can be used to predict the student's probable scholastic achievement.

Statement of Hypotheses

To determine the validity of the D.A.T.B. scores and high school algebra grades against the first year grade point average the following hypotheses might be stated:

1. There is no significant relationship between the D.A.T.B. scores and the first year grade point averages earned at the Honolulu Technical School.

2. There is no significant relationship between the high school algebra grades and the first year grade point averages earned at the Honolulu Technical School.

CHAPTER II

THE TECHNICAL INSTITUTE

This chapter includes a brief discussion on the history, objectives, and philosophy of technical institute education. This discussion is to provide the reader a better understanding and appreciation to the problem undertaken by this study.

History of the Technical Institute

Although the idea of the technical institute as it is known today had its beginning in 1895, it was not until 1931 when the Wickenden-Spahr report[1] was published that much attention was given in higher education circles to the technical institute. This definitive study described the technical institute in the United States as follows:[2]

1. It is a post high school, but distinct in character from a college or university.
2. Its purpose is to train men and women for callings and functions which occupy an area between the skilled crafts and the highly scientific professions. A fair proportion of those trained advance in time to professional status.
3. It caters principally to persons who through either previous or collateral experience in industry have found their bearings and

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[1]William E. Wickenden and Robert H. Spahr, A Study of Technical Institutes, Society for the Promotion of Engineering Education, (Lancaster, Pa., 1931), pp. 17-18.

[2]Leo F. Smith and Laurence Lipsett, The Technical Institute, (New York, 1956), pp. 4-5.

desire intensive preparation for chosen lines of progress.

4. It offers training both for technical pursuits, concerned with planning control, and for supervisory pursuits, concerned with operation and maintenance. The engineering college more largely emphasizes the former group, the technical institute on the other hand, emphasizes the latter.

5. Being intensive in purpose, its courses are shorter in duration than those of the professional colleges. They are essentially terminal rather than preparatory courses.

6. Being a school without academic standardization, its admission and graduation requirements are less formal than those of the colleges and stress capacity and experience more than credit units.

7. Its methods of teaching are relatively direct, with a strong emphasis on doing as distinct from book study.

8. Its teachers, while possessing adequate scholarly preparation, are chosen primarily on the basis of practical experience, personal sagacity, and ability to teach through programs of orderly experience.

9. Its entire scheme of instruction follows much more closely the actual usage of industry than that of professional engineering schools.

Some of the characteristics listed above are still applicable today, but there has been some shift in emphasis and an increase in admission and graduation requirements. The rapid changes in technological, economic, and social significance at the beginning of World War II provided a direct impetus toward technical institute type of education. Some of the developments in what has been called the coming of age of the technical institute in chronological order are:

1. In 1941, the establishment of the Technical Institute Division of the American Society for Engineering Education.

2. In 1944, the Engineer's Council for Professional Development (E.C.P.D.) accepted the responsibility for inspecting and evaluating technical institute programs. In 1945, its first year of activity, the E.C.P.D. accredited curriculums in seven institutions. In the meantime, the National Council of Technical Schools, comprised

mainly of proprietary institution also established its own accrediting procedures.

3. By 1953 the growth of a body of literature on the technical institute movement increased tremendously.
4. In 1956, the granting of the Associate in Engineering degree for the completion of accredited two year curriculum in engineering technologies by the American Society for Engineering Education.
5. In April, 1956, the establishment of the Presidents Committee on Scientists and Engineers, which included a member specifically assigned to study technical institute education.
6. In 1956-1957, the State Highway Departments of California and Illinois established a system whereby it gave full recognition, status, and potential to the engineering technician in the engineering personnel organization.
7. In 1957, the establishment of a Committee on Engineering Technicians and Technical Institute Education by the National Society of Professional Engineers.
8. In the following years, the U.S. Civil Service Commission began listing technical institute graduation as part of the requirements for many positions. The inclusion of several hundred technician jobs in the revision of the Dictionary of Occupational Titles were being prepared during this period by the United States Employment Service and the Department of Labor.
9. In 1958, the National Defense Education Act was passed, in large part as a result of pressures and hysteria following Sputnik I. The purpose of the bill was "To strengthen the national defense and to encourage and assist in the expansion and improvement of

educational programs to meet critical national needs, and for other purposes." The Congress of the United States recognized the need for technician by including in the National Defense Act the provision of Title VIII directed exclusively toward the improvement of technical education.

The challenge of Sputnik has aroused the American people from their educational lethargy; yet, it failed to cause higher education to recognize technical institute education as an integral part of the expanding needs for engineering education.

> Another opposition which continues to arise and plague the progressive outlook today is personal or social status. The status question is inherent in the prevailing American habit of regarding a four year baccalaureate degree more as a mark of social distinction than as a measure of the fitness and effectiveness of the educational program for the individual receiving it. This traditional over-emphasis on the collegiate baccalaureate program has by direct inference and popular understanding placed the brand of second class status on the technical institute program.[3]

Trends indicate that engineering education is placing greater emphasis on engineering science rather than engineering practices. Hence, greater emphasis is placed on research and basic design rather than practical application of scientific principles. It therefore becomes obvious that there will be a large gap between the engineering scientist and that of the craftsman. The technician bridges the gap between the engineer scientist and the craftsman by combining the "know why" of the former and the "know how" of the latter. The courses offered on the technical institute level are equal or superior to courses offered some twenty years ago in engineering colleges.

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[3]G. Ross Henninger, "The Technical Institute In America," Journal of Engineering Education, Vol. 51, No. 1 p. 33.

Objectives of the Technical Institute

The major objective of the technical institute is the preparation of students for effective and satisfying participation in a democratic and technological society.[4] In addition to the broad objectives, some of the more important specific objectives are:[5]

1. To prepare graduates for occupational competence in a clearly identified technological occupation or cluster of jobs.
2. To serve the needs of industry for technical personnel.
3. To provide instruction in the technology of specific industries.
4. To serve technical education needs of employed adults.

In some areas of the United States, the traditional technical institute function is currently being performed by junior colleges. It must be emphasized therefore, that the technical institute program is not intended as a feeder channel to the University, nor is it the "dumping ground" for those who failed to make the grade in engineering. Frequently, technical institute education is referred to as a "terminal" program.

> The technical institute is no more "terminal" than any other collegiate degree program. It is "terminal" only in that it is not specifically designed to meet the limiting requirements characteristic of most college and university catalogs for "transfer credits" from preparatory schools. The bonafide technical institute is designed instead to give the student a high degree of proficiency in his selected field of technology, solidly supported by a sound working knowledge of the mathematics, basic science, communicative skills, and technological principles involved in that field. The emphasis is upon the understanding and application of

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[4] Leo F. Smith and Laurence Lipsett, The Technical Institute (New York, 1956), p. 105.

[5] Ibid., p. 106.

> fundamental principles rather than upon their theoretical development.[6]

It is also interesting to note the difference between the technical institute program and the vocational program. Henninger states that:

> One clear difference between the technical institute program and the vocational-technical program long recognized in both federal and state legislation which has primary relationship toward the area of the secondary school, lies in the contrast in basic orientation of the two programs: (1) The basic objective of the technical institute program is to turn out competent engineering technicians capable of productive service and growth in and with the selected field of engineering technology. This presupposes rigorous screening and selection of entering students to assure appropriateness of aptitude and interest. (2) The basic objective of the vocational-technical program is to accept students as they come along, and to help them make the best use of their talents as whatever level these happen to materialize. Both of these programs are important contributions to society and to their respective participants, but they are distinctly different in philosophy and neither can take the place of the other.[7]

Another goal of the technical institute is that of providing the leadership necessary to meet the challenge of helping the underdeveloped countries develop their educational systems and to aid them in their transistion to an industrialized development.

> In most U.S. engineering colleges the foreign student takes the same program as the American student, with most of these programs now being strongly oriented toward basic science, with heavy emphasis on physics, computers, electronic automation and like, and minimum emphasis on the practical questions of how to get the job done. Too frequently the engineering student from the underdeveloped country becomes so familiar with and dependent on these sophisticated instruments and approaches that he is completely frustrated when he returns to his homeland and finds them unavailable or unacceptable in meeting the more prosaic problems of building dams and sewers, water works, and power stations.[8]

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[6]G. Ross Henninger, "The Technical Institute In America," Journal of Engineering Education, Vol. 51, No. 1, p. 35.

[7]Ibid., p. 36.

[8]A. C. Ingersol, "Engineering and Technological Training for Underdeveloped Nations," Journal of Engineering Education, Vol. 51, No. 10, p. 795.

Obviously, there is a great waste of effort and energy in the present exchange program for it does not educate the international engineering student for his real needs. Being in their first stage of progress, what the underdeveloped nations need are taught in the technical institutes. Here it becomes possible for the international student to learn the practical things he needs to know to accomplish his immediate problems.

Philosophy of the Technical Institute

> The philosophy of the technical institute idea is that for every person who has the capacity, incentive, and resources to pursue formal technological education to a bachelor's degree, there are many who have the right capacity, interest, and aptitude to develop productive and rewarding careers in the expanding realm of applied science and the technologies which neither requires nor justify four or more years of collegiate study.[9]

To achieve its true stature, the technical institute must prove to the society in which it functions that it does have a high level program, and its product is of vital importance to our industry. One of the foremost obligations of the technical institute is to maintain excellence in instruction, and this cannot be done unless admission is limited to students capable of this level and type of education.

The extent to which the technical institute admission practice is selective rests upon the interpretation of equal opportunity. People are differently endowed, and due to their differences it is not an infringement of equal opportunity when limits are set as to who may be admitted to the technical institute. Everyone has an equal

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[9]G. Ross Henninger, The Technical Institute in America, (New York, 1959), pp. 17-18.

opportunity to qualify, but they must prove their ability.

The admission practice of the technical institute should be related to the caliber of education expected, and to the States's total plan for higher education. The admission standards used should be related to success in the school program as well as success on the job.

In the selective admission techniques, no single test or criterion is used alone because there are many characteristics that cannot be measured by tests alone. High school records and the pre-admission interview should be included in making the judgment. A periodic re-evaluation is necessary to provide for the correction of errors and improvement in the selective admission techniques.

CHAPTER III

METHODS AND RESULTS OF INVESTIGATION

In this chapter, the writer reveals the methodology used in investigating the problem of this study. The selection of the sample, the procedure followed, and the treatment and analysis of the data are also discussed.

Population

The admission data to be considered was gathered from the group of students who entered Honolulu Technical School in September of 1960, 1961, and 1962. Approximately 120 students were enrolled during this period. Of this total number, more than thirty per cent were excluded from the samples. In practically all of these cases, the criterion or grade point average for the first year was missing because those students withdrew from school. Students who entered before 1960 were not included in this population because data were missing for one or more of the variables.

Data

In a previous study it was found that students earning a passing grade (2.0 or better) at the end of the first year generally do equally as well or better in the second year. Thus, the grade point average for the first year is selected as the criterion of success for this study.

Letter grades earned by students are converted to a numerical scale ranging from 0 for F to 4.0 for A. Grade point averages are computed by multiplying the numerical grade by the number of credit hours and taking the mean of the sum of these products.

The predictor variables employed in this experiment are the D.A.T.B. scores and the high school algebra grades. The five examinations that make up the Differential Aptitude Test Battery are: Spatial Relations, Abstract Reasoning, Mechanical Reasoning, Numerical Ability, and Verbal Reasoning. By a comparison of these test scores against the first year grade point average, the testing of the first hypothesis can be accomplished.

The testing of the second hypothesis will utilize the high school algebra grades as the predictor variable. This second predictor variable is expressed on a four point scale where A equals 4, B equals 3, etc.

Procedure

The determination of the validity of the D.A.T.B. scores and high school algebra grades against a criterion of first year grade point average is a problem in statistical inference or the testing of hypotheses. There are several methods of approach to this problem. They are the Pearson product moment coefficient of correlation, the Spearman rank-difference coefficient of correlation, and the Biserial coefficient of correlation. These measures of correlation may be thought of essentially as the ratio which expresses the extent to which changes in one variable are accompanied by or are dependent upon changes in a second variable.

For this study, the Pearson product moment coefficient of correlation, designated r, is the measure which will be used to yield information regarding the relationship of the criterion and the predictor variables. Although both the Pearson product moment coefficient of correlation and the Spearman rank-difference coefficient of correlation yield similar values, the former is preferred since it considers the raw data which the latter disregards except as they affect the ranks in the distribution. As to Biserial r, according to Guilford[1], one should always favor the Pearson r whenever there is a real choice especially in this case where N is small. The standard error for a Biserial r is also considerably larger than of a Pearson r derived from the same sample. In addition to telling the degree of relationship, the Pearson r, in conjunction with the two means and standard deviations, permit the writing of a linear equation for predicting probable grade point averages from the predictor variables.

To test the hypothesis regarding the relationship between D.A.T.B. scores and G.P.A. the statistical hypothesis known as the null hypothesis will be employed. This hypothesis which states that there is a null amount of correlation will be rejected when the observed data reaches some prescribed level of significance but will not be rejected otherwise.

The t-ratio test of r will be used to test the null hypothesis. The t-ratio designated t, is defined as the ratio of the obtained r to the standard error of r. There is no rule or formula in determining how large a correlation or how large a t is required in order to reject

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[1]J. P. Guilford, Fundamental Statistics In Psychology and Education, (New York, 1950), p. 327.

the null hypothesis. There is the balancing of risks; that of failing to reject the null hypothesis too often may mean that we are apt to overlook real differences while rejecting it may lead to the acceptance of a chance difference as real. The procedure to be used in this study is to reject the null hypothesis when t is as large as 2.648 (1% level) or larger, not reject it when t is 1.65 (5% level), and reserving judgment when it is between the two values of t. This in effect, introduces a region of indecision, and the decision to reject or not reject the null hypothesis is postponed until more data are collected or the experiment is repeated.

The first task is that of constructing a scatter diagram or correlation diagram. The steps in constructing the scatter diagram and in computing r may be outlined as follows:

Step 1

Group the Verbal Reasoning scores into class intervals and enter them on the Y axis. Then group the grade point averages into class intervals and enter them on the X axis. See Table I.

Step 2

Place one tally mark for each pair of scores in the appropriate cell of the table. After each of the scores have been plotted, place an Arabic numeral in each cell to denote the number of tallies the cell contains.

Step 3

Add the frequencies in each row and enter the results in the column marked fy. Next add the frequencies in each column and enter the results in the row marked fx. The sums of row fx and column fy should both equal to N, in this case 72.

TABLE I

CORRELATION TABLE FOR VERBAL REASONING SCORES AND GRADE POINT AVERAGE

X: Grade Point Average

Y: Verbal Reasoning

	.8	1.1	1.4	1.7	2.0	2.3	2.6	2.9	3.2	3.5	3.8	fy	y'	fy'	fy'2	x'y'
41-43							1			1		2	6	12	72	30
38-40									1		1	2	5	10	50	40
35-37												0	4	0	0	0
32-34				1				2	1			4	3	12	36	15
29-31					2	2						4	2	8	16	- 4
26-28				2	1	2	3	1		1		10	1	10	10	4
23-25	1		2			5	4		1	1		14	0	0	0	0
20-21		1	2	5	7	4	1	1				21	-1	-21	21	24
17-19	1		2		1		2			1		7	-2	-14	28	12
14-16		1		1	2	2						6	-3	-18	54	24
11-13								1				1	-4	- 4	16	- 8
8-10		1										1	-5	- 5	25	20
fx	2	3	6	9	13	15	11	5	3	4	1	72		-10	328	157
x'	- 5	- 4	- 3	- 2	- 1	0	1	2	3	4	5					
fx'	-10	-12	-18	-18	-13	0	11	10	9	16	5	-20				
fx'2	50	48	54	36	13	0	11	20	27	64	25	348				
x' y'	10	36	18	6	10	0	4	4	24	20	25	157				

Step 4

Assume an arbitrary origin near the center of the distribution for each variable and record the deviation values x' and y' in their respective row and column.

Step 5

Multiply the values for fy and y' in the same rows and enter the products in the fy' column. Next multiply the values for fx and x' in the same column and enter the product in the fx' row. (All calculations in step 5 should be with due regard to sign.)

Step 6

Multiply the values for y' and fy' in the same rows and enter the products in the fy'^2 column. Likewise, multiply the values for x' and fx' in the same columns and enter the products in the fx'^2 row.

Step 7

Total the fy' and fy'^2 column to obtain $\Sigma fy'$ and $\Sigma fy'^2$. Also, total the fx' and fx'^2 rows to obtain $\Sigma fx'$ and $\Sigma fx'^2$.

Step 8

Multiply each tally by both its corresponding x' and y' values and enter the product in the $x'y'$ column. Total the $x'y'$ column to obtain $\Sigma x'y'$.

Step 9

Calculate the corrections and standard deviations for both X and Y from the formulas given below.

$$C'_x = \frac{\Sigma fx'}{N} = \frac{-20}{72} = -.278$$

$$C'_y = \frac{\Sigma fy'}{N} = \frac{-10}{72} = -.139$$

$$\sigma_x = \sqrt{\frac{\Sigma fx'^2}{N} - (C'x^2)} = \sqrt{\frac{348}{72} - .0773} = 2.18$$

$$\sigma_y = \sqrt{\frac{\Sigma fy'^2}{N} - (C'y^2)} = \sqrt{\frac{328}{72} - .019} = 2.13$$

Step 10

Substitute the values for $\Sigma x'y'$, N, c'_x, c'_y, σ_x, and σ_y in the equation below and solve for r.

$$r = \frac{\frac{\Sigma x'y'}{N} - (C'xC'y)}{\sigma_x \sigma_y} = \frac{2.142}{4.64} = .462$$

The same procedure will be followed in computing the coefficient of correlation between each test score and the grade point average and between the high school algebra grade and the criterion. Tables II, III, IV, V, and VI are the results of these calculations. Upon the completion of this procedure the results may then be analyzed and the hypotheses rejected or not rejected.

Data Analysis

It is interesting to note that there is a minus .097 correlation between the Abstract Reasoning test and the G.P.A. Since the working hypothesis states that there is a null amount of correlation, it becomes necessary to test the obtained coefficients of correlation to see if the relationships are real or merely chance relationships. The test of significance is initiated by employing Fisher's t formula.

TABLE II

CORRELATION TABLE FOR NUMERICAL ABILITY SCORES AND GRADE POINT AVERAGE

X: Grade Point Average

Y: Numerical Ability

	.8	1.1	1.4	1.7	2.0	2.3	2.6	2.9	3.2	3.5	3.8	fy	y'	fy'	fy'2	x'y'
38-40				1		1	1					3	4	12	48	- 4
35-37			1	2	1	1	2	2	1	1	1	12	3	36	108	30
32-34			1	2	4	2	4	3	2	3		21	2	42	84	34
29-31		1	1	2	2	3	1					10	1	10	10	-12
26-28		2			3	3	1					9	0	0	0	0
23-25	1		1		2	2	2					8	-1	- 8	8	8
20-22	1		1	2		2						6	-2	-12	24	24
17-19					1	1						2	-3	- 6	18	3
14-16			1									1	-4	- 4	16	12
fx	2	3	6	9	13	15	11	5	3	4	1	72		70	316	95
x'	- 5	- 4	- 3	- 2	- 1	0	1	2	3	4	5					
fx'	-10	-12	-18	-18	-13	0	11	10	9	16	5	-20				
fx'2	50	48	54	36	13	0	11	20	18	64	25	348				
x'y'	15	- 4	3	-24	- 8	0	17	24	21	36	15	95				

$c'_x = -.278$

$c'_y = .972$

$\sigma_x = 2.18$

$\sigma_y = 1.86$

$r = .393$

TABLE III

CORRELATION TABLE FOR MECHANICAL REASONING SCORES AND GRADE POINT AVERAGE

X: Grade Point Average

Y: Mechanical Reasoning

	.8	1.1	1.4	1.7	2.0	2.3	2.6	2.9	3.2	3.5	3.0	fy	y'	fy'	fy'2	x'y'
61-65				1		1	2					4	5	20	100	0
56-60			1	1	1	3	1				1	8	4	32	128	0
51-55					4	1	3			2		10	3	30	90	21
46-50		2	1		4	6	1	1				15	2	30	60	-24
41-45			2	1	2	3	1	2	3			14	1	14	14	4
36-40	1	1	1			1	1	1		1		7	0	0	0	0
31-35				4	1			1		1		7	-1	- 7	7	3
26-30				1	1							2	-2	- 4	8	6
21-25	1						2					3	-3	- 9	27	9
16-20				1								1	-4	- 4	16	8
11-15			1									1	-5	- 5	25	15
fx	2	3	6	9	13	15	11	5	3	4	1	72		97	475	42
x'	- 5	- 4	- 3	- 2	- 1	0	1	2	3	4	5					
fx'	-10	-12	-18	-18	-13	0	11	10	9	16	5	-20				
fx'2	50	48	54	36	13	0	11	20	27	64	25	348				

$c'x = -.278$

$c'y = 1.35$

$\sigma_x = 2.18$

$\sigma_y = 2.57$

$r = .171$

TABLE IV

CORRELATION TABLE FOR ABSTRACT REASONING SCORES AND GRADE POINT AVERAGE

X: Grade Point Average

Y: Abstract Reasoning	.8	1.1	1.4	1.7	2.0	2.3	2.6	2.9	3.2	3.5	3.8	fy	y'	fy'	fy'2	x'y'
47-49				1	1							2	5	10	50	-15
44-46	1		2	1	3	2		1		1		11	4	44	176	-40
41-43				2	4	3	5		2			16	3	48	144	9
38-40		2	1	3	1	5	1		1	2	1	17	2	34	68	2
35-37		1	1	1	1	3	4	4		1		16	1	16	16	6
32-34			1	1	2		1					5	0	0	0	0
29-31						2						2	-1	-2	2	0
26-28			1		1							2	-2	-4	8	8
23-25												0	-3	0	0	0
20-22	1											1	-4	-4	16	20
fx	2	3	6	9	13	15	11	5	3	4	1	72	142	142	480	-14
x'	-5	-4	-3	-2	-1	0	1	2	3	4	5					
fx'	-10	-12	-18	-18	-13	0	11	10	9	16	5	-20				
fx'2	50	48	54	36	13	0	11	20	27	64	25	348				

$c'_x = -.278$

$c'_y = 1.97$

$\sigma_x = 2.18$

$\sigma_y = 1.67$

$r = -.097$

TABLE V

CORRELATION TABLE FOR SPATIAL RELATION SCORES AND GRADE POINT AVERAGE

X: Grade Point Average

Y: Spatial Relations	.8	1.1	1.4	1.7	2.0	2.3	2.6	2.9	3.2	3.5	3.8	fy	y'	fy'	fy'^{2}	x'y'
96-100				1								1	7	7	49	-14
91-95						3				1		4	6	24	144	24
86-90			1	1	1	1	3					7	5	35	175	-15
81-85			2		7	1	2	1	1		1	15	4	60	240	- 4
76-80	1	1	1	1		1	1			1		7	3	21	63	-27
71-75				1		2	1					4	2	8	16	- 2
66-70				1	2	2		1		1		7	1	7	7	2
61-65				2	1	2	1		1			7	0	0	0	0
56-60			1	1		1	2	2				7	-1	- 7	7	- 1
51-55					1	2		1				4	-2	- 8	16	- 2
46-50		2			1		1		1			5	-3	-15	45	15
41-45												0	-4	0	0	0
36-40			1									1	-5	- 5	25	15
31-35				1						1		2	-6	-12	72	12
26-30	1											1	-7	- 7	49	35
fx	2	3	6	9	13	15	11	5	3	4	1	72		108	908	14
x'	- 5	- 4	- 3	- 2	- 1	0	1	2	3	4	5					
fx'	-10	-12	-18	-18	-13	0	11	10	9	16	5	-20				
fx'^{2}	50	48	54	36	13	0	11	20	18	64	25	348				

$c'_x = -.278$

$c'_y = 1.50$

$\sigma_x = 2.18$

$\sigma_y = 3.22$

$r = .087$

TABLE VI

CORRELATION TABLE FOR HIGH SCHOOL ALGEBRA GRADES AND GRADE POINT AVERAGE

X: Grade Point Average

Y: High School Algebra	.8	1.1	1.4	1.7	2.0	2.3	2.6	2.9	3.2	3.5	3.8	fy	y′	fy′	fy′²	x′y′
4				1		1	2			1		5	2	10	20	18
3		1	4	3	5	8	3	3	1			28	1	28	28	13
2				2	4	3	3	2	1	3		18	0	0	0	0
1	2	3	2	3	4	4			1			19	−1	−19	19	16
fx	2	4	6	9	13	16	8	5	3	4	0	70		19	67	47
x′	−4	−3	−2	−1	0	1	2	3	4	5	6					
fx′	−8	−12	−12	−9	0	16	16	15	12	20	0	38				
fx′²	32	36	24	9	0	16	32	45	48	100	0	342				

$$c'_x = \frac{\Sigma fx'}{N} = \frac{38}{70} = .543$$

$$\sigma_x = \sqrt{\frac{\Sigma fx'^2}{N} - (c'_x)^2} = 2.14$$

$$c'_y = \frac{\Sigma fy'}{N} = \frac{19}{70} = .271$$

$$\sigma_y = \sqrt{\frac{\Sigma fy'^2}{N} - (c'_y)^2} = .94$$

$$r = \frac{\frac{\Sigma x'y'}{N} - (c'_x\, c'_y)}{\sigma_x\, \sigma_y} = .261$$

$$t = r\sqrt{\frac{N - 2}{1 - r^2}} \quad \text{(Fisher's formula for t)}$$

To test a correlation of .462 with N = 72, proceed as follows:

$$t = .462\sqrt{\frac{72 - 2}{1 - (.462)^2}} = .462 \times 9.43 = 4.36$$

Referring to Fisher's t table with degrees of freedom N − 2 or 72 − 2 = 70, it is found that t must be equal to or greater than 2.648 to be significant at the one per cent level. Since the calculated t value is greater than 2.648, the conclusion is that the correlation of .436 is real or shows a significant relationship. There is less than one chance in 100 that the relationship could be due to chance, hence, the null hypothesis is rejected.

Continuing the t-test on the remaining coefficients of correlation, the results indicate that besides the VR test, the NA test is the only other test that survived the t ratio test. The results of the t ratio test with relation to the coefficients of correlation are shown below in Table VII.

TABLE VII

COEFFICIENT OF CORRELATION AND t-TEST RESULTS.

Name of Test	r	t-test	Null Hypothesis
Verbal Reasoning	.462	4.35	Reject
Numerical Ability	.393	3.58	Reject
Spatial Relation	.087	.73	Fail to reject
Mechanical Reasoning	.171	1.45	Fail to reject
High School Algebra	.261	2.26	???

By examining Table VII it is found that the relationship between the high school algebra grades and the G.P.A. is not significant at the one per cent confidence level. Instead, it falls into the area of indecision. The absence of the AR test result indicates that the t-test was not administered. With an r of minus .097 it is obvious what the results of the t-test would be.

The findings thus far, have been in relation to one variable and the criterion. Now that the testing of the hypotheses of this study have been completed, it would be interesting to discover the relationship of grade point average and NA test and VR test simultaneously. In other words, the relationship of three variables all at one time. One approach to this problem would be to convert the VR and NA scores to standard scores and then combine them. This step would eliminate one variable and the net result will be a simple two variable correlation problem. Rather than selecting this method, the multiple correlation approach will be used. This method is superior and more accurate because it takes into consideration the intercorrelation of the two variables acting on the criterion. By using the Verbal Reasoning and Numerical Ability test data, the problem of multiple correlation and multiple regression equations can now be investigated.

Multiple Correlation

In general, any prediction made from the raw data would obviously be subject to a large error of estimate. If a prediction based upon all of the data is to be made a knowledge of regression equation is necessary. Given a test score Y of a student, if the Y is substituted in the regression equation, it is possible to predict the student's grade point average more accurately than by simply picking the mean of the G.P.A. It is impossible to predict the student's scholastic achievement with absolute certainty, but by considering more than one variable a much more accurate prediction can be made.

Multiple correlation is not merely the sum of the correlations of the independent variables and the dependent variable. If such were the case, the multiple r may add up to more than unity.

Proceeding in a similar fashion as before, the amount of correlation between a dependent variable and two others can be calculated. However, the first step is not the plotting of a scatter diagram because with three variables, the resulting scatter diagram must be a three dimensional figure. It is evident therefore, that another mean must be sought to obtain the intercorrelations among the three variables. The solution of a multiple correlation problem is as follows:

Compute the coefficient of correlation between NA scores and VR scores. Table VIII, illustrates the method of obtaining r. Upon the completion of computing the coefficient of correlation between VR scores and NA scores, a table showing the intercorrelation among the three variables is constructed.

TABLE VIII

CORRELATION TABLE FOR VERBAL REASONING SCORES AND NUMERICAL REASONING SCORES

X: Numerical Ability

Y: Verbal Reasoning	14-	17-	20-	23-	26-	29-	32-	35-	38-		fy	y'	fy'	fy'^2	x'y'
41-43								2			2	6	12	72	36
38-40								2			2	5	10	50	30
35-37											0	4	0	0	0
32-34			1				2	1			4	3	12	36	15
29-31		1		1	1		1				4	2	8	16	- 4
26-28				1	1	1	5	2			10	1	10	10	16
23-25			2	3	2		6		1		14	0	0	0	0
20-22		1	3	1	2	7	3	3	1		21	-1	-21	21	-16
17-19	1			2	1		2	1			7	-2	-14	28	- 2
14-16					1	2	1	1	1		6	-3	-18	54	-33
11-13							1				1	-4	- 4	16	- 8
8-10					1						1	-5	- 5	25	0
fx	1	2	6	8	9	10	21	12	3				-10	328	34
x'	- 4	- 3	- 2	- 1	0	1	2	3	4						
fx'	- 4	- 6	-12	- 8	0	10	42	36	12						
fx'^2	16	18	24	8	0	10	84	108	48						

$c'x = .972$

$c'y = -.139$

$\sigma x = 1.86$

$\sigma y = 2.13$

$r = .153$

TABLE IX

INTERCORRELATION AMONG VR, NA, AND G.P.A.

	VARIABLES	VR (X_3)	NA (X_2)	GPA (X_1)
X_3,	Verbal Reasoning		.153	.462
X_2,	Numerical Ability	.153		.393
X_1,	Grade Point Average	.462	.393	
M_x	Mean	23.58	29.92	2.32
σ_x	Standard Deviation	2.13	1.86	2.18

To avoid ambiguities with regard to variables, r_{12} would be the coefficient of correlation between variable X_1 and X_2. The coefficient of correlation r_{13} and r_{23} are defined in similar fashion.

$$R_{1.23} = \sqrt{\frac{r_{12}^2 + r_{13}^2 - 2r_{12}\, r_{13}\, r_{23}}{1 - r_{23}^2}} \quad \text{(Multiple correlation R)}$$

$$R_{1.23} = \sqrt{\frac{.393^2 + .462^2 - 2(.393)\,(.462)\,(.153)}{1 - (.153^2)}}$$

$$R_{1.23} = .564$$

The multiple correlation $R_{1.23}$ is generally an inflated value especially in small samples. It is necessary therefore to apply the formula for this correction.

$$cR = \sqrt{1 - (1 - R^2)\ (N - 1)/(N - M)}$$

where N = number of cases in the sample correlated

M = number of variables

Substituting the values in the equation

$$_cR = \sqrt{1 - (1 - .564^2)\ (71/69)} \ = \ .546$$

.546 represents the corrected multiple correlation $R_{1.23}$. The general form of the multiple regression equation is:

$$X_1' = a + b_{1.23} X_2 + b_{13.2} X_3$$

where a is a constant whose function is to assure that the mean of the X_1' values coincide with the mean of the X_1 values.

$b_{12.3}$ is the multiplying constant or weight for the X_2 values.

$b_{13.2}$ is the multiplying constant or weight for the X_3 values.

Treatment to Beta weights and partial correlations may be found in reference to Guilford.[2]

The b coefficients are computed by employing the so-called beta coefficients, designated β. Beta coefficients are called standard partial regression coefficients. The following are the formulas for the Beta coefficients and partial regression coefficients $b_{12.3}$ and $b_{13.2}$.

$$b_{12.3} = \left(\frac{\sigma_1}{\sigma_2}\right) \beta_{12.3}, \qquad b_{13.2} = \left(\frac{\sigma_1}{\sigma_3}\right) \beta_{13.2}$$

$$\beta_{12.3} = \frac{r_{12} - r_{13}\, r_{23}}{1 - r_{23}^2} \qquad \beta_{13.2} = \frac{r_{13} - r_{12}\, r_{23}}{1 - r_{23}^2}$$

Solving for the standard partial regression coefficients

$$\beta_{12.3} = \frac{.393 - (.462)\ (.153)}{1 - (.153^2)} = .330$$

$$\beta_{13.2} = \frac{.462 - (.393)\ (.153)}{1 - (.153^2)} = 4.11$$

Solving for the b coefficients

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[2] J. P. Guilford, Fundamental Statistics In Psychology and Education, (New York, 1950), pp. 424-470.

$$b_{12.3} = (2.18/1.86)\ (.330) = .386$$

$$b_{13.2} = (2.18/2.13)\ (.411) = .419$$

The equation for constant a is

$$a = M_1 - b_{12.3}\,M_2 - b_{13.2}\,M_3$$

$$a = 2.32 - .386(29.92) - .419(23.58) = -19.11$$

The regression equation can now be completed by inserting the values of a, $b_{12.3}$ and $b_{13.2}$.

$$X_1' = a + b_{12.3}\,X_2 + b_{13.2}\,X_3$$

$$X_1' = -19.11 + (.386)X_2 + (.419)X_3$$

For every unit increase in X_2, X_1' is increasing by a factor of .386 unit, likewise for every unit increase in X_3, X_1' increases by .419 unit. With this formula it is now possible to predict the most probable scholastic performance of the student who enters Honolulu Technical School. This leads to the next problem which is concerned with the accuracy of prediction by means of the regression equation. The accuracy with which X_1' is predicted is given by the formula

$$\sigma_{1.23} = \sigma_1 \sqrt{1 - R_{1.23}^{\,2}}$$

$$\sigma_{1.23} = 2.18\sqrt{1 - (.546^2)} = 1.83$$

From the above equation the reliability of any prediction will be the predicted grade point average $\pm$ 1.83. The chances therefore are about two in three that the prediction does not miss the true grade point average by more than $\pm$ 1.83.

The prediction of the student's probable scholastic achievement is also possible by the graphical method. Assuming that the Numerical Ability test score and the Verbal Reasoning test score were used as predictor variables, a graph would be constructed as shown below.

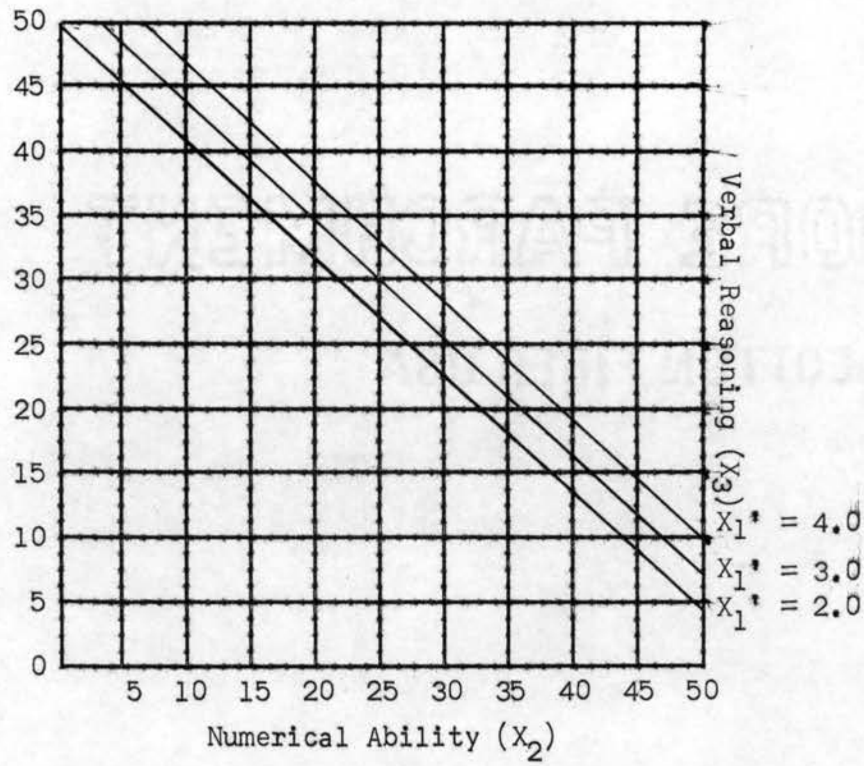

Figure 1. A Weighted Diagram As Called for by the Multiple Regression Equation to Predict X_1' from Different Combination of NA and VR Scores

To construct the graph above, the results of the multiple regression equation must also be considered. The diagonal lines represents the X_1' scores or more specifically the grade point averages. To predict the probable achievement of a particular student whose X_2 score is 20 and whose X_3 score is 35, the prediction would be exactly 3.0. Interpolation is necessary when the prediction is not exactly on the diagonal lines.

CHAPTER IV

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The purpose of this study was to gather data that might assist in interpreting the validity of the Honolulu Technical School's admission practices for electronics students. Specifically, the study sought to:

1. Determine whether there is any significant relationship between the D.A.T.B. scores and the first year grade point average.
2. Determine whether there is any significant relationship between the high school algebra grades and the first year grade point average.
3. Determine the extent to which the multiple regression equation can predict electronic student's scores at the Honolulu Technical School.

Investigation of the above problems were accomplished by first solving for the Pearson product moment coefficient of correlation, designated r. After computing the coefficients of correlation, Fisher's t test was used to determine whether the null hypothesis would be rejected or not rejected. The correlation between the high school algebra test and the criterion proved to be significant at the five per cent level of significance, but not at the one per cent level. Because of this correlation the high school algebra grade was not used in the computation of multiple correlation, $R_{1.23}$. Using the multiple regression equation, it was possible to estimate a student's probable scholastic achievement from his VR and NA scores. In order to show just how probable such estimates are, the standard error of estimate was calculated. The standard error of estimate, therefore, permits one to infer the possible magnitude of the prediction error.

The population consisted of only 72 students who completed the first year at the Honolulu Technical School during the period of September, 1960, 1961, and 1962. More than thirty per cent of the total number of students enrolled during this period were excluded because of incomplete data.

Conclusion

Results of this study indicated that only the VR test and NA test had significant relationship with the grade point average. The MR and SR test showed an insignificant correlation with the criterion, while the AR test dropped into the negative correlation region.

The high school algebra grade missed being significant at the one per cent confidence level. However, there is a possibility that this may prove to be another significant predictor variable. Perhaps with more data and a much more accurate means of interpreting the grades from the high school record, the coefficient of correlation between the algebra grades and G.P.A. may increase. Presently, the secondary schools vary widely in standards, students, and curriculum. The private high schools, rural high schools, and urban high schools all have their own methods of listing the level of courses and each employs a different grading system.

In predicting the student's probable grade point average, either the graphical method or multiple regression equation may be used. The reliability of any prediction will be the predicted grade point average plus or minus the standard error of estimate. In other words, the chances are about 2 in 3 that the prediction does not miss the true grade point average by more than ± 1.83.

Recommendation

This study has revealed the need for continued investigation in the area of high school algebra as a possible predictor variable. It is recommended that:

1. A thorough investigation be conducted utilizing larger samples and perhaps employ other predictor variables to improve the multiple coefficient of correlation.
2. The results of this study be considered in developing criteria for selecting and admitting students to the electronics program at the Honolulu Technical School.

BIBLIOGRAPHY

Boyer, Lee E., Koken, James E., and Lamke, T. A. "Admission Test as Predicting Success of Vocational School Students," Journal of Educational Research, Dembar Publication Inc., December, 1956, 313-315.

Elton, Charles F. and Morris, Donald. "The Use of the D.A.T. In a Small Liberal Arts College," Journal of Educational Research, Dembar Publication Inc., October, 1956, 139-143.

Guilford, J. P. Fundamental Statistics In Psychology and Education. McGraw-Hill Book Company, Inc., 1950.

Ingersol, A. C. "Engineering and Technological Training for Undeveloped Nations," Journal of Engineering Education, Vol. 51, No. 10, 794-799.

Henninger, G. Ross, The Technical Institute in America. McGraw-Hill Book Company, Inc., 1959, 1-30.

Henninger, G. Ross, "The Technical Institute In America," Journal of Engineering Education, Vol. 51, No. 1, 31-36.

Lawshe, C. H. Jr., and Thornton, G. R. "A Test Battery for Identifying Potentially Successful Naval Electrical Trainees." Journal of Applied Psychology, XXVII (1943), 399-406.

Levine, Abraham S. "Aptitude Versus Achievement Tests as Predictors of Achievement," Educational and Psychological Measurement, Vol. 18, No. 3, 517-525.

McNemar, Quinn. Psychological Statistics. John Wiley and Sons, Inc., 1962.

Patterson, C. H. "Predicting Success In Trade and Vocational School Courses," Educational Psychological Measurement, Vol. 16, No. 3, 352-400.

Samuelson, Cecil O. "The General Aptitude Test Battery In Predicting Success of Vocational School Students." Journal of Educational Research, Dembar Publication Inc., November, 1956, 175-182.

Schaartz, Alfred and Tiedeman, Stuart C. Evaluating Student Progress In the Secondary School. Longmans, Green and Company, 1957.

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