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ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample is included. (AG)

TECHNICAL REPORT

ON

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

ELECTRICAL TECHNOLOGY - TECHNICAL INSTITUTE TRAINING 0-67.

S-322
~~B-602~~

U. S. Employment Service
in Cooperation with
New York State Employment Service

November 1964

GATB # 2503

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

ELECTRICAL TECHNOLOGY - TECHNICAL INSTITUTE TRAINING 0-67.

S-322
~~B-602~~

Summary

The General Aptitude Test Battery, B-1002B, was administered to a final sample of 63 male students enrolled in the two-year Electrical Technology curriculum at the Erie County Technical Institute, Buffalo, New York. This training was established under Title VIII of the National Defense Education Act of 1958. The criterion consisted of grade-point averages. On the basis of mean scores, standard deviations, correlations with the criterion, job analysis data, and their combined selective efficiency, Aptitudes G-Intelligence, V-Verbal Aptitude, N-Numerical Aptitude and S-Spatial Aptitude were selected for inclusion in the final norms.

GATB Norms for Electrical Technology - Technical Institute Training 0-67., S-322 ~~B-602.~~

B-1001			B-1002		
Aptitude	Tests	Minimum Acceptable Aptitude Score	Aptitude	Tests	Minimum Acceptable Aptitude Score
G	CB-1- H CB-1- I CB-1- J	120	G	Part 3 Part 4 Part 6	115
V	CB-1- J	100	V	Part 4	100
N	CB-1- D CB-1- I	100	N	Part 2 Part 6	95
S	CB-1-F CB-1-H	115	S	Part 3	110

Effectiveness of Norms

The data in Table IV indicate that only 67 percent of the non-test-selected students used for this study were good students; if the students had been test-selected with the above norms, 80 percent would have been good students. 33 percent of the non-test-selected students used for this study were poor students; if the students had been test-selected with the above norms, only 20 percent would have been poor students.

TECHNICAL REPORT

I. Purpose

This study was conducted to determine the best combination of aptitudes and minimum scores to be used as norms on the General Aptitude Test Battery in screening applicants for referral to a training curriculum in Electrical Technology. (These norms may be particularly useful in screening applicants for training established under Title VIII of the National Defense Education Act of 1958.)

II. Sample

The General Aptitude Test Battery, B-1002B, was administered in March 1962 to 72 senior male students enrolled in a two-year Electrical Technology curriculum at the Erie County Technical Institute, Buffalo, New York. This training was established under Title VIII of the National Defense Education Act of 1958. Nine students were eliminated from the sample due to the collection of incomplete test and/or criterion data. Therefore, the final sample consisted of 63 male students who successfully completed the two-year course of study.

The two-year curriculum in Electrical Technology at the Erie County Technical Institute is accredited by the Engineers Council for Professional Development. Graduates are awarded the Degree of Associate in Applied Science. The requirements for enrollment are: high school graduation; recommendation by high school principal; good high school background in mathematics and science; evidence that the student is physically qualified for the curriculum; acceptance through formal application; qualifying on admission interview and tests.

TABLE I

Mean (M), Standard Deviation (σ), Range, and Pearson Product-Moment Correlation with the Criterion (r) for Age

	M	σ	Range	r
Age (years)	20.4	1.8	19-27	.231

III. Course Description

Title of Course Curriculum: Electrical Technology

Summary: The Electrical Technology curriculum at the Erie County Technical Institute requires two years of instruction. Students spend three quarters of each year in classes and laboratories at the Institute and are employed in industry for the remaining portion of the year. The curriculum provides for extensive training in basic electrical theory and laboratory testing leading to positions in manufacturing, communications, light and power, and chemical and steel. These occupations require a high degree of specialized knowledge, a broad understanding of operational procedures and the ability to supervise the work of others.

Technical Curriculum: The following courses comprise the core of technical subjects in Electrical Technology.

Electricity: The study of A.C. and D.C. theory and machinery.

Electrical Drafting: The use of instruments, isometric drawings, wiring diagrams and electrical symbols.

Electronics: The study of potential dividers, power transfer, circuits and electronics equipment.

Fabrication Processes: The study of motor construction, machine testing, operation of machinery, wiring, splicing and soldering.

Physics: Basic principles of temperature, heat and gas laws, statics and dynamics, illumination and sound.

Strength of Materials: The study of physical properties of industrial materials including laboratory testing.

Industrial Controls: The theory of control circuits and motor controls.

The subjects in the Electrical Technology curriculum and the approximate number of classroom and laboratory hours in each sucject are as follows:

Subject	Classroom Hours	Laboratory Hours
Electricity	300	240
Electrical Drafting	70	100
Electronics	180	180
Fabrication Processes	110	--
Physics	100	80
Strength of Materials	40	40
Industrial Controls	50	60
Communication Skills	140	--
Sociology, Health Ed., Human Relations, Coordinating Conferences	130	--
Mathematics	180	--

The course of study consists of approximately 1300 hours of classroom instruction and 700 hours of laboratory work.

NOTE: Since technical institute training curriculums usually prepare students for broad categories of technical work rather than for specific jobs, a specific Dictionary of Occupational Titles classification cannot be assigned to the Electrical Technology course curriculum. However, the following are titles of positions held by graduates of the Electrical Technology curriculum at the Erie County Technical Institute, Buffalo, New York:

Electrical Draftsman	Engineering Assistant
Electrical Estimator	Instrument Technician
Electrical Laboratory Technician	Junior Engineer
Electrical Maintenance Technician	Laboratory Technician
Electronics Technician	Technical Salesman

IV. Experimental Battery

All the tests of the GATB, B-1002B, were administered to the sample group.

V. Criterion

The criterion data collected consisted of "total" and "refined" grade-point averages. The total grade-point average consisted of the ratio between the total number of honor points earned and the total number of credit hours taken in the two-year course of instruction. Honor points assigned to each letter grade are: A = 4, B = 3, C = 2, D = 1, and F = 0. The refined grade-point average was the student's grade-point average for only the core of technical subjects in Electrical Technology (see section III of this report). Pearson product-moment correlations were computed between each of the GATB aptitudes and (1) total grade-point averages, and (2) refined grade-point averages. Of these criteria, higher correlations were obtained with the total grade-point averages. Therefore, total grade-point averages were used as the final criterion, having a range of 2.00-3.53, a mean of 2.44 and a standard deviation of .44.

VI. Qualitative and Quantitative Analyses

A. Qualitative Analysis

On the basis of the job analysis data, the following aptitudes were rated "important" for success in this two-year training curriculum:

Intelligence (G) - required to learn and understand fundamentals of course materials, functioning of tools and machinery, and interpretation of symbols, diagrams and related technical information.

Verbal Aptitude (V) - required to understand written technical information and to present information orally and in writing.

Numerical Aptitude (N) - required to apply mathematical concepts to problems, interpret diagrams, read instruments and prepare reports.

Spatial Aptitude (S) - required in the operation of machinery, interpretation of drawings and diagrams, and preparation of diagrams.

Form Perception (P) - required to perceive details in textbooks and to prepare graphic materials.

B. Quantitative Analysis:

TABLE II

Means (M), Standard Deviations (σ), and Pearson Product-Moment Correlations with the Criterion (r) for the Aptitudes of the GATB; N = 63

Aptitudes	M	σ	r
G-Intelligence	121.4	11.3	.385**
V-Verbal Aptitude	109.3	10.7	.317*
N-Numerical Aptitude	117.6	12.0	.314*
S-Spatial Aptitude	126.4	13.6	.086
P-Form Perception	116.3	15.1	.040
Q-Clerical Perception	110.7	12.4	.077
K-Motor Coordination	111.4	11.4	-.055
F-Finger Dexterity	109.9	19.0	-.115
M-Manual Dexterity	115.5	17.5	-.012

*Significant at the .05 level
**Significant at the .01 level

C. Selection of Test Norms:

TABLE III

Summary of Qualitative and Quantitative Data

Type of Evidence	Aptitudes								
	G	V	N	S	P	Q	K	F	M
Job Analysis Data									
Important	X	X	X	X	X				
Irrelevant									
Relatively High Mean	X		X	X					
Relatively Low Sigma	X	X	X			X			
Significant Correlation with Criterion	X	X	X						
Aptitudes to be Considered for Trial Norms	G	V	N	S					

Trial norms consisting of various combinations of Aptitudes G, V, N, and S with appropriate cutting scores were evaluated against the criterion by means of the Phi Coefficient technique. A comparison of the results showed that B-1002 norms consisting of G-115, V-100, N-95 and S-110 had the best selective efficiency.

VII. Validity of Norms

The validity of the norms was determined by computing a Phi Coefficient between the test norms and the criterion and applying the Chi Square test. The criterion was dichotomized by placing 33 percent of the sample in the low criterion group because this percent was considered to be the unsatisfactory or marginal students.

Table IV shows the relationship between test norms consisting of Aptitudes G, V, N and S with critical scores of 115, 100, 95 and 110, respectively, and the dichotomized criterion for the experimental sample of students. Individuals in the high criterion group have been designated as "good students" and those in the low criterion group as "poor students."

TABLE IV

Validity of Test Norms for Electrical Technology
(G-115, V-100, N-95 and S-110)

N = 63	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Students	7	35	42
Poor Students	12	9	21
Total	19	44	63

Phi Coefficient = .42
χ^2 = 10.905
P/2 < .0005

The data in the above table indicate a significant relationship between the test norms and the criterion for the sample.

VIII. Conclusions

On the basis of the results of this study, Aptitudes G, V, N and S with minimum scores of 115, 100, 95 and 110, respectively, have been established as B-1002 norms for selecting students for the two-year Electrical Technology curriculum described on page 3 of this report. The equivalent B-1001 norms consist of G-120, V-100, N-100 and S-115.

IX. Determination of Occupational Aptitude Pattern

Since a specific (6 digit) Dictionary of Occupational Titles classification cannot be assigned to the two-year curriculum in Electrical Technology (see page 4 of this report), no OAP analysis was made on the data for this study.