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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)

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Development of USES Aptitude Test Battery

for

Printing Curricula

65XX ; 97XX

U.S. DEPARTMENT OF LABOR
MANPOWER ADMINISTRATION

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Technical Report on Development of USES Aptitude Test Battery

For

Printing Curricula 65XX; 97XX
S-421

(Developed in Cooperation with the
Michigan State Employment Service)

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September 1968

FORWARD

The United States Employment Service General Aptitude Test Battery (GATB) was first published in 1947. Since that time the GATB has been included in a continuing program of research to validate the tests against success in many different occupations. Because of its extensive research base the GATB has come to be recognized as the best validated multiple aptitude test battery in existence for use in vocational guidance.

The GATB consists of 12 tests which measure 9 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, with a standard deviation of 20.

Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, in combination, predict job performance. For any given occupation, cutting scores are set only for those aptitudes which contribute to the prediction of performance of the job duties of the experimental sample. It is important to recognize that another job might have the same job title but the job content might not be similar. The GATB norms described in this report are appropriate for use only for jobs with content similar to that shown in the job description included in this report.

Charles E. Odell, Director
U. S. Employment Service

DEVELOPMENT OF USES APTITUDE TEST BATTERY

FOR

Printing Curricula 65XX; 97XX
S-421

This report describes research undertaken for the purpose of developing General Aptitude Test Battery (GATB) norms for the Printing Curricula 65XX; 97XX. The following norms were established:

GATB Aptitudes	Minimum Acceptable GATB Scores
G - General Learning Ability	90
Q - Clerical Perception	110
F - Finger Dexterity	80

RESEARCH SUMMARY

Sample:

70 male General Printing and Printing Management and Supervision students at Ferris State College, Big Rapids, Michigan.

Criterion:

A multiple-hurdle criterion was used consisting of total grade-point average and core curriculum grade-point average earned in the six-quarter General Printing course.

Design:

Concurrent (test and criterion data were collected at approximately the same time).

Minimum aptitude requirements were determined on the basis of a job analysis and statistical analyses of aptitude mean scores, standard deviations, aptitude criterion correlations and selective efficiencies.

Validity:

Phi Coefficient = .42 (P/2 < .0005)

Effectiveness of Norms:

67% of the nontest-selected students in the sample used for this study were good students; if the students had been test-selected with the S-421 norms, 84% would have been good students. 33% of the nontest-selected students used for this study were poor students; if the students had been test-selected with the S-421 norms, only 16% would have been poor students. The effectiveness of the norms is shown graphically in Table 1.

TABLE 1

Effectiveness of Norms

	Without Tests	With Tests
Good students	67%	84%
Poor Students	33%	16%

SAMPLE DESCRIPTION

Size:

N = 70

Occupational Status:

Students who completed the six-quarter curriculum in General Printing.

Educational Institution:

Students were enrolled in the Trade and Industrial Division, Ferris State College, Big Rapids, Michigan.

Course Selection Requirements:

Education: High school education or equivalent or sufficient maturity, motivation and aptitude to profit from instruction.

Previous Experience: None required.

Tests: None used.

Other: Application for admission into the curriculum and a personal conference if needed to ascertain applicant's fitness for success.

Principle Activities:

The course description is shown in the Fact Sheet in the Appendix.

Minimum Experience:

All students in the sample had been enrolled in the curriculum for at least 5 quarters.

TABLE 2

Means, Standard Deviations (SD), Ranges, and Pearson Product-Moment Correlations with the Criteria of Total Grade-Point Average (r) and Core Curriculum Grade-Point Average (r_1) for Age and Education

	Mean	SD	Range	r	r_1
Age (years)	21.5	3.2	19-42	.214	.143
Education (years)	14.3	.6	14-16	-.061	-.094

EXPERIMENTAL TEST BATTERY

All 12 tests of the GATB, B-1002, were administered during the period November 1963 to February 1967.

CRITERION

The criterion was a multiple-hurdle criterion consisting of the total grade-point average and the grade-point average in the core curriculum earned in the six-quarter General Printing course. Grade-point averages were computed as follows: total number of honor points (A-4, B-3, C-2, D-1, E-0) received divided by course hours taken, and multiplied by 100.

Criterion distribution:

Total Grade-Point Average		Core Curriculum Grade-Point Average	
Possible Range:	0-400	Possible Range:	0-400
Actual Range:	192-370	Actual Range:	189-390
Mean:	265.8	Mean:	290.2
Standard Deviation:	43.9	Standard Deviation:	52.4

Criterion Dichotomy:

The criterion was dichotomized into high and low groups by placing 33% of the sample in the low criterion group to correspond with the percentage of students considered unsatisfactory or marginal. The low criterion group consisted of those students who failed to meet the critical score of 235 on either the total grade-point average or the core curriculum grade-point average, or both. Students in the high criterion group were designated as "good students" and those in the low criterion group as "poor students."

APTITUDES CONSIDERED FOR INCLUSION IN THE NORMS

Aptitudes were considered for tryout in the norms on the basis of a qualitative analysis of the courses studied and a statistical analyses of test and criterion data. Aptitudes G, V, P, Q, and M which do not have a high correlation with the criterion were considered for inclusion in the norms because qualitative analysis indicated they were important in course duties and the sample had relatively high mean scores on aptitudes P, Q, and M and relatively low standard deviations on aptitudes G, V, and Q. Tables 3, 4, and 5 show the results of the qualitative and statistical analyses.

TABLE 3

(Based on the course analysis, the aptitudes listed appear to be important for course success)

<u>Aptitude</u>	<u>Rationale</u>
G - General Learning Ability	Necessary to complete course work; understand theories and principles; make decisions.
V - Verbal Aptitude	Necessary in proofreading; course work; and communication.
P - Form Perception	Necessary in visual perception of detail, layout, design, and color.
Q - Clerical Perception	Necessary in detailed proofreading; type identification.
F - Finger Dexterity	Necessary in hand setting of type.
M - Manual Dexterity	Necessary in operation and care of printing machinery.

TABLE 4

Means, Standard Deviations (SD), Ranges, and Pearson Product-Moment Correlations with the Criteria of Total Grade-Point Average (r) and Core Curriculum Grade-Point Average (r₁) for the Aptitudes of the GATB

Aptitude	Mean	SD	Range	r	r ₁
G - General Learning Ability	112.8	11.3	75-133	.163	.087
V - Verbal Aptitude	100.4	9.4	86-121	.181	.081
N - Numerical Aptitude	114.5	11.9	86-138	.161	.111
S - Spatial Aptitude	116.1	16.0	68-150	.172	.194
P - Form Perception	120.4	20.2	76-172	.017	.093
Q - Clerical Perception	115.5	11.1	93-143	.149	.205
K - Motor Coordination	110.9	19.6	66-159	-.008	.067
F - Finger Dexterity	108.8	20.2	57-154	.242*	.315**
M - Manual Dexterity	116.5	21.7	55-160	.133	.188

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

TABLE 5

Summary of Qualitative and Quantitative Data

Type of Evidence	Aptitudes									
	G	V	N	S	P	Q	K	F	M	
Job Analysis Data										
<u>Important</u>	X	X			X	X		X	X	
Irrelevant										
Relatively High Mean				X	X	X				X
Relatively Low Standard Dev.	X	X	X			X				
Significant Correlation with Criterion 1									X	
Significant Correlation with Criterion 2									X	
Aptitudes to be Considered for Trial Norms	G	V			P	Q			F	M

DERIVATION AND VALIDITY OF NORMS

Final norms were derived on the basis of a comparison of the degrees to which trial norms consisting of various combinations of Aptitudes G, V, P, Q, F, and M, at trial cutting scores, were able to differentiate between the 67% of the sample considered good students and the 33% of the sample considered poor students. Trial cutting scores at five-point intervals approximately one standard deviation below the mean are tried because this will eliminate about 1/3 of the sample with three-aptitude norms. For two-aptitude trial norms, minimum cutting scores of slightly more than one standard deviation below the mean will eliminate about 1/3 of the sample; for four-aptitude trial norms, cutting scores of slightly less than one standard deviation below the mean will eliminate about 1/3 of the sample. The Phi Coefficient was used as a basis for comparing trial norms. The optimum differentiation for the Printing Curricula 65XX; 97XX was provided by norms of G-90, Q-110, and F-80. The validity of these norms is shown in Table 6 and is indicated by a Phi Coefficient of .41 (statistically significant at the .0005 level).

TABLE 6

Concurrent Validity of Test Norms, G-90, Q-110, and F-80

	Nonqualifying Test Scores	Qualifying Test Scores	Total
Good Students	11	36	47
Poor Students	16	7	23
Total	27	43	70

Phi Coefficient (ϕ) = .41
Significance Level = $P/2 < .0005$

Chi Square (χ^2_y) = 12.0

DETERMINATION OF OCCUPATIONAL APTITUDE PATTERN

The data for this study did not meet the requirements for incorporating the occupation into any of the 36 OAP's included in Section II of the Manual for the General Aptitude Test Battery. The data for this sample will be considered for future groupings of occupations in the development of new occupational aptitude patterns.

A-P-P-E-N-D-I-X

Required Courses:

Courses that must be completed (212 hours) before Ferris State College will grant a certificate in Printing:

Non-Core Curriculum

Communication Skills I, II & III - 3 hours/week (1st, 2nd & 3rd quarters)

Basic Mathematics - 5 hours/week (1st quarter)

Typewriting I & II - 5 hours/week (1st & 2nd quarter)

Continuing Orientation - 1 hour/week (1st quarter)

Health & Physical Education - 3 hours/week (1st, 2nd & 3rd quarters)

Business Correspondence - 5 hours/week (4th quarter)

Social Science, Man & Society - 5 hours/week (4th quarter)

Marketing-Principles of Advertising - 4 hours/week (4th quarter)

Accounting I - 4 hours/week (5th quarter)

Everday Law - 4 hours/week (5th quarter)

Small Business Management - 3 hours/week (5th quarter)

Speech - 4 hours/week (5th quarter)

Foremanship Training - 3 hours/week (6th quarter)

Political Science - 5 hours/week (6th quarter)

Specialized Selling - 5 hours/week (6th quarter)

Electives - 4 hours (2 in 4th quarter; 2 in 6th quarter)

Core Curriculum-General Printing The first 6 quarters comprise the General Printing program.

Hand Composition - 18 hours/week (1st quarter)

Basic Letterpress - 20 hours/week (2nd quarter)

Ink and Color - 2 hours/week (2nd quarter)

Printers Mathematics - 3 hours/week (2nd quarter)

Photochemical Reproduction (camera work, platemaking, photo-engravings)
20 hours/week (3rd quarter)

Science for Printers - 5 hours/week (3rd quarter)

Fundamentals of Layout and Design - 4 hours/week (3rd quarter)

Offset Press Work - 20 hours/week (4th quarter)

Machine Composition - 20 hours/week (5th quarter)

Advanced Shop Practice - 20 hours/week (6th quarter)

Core Curriculum - Printing Management and Supervision

Any student satisfactorily completing the 6 quarter program in General Printing may specialize in Management and Supervision by enrolling in the seventh and eighth quarters.

Printing Production Management - 23 hours/week or more by arrangement
with instructor (7th quarter)

Estimating I - 5 hours/week (7th quarter)

Newspaper Practice - 4 hours/week (7th quarter)

Management and Supervision - 30 hours/week (8th quarter)

Estimating and Cost Analysis - 5 hours/week (8th quarter)

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FACT SHEET

Job Title: Printing Curricula 65XX; 97XX

Course Summary: Ferris State College offers two printing programs: General Printing and Printing Management. The first six quarters of both the General Printing and Printing Management curricula are the same. This allows the student to survey the various trade areas and then determine the branch of industry he would like to choose. Printing students receive a sound background in areas of Composition, Letter Presswork, Offset Process, Bindery Work, Platemaking and Stripping. The General Printing course gives preparation for work in the back shop of small job shops and newspapers. The Management and Supervision course prepares a person for backshop work plus training for supervisory positions.

Any specialized areas, such as Machine Composition, may be taken by arrangement. This depends on the students background and is arranged if he has had the experience to profit from the instruction. Unless the student has actual experience in a specific area, the first year courses are taken in sequence. This is a general printing curriculum which gives preparation for several of the many technical specialities in printing.

A State-wide Printing Advisory Board assists the college in keeping abreast of the most recent technological developments within the Printing industry.

Effectiveness of Norms: Only 67% of the nontest-selected students used for this study were good students; if the students had been test-selected with S-421 norms, 84% would have been good students. 33% of the nontest-selected students used for this study were poor students; if the students had been test-selected with S-421 norms, only 16% would have been poor students.

Applicability of S-421 Norms: The aptitude test battery is applicable to training situations which include most of the curriculum described above.

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