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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 and a personnel evaluation form are also included. (AG)

July 1969 United States Training and Employment Service Technical Report S-435







# Development of USTES Aptitude Test Battery

# for

# Illustrator

## (profess. & kin.) 141.081

U.S. DEPARTMENT OF LABOR
MANPOWER ADMINISTRATION

# Technical Report on Development of USTES Aptitude Test Battery

For . . . . .

## Illustrator (profess. & kin.) 141.081

S-435

(Developed in Cooperation with the
Michigan State Employment Service)

Manpower Administration
U. S. Department of Labor

July 1969

## FOREWORD

The United States Training and 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.

GATB #2734

DEVELOPMENT OF USTES APTITUDE TEST BATTERY

for

Illustrator (profess. & kin.) 141.081-042

S-435

This report describes research undertaken for the purpose of developing General Aptitude Test Battery (GATB) norms for the occupation of Illustrator (profess. & kin.) 141.081-042. The following norms were established:

| GATB Aptitudes | Minimum Acceptable GATB Scores |
|---|---|
| G - General Learning Ability | 95 |
| S - Spatial Aptitude | 110 |
| P - Form Perception | 120 |
| K - Motor Coordination | 95 |

RESEARCH SUMMARY

Sample:

52 ( 39 male and 13 female) Commercial Art Technology students at Ferris State College, Big Rapids, Michigan.

This study was conducted prior to the requirement of providing minority group information. Therefore, minority group composition is unknown.

Criterion:

Core-Curriculum grade-point average earned in six-quarter Commercial Art Technology curriculum.

Design:

Concurrent (all students tested in their 5th or 6th quarter).

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

Concurrent Validity:

Phi Coefficient = .40 ($P/2 < .005$)

Effectiveness of Norms:

Only 65% of the nontest-selected students in the sample used for this study were good students; if the students had been test-selected with the above norms, 80% would have been good students. 35% of the nontest-selected students used for this study were poor students; if the students had been test-selected with the above norms, only 20% 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 | 65% | 80% |
| Poor Students | 35% | 20% |

SAMPLE DESCRIPTION

Size: N = 52

Educational Status:

Students who completed six-quarter curriculum in Commercial Art Technology.

Educational Institution:

Students were enrolled in the School of Technical and Applied Arts, Ferris State College, Big Rapids, Michigan.

Course Selection Requirements:

Education:

High school graduation or equivalent or sufficient maturity, motivation and aptitude to profit from instruction.

Previous Experience:

None required but any previous experience is evaluated and the student placed at level of his ability to do work.

Tests: None used.

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

Principal Activities:

The job duties of the occupation and the subjects contained in the course of study are shown 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 (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 | 2.3 | 20-30 | .417** | .393** |
| Education (years) | 14.4 | .7 | 14-16 | -.225 | -.169 |

**Significant at the .01 level

EXPERIMENTAL TEST BATTERY

All 12 tests of the GATB, B-1002, were administered during the period of August 1964 to May 1967.

CRITERION

The criterion was the grade-point average earned in the core-curriculum courses of the six-quarter Commercial Art Technology curriculum. 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 the course hours taken, and multiplied by 100.

A second criterion measure was also obtained. Total grade-point averages were computed for the sample but the core-curriculum grade-point averages were used as the final criterion.

Criterion Distribution:

| | |
|---|---|
| Possible Range: | 0-400 |
| Actual Range: | 158-354 |
| Mean: | 247.6 |
| Standard Deviation: | 46.8 |

Criterion Dichotomy: The criterion was dichotomized into high and low groups by placing 35% of the sample in the low group to correspond with the percentage of students considered unsatisfactory or marginal. Students in the high criterion group were designated as "good students" and those in the low group as "poor students". The criterion critical score is 225.

## APTITUDES CONSIDERED FOR INCLUSION IN THE NORMS

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

TABLE III

Based on the course analysis, the following aptitudes appear to be important for successful completion of the curriculum.

| Aptitude | Rationale |
|---|---|
| G - General Learning Ability | Necessary to understand course work, underlying principles and printing production processes. |
| S - Spatial Aptitude | Necessary to visualize and depict three-dimensional objects on two-dimensional surface. |
| P - Form Perception | Necessary to perceive and depict pertinent details in objects, layouts, graphic reproductions and pictorial compositions. |
| K - Motor Coordination | Necessary to coordinate eyes and hands to make precise movements in lettering and drawing. |
| M - Manual Dexterity | Necessary in use of equipment and in drawing skillfully. |

TABLE IV

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 the Aptitudes of the GATB

| Aptitude | Mean | SD | Range | r | $r_1$ |
|---|---|---|---|---|---|
| G - General Learning Ability | 115.5 | 11.4 | 92-144 | .189 | .165 |
| V - Verbal Aptitude | 106.5 | 11.1 | 90-129 | .146 | .094 |
| N - Numerical Aptitude | 107.5 | 12.4 | 83-139 | .091 | .026 |
| S - Spatial Aptitude | 131.2 | 14.9 | 97-160 | .063 | .098 |
| P - Form Perception | 133.7 | 16.5 | 95-167 | .115 | .076 |
| Q - Clerical Perception | 119.8 | 14.8 | 90-150 | .131 | .072 |
| K - Motor Coordination | 111.2 | 14.3 | 76-140 | .124 | .108 |
| F - Finger Dexterity | 109.9 | 19.0 | 73-157 | .234 | .221 |
| M - Manual Dexterity | 116.6 | 20.2 | 73-160 | -.054 | -.011 |

TABLE V

Summary of Qualitative and Quantitative Data

| Type of Evidence | APTITUDES | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | G | V | N | S | P | Q | K | F | M |
| Course Analysis Data Important | x | | | x | x | | x | | x |
| Irrelevant | | | | | | | | | |
| Relatively High Mean | | | | x | x | x | | | |
| Relatively Low Standard Dev | x | x | x | | | | x | | |
| Significant Correlation with Criterion 1 | | | | | | | | | |
| Significant Correlation with Criterion 2 | | | | | | | | | |
| Aptitudes to be Considered for Trial Norms | G | | | S | P | | K | | |

DERIVATION AND VALIDITY OF NORMS

Final norms were derived on the basis of a comparison of the degree to which trial norms consisting of various combinations of Aptitudes G, S, P, and K, at trial cutting scores, were able to differentiate between the 65% of the sample considered good students and the 35% 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 occupation of Illustrator (profess. & kin.) 141.081-042 was provided by norms of G-95, S-110, P-120, and K-95. The validity of these norms is shown in Table 6 and is indicated by a Phi Coefficient of .40 (statistically significant at the .005 level).

TABLE VI

Concurrent Validity of Test Norms, G-95, S-110, P-120, and K-95

| | Nonqualifying Test Scores | Qualifying Test Scores | Total |
|---|---|---|---|
| Good Students | 6 | 28 | 34 |
| Poor Students | 11 | 7 | 18 |
| Total | 17 | 35 | 52 |

Phi Coefficient ($\phi$) =.40 Chi Square $(\chi^2_y) = 8.2$

Significance Level = $p/2 < .005$

DETERMINATION OF OCCUPATIONAL APTITUDE PATTERN

The data for this study did not meet the requirements for incorporating the occupation studied into any of the 36 OAPs 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.

Required Course Curriculum:

The following courses must be successfully completed by students in the Commercial Art Technology program at Ferris State College in order to be awarded an Associate in Applied Science degree.

Non-Core Curriculum

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

Social Science - 3 hours/week (1st, 2nd, and 3rd quarters)

English - 3 hours/week (1st, 2nd, and 3rd quarters)

Physical Education - 1/2 hour/week (1st, 2nd, and 3rd quarters)

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

Art (History) - 2 hours/week (2nd and 3rd quarters)

Health Education - 1-1/2 hours/week (3rd quarter)

Biological Science or Physical Science - 4 hours/week (4th and 5th quarters)

Political Science - 3 hours/week (5th and 6th quarters)

Elective - 3 hours/week (2nd quarter)

Speech - 4 hours/week or Elective - 3 hours/week (6th quarter)

Core Curriculum

Drawing and Painting 1 - 5 hours/week (1st quarter)

Beginning course in fundamental art techniques. Introduction to tools and media employed by commercial artists.

Perspective Drawing - 3 hours/week (1st quarter)

Introduction to theory and practice of creating two-dimensional representations of three-dimensional objects.

Lettering 1 - 2 hours/week (1st quarter)

Introduction to lettering and type. Emphasis on practice of lettering and use of various tools.

Core Curriculum (cont'd)

Drawing and Painting 2 - 6 hours/week (2nd quarter)

Continuation of study of techniques introduced in 1st quarter Drawing and Painting course. Application of techniques in practical work from still life and life. Study of color and the properties of color.

Lettering 2 - 2 hours/week (2nd quarter)

Advanced study of fundamentals of correct use of lettering in advertising. Practice in indications for layouts.

Drawing and Painting 3 - 6 hours/week (3rd quarter)

Advanced drawing and painting from still life and life. Students are encouraged to apply previously studied techniques to the development of individual creative projects.

Lettering 3 - 2 hours/week (3rd quarter)

Practical application of fundamentals taught in Lettering I and 2. Emphasis placed on lettering as an element of design. Professional quality of rendering is stressed.

Typography - 2 hours/week (3rd quarter)

History of type faces. Appropriate use of type faces, margins, and white space for specific purposes.

Design 1 - 2 hours/week (4th quarter)

Introduction to the elements and principles of composition and design.

Core Curriculum (cont'd)

Advertising Design 1 - 7 hours/week (4th quarter)

Study of elements of design and layout which apply to advertising art. Practical problems in layout and design using a variety of materials and techniques employed in art work development.

Design 2 - 2 hours/week (5th quarter)

Practical application of the elements and principles studied in Design I. Students work on projects employing design techniques used in commercial art.

Advertising Design 2 - 6 hours/week (5th quarter)

Practical work in techniques of advertising layout and rendering of manufactured products. Practice on preparing art work for printing; employ procedures of color separation, keylining and copyfitting.

Printing Production Processess - 3 hours/week (5th quarter)

Observation and practice course in which students employ various techniques to convert their art work into printed material. Also included are evolution of type faces, camera work, photo engraving and offset theory and practice.

Design 3 - 2 hours/week (6th quarter)

Advance course in two-dimensional designing. Practical problems in producing original and functional design.

Advertising Design 3 - 7 hours/week (6th quarter)

Advanced work in advertising layout and production art with some individual specialization permitted. Students are assisted in preparing portfolios for job interviews.

## DEFINITION OF TERMS

Color Separation - isolation on separate negatives, by use of color filters, of parts of a picture or design that are to be printed in the given color: similar isolation accomplished by application of acid-resisting paint to the plate to prevent etching of the painted spots.

Copyfitting - preparing proper spacing and composition of manuscripts of printed matter to be put in type or plates for printing.

Face - style or cut of type; the upper or printing surface of a type.

Indication - drawing technique in which a suggestion of features is made, as distinguished from a completely detailed representation.

Keyline - a line of print explaining symbols.

Layout - arrangement or plan for graphic presentation of information; outline, usually in diagram form, which provides directions for final arrangement of graphic information.

Offset - printing process in which an impression is first received by a rubber-surfaced cylinder and then transferred to paper.

Rendering - to apply a medium, such as ink or crayon, to a drawing so as to bring out form and modeling.

FACT SHEET

Job Title: Illustrator (profess. & kin.) 141.081-042

Job Summary:

Draws and paints illustrations for printed material, including advertisements, books, magazines, and posters. Visualizes and depicts three-dimensional objects on two-dimensional surfaces. Uses various handtools for drawing and painting. Studies design layout or proposed sketch and selects graphic and pictorial techniques best suited to produce desired visual effect and to conform with specified printing method; bases judgment on knowledge of advertising design principles and printing production processes. Executes design, using selected technique; renders pertinent details from memory, still life, live models, reference material, or manufactured products. Employs lettering, type open space, and margins as elements of design. Arranges objects and lettering in proper perspective. Prepares art work for printing; checks details of work after printing.

Course Summary:

The Commercial Art Technology curriculum is designed to prepare students for a technical career in commercial art at an intermediate occupational level. The curriculum includes theory and practice in various techniques of lettering, drawing, and printing; in these courses students become familiar with the tools and media employed in commercial art. In addition, a detailed study is made of the elements and principles of advertising design, composition, and layout. Graduates of the two-year Commercial Art Technology program generally are qualified for entry positions as assistants to professional personnel in the field of commercial art.

Effectiveness of Norms:

Only 65% of the nontest-selected students used for this study were good students; if the students had been test-selected with the S-435 norms, 80% would have been good students. Thirty-five percent of the nontest-selected students used for this study were poor students; if the students had been test-selected with the S-435 norms, only 20% would have been poor students.

Applicability of S-435 Norms:

The aptitude test battery is applicable to jobs which include a majority of the job duties described above.

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