1956

The development of an achievement test in industrial arts for the seventh and eighth grades

Vernon W. Hintzman

The University of Montana

THE DEVELOPMENT OF AN ACHIEVEMENT TEST

IN INDUSTRIAL ARTS

FOR THE SEVENTH AND EIGHTH GRADES

by

Vernon W. Hintzman

B. A., Iowa State Teachers College, 1926

B. A., Eastern Washington College of Education, 1938

Presented in partial fulfillment of the
requirements for the degree of
Master of Education

Montana State University

1956

Approved:

H W Knapp
Chairman, Board of Examiners

J B Castle
Dean, Graduate School

May 18 1956

TABLE OF CONTENTS

CHAPTER		PAGE
I.	THE PROBLEM, ITS SETTING AND IMPORTANCE	1
	Setting of the Problem	1
	Objectives of Education	1
	Objectives of Industrial Arts Education	2
	Comparison of the Objectives and Place in the Curriculum.	3
	The Problem	4
	Statement of the Problem	4
	Importance of the Study	5
	Delimitation of the Study	6
II.	REVIEW OF RELATED LITERATURE	7
	History of Testing	7
	Types of Tests	8
	Achievement Tests	8
	Scholastic-aptitude Tests	8
	Special Aptitude Tests	9
	Interest Inventories	9
	Personality Instruments	9
	Tests in the Industrial Arts Field	10
III.	TECHNIQUE OF THE STUDY	12
	Factors To Consider in Planning the Test	12
	Reliability	12
	Validity	12
	Usability	13

CHAPTER		PAGE
	Construction of the Test	14
	Analysis of the Returned Tests	17
IV.	EVALUATION OF THE RESULTS	19
	Reliability	19
	Comparison of the Groups Tested	21
	Correlation with Scores on Stanford Achievement Tests	24
V.	SUMMARY AND CONCLUSIONS	27
	Importance of Industrial Arts in Elementary Curriculum	27
	The Industrial Arts Achievement Test as a Measuring Instrument	28
	Positive Values of the Test	28
	Some Criticisms and Recommendations	29
BIBLIOGRAPHY		31
APPENDIX A.	Tables	34
APPENDIX B.	The Test, Key, and Directions for Administering	40

LIST OF TABLES

TABLE PAGE

I. Number of Tests Returned by Grade and Type of School 34

II. Correct Answers on Test Questions 35

LIST OF PERCENTILE GRAPHS

GRAPH PAGE

1. Comparison of Seventh Grade Scores with Eighth Grade Scores . . 22

2. Comparison of Eighth Grade from Small Schools with Eighth Grade from Large Schools 23

3. Comparison of Seventh Grade from Small Schools with Seventh Grade from Large Schools 25

CHAPTER I

THE PROBLEM, ITS SETTING AND IMPORTANCE

SETTING OF THE PROBLEM

Instruction in industrial arts has not been so well standardized as instruction in most of the other fields covered in the junior high school.[1] A lack of uniformity in the instruction seems to be apparent when transfer students enter school at mid-term. The State Department of Public Instruction of Montana does not require that woodworking be taught in the seventh and eighth grades. This might be the reason that few schools offer the subject, and those who do seem to vary in the instruction offered. If industrial arts education fits into the elementary education program, there should be some method devised for measuring achievement and standardizing the minimum requirements.

Objectives of Education

Many changes have been made in the thinking of educational leaders since World War I. Advances in the understanding of how people learn and mature have brought about improved methods of instruction.[2] The Educational Policies Commission of the National Education Association of the

---

[1]Louis V. Newkirk and Harry A. Greene, *Tests and Measurements in Industrial Education* (New York: John Wiley & Sons, Inc., 1935), p. 63.

[2]Educational Policies Commission, *Public Education and the Future of America* (Washington: National Education Association of the United States, 1955), p. 50.

United States has summed it up:

> . . . Schools became more concerned about educating each individual in such a way as to enable him to become a happy, responsible and productive member of his community. . . . As the special problems of young people at different age levels were surveyed, some communities began to reorganize their public-school system to include three-year junior high schools which would follow six-year elementary schools and precede three-year senior high schools. It was hoped that in junior high schools more attention could be given to the special needs of young people as they left childhood.

Modern educational leaders have grouped the objectives of education into four categories: (1) The Objectives of Self-Realization (2) The Objectives of Human Relationship (3) The Objectives of Economic Efficiency, and (4) The Objectives of Civic Responsibility. In identifying these four aspects of the aims of education, the Educational Policies Commission states that "the classification will be more helpful if we think of it as a series of four vantage points from which the purposes of education may be studied, the total result being a comprehensive view of the whole."[3]

Objectives of Industrial Arts Education

Some objectives for which the industrial arts program should assume responsibility are: to encourage respect for and appreciation of the skills and knowledge that are a part of each skilled craft; to value, care for, and select wisely the tools an individual purchases or uses;

---

[3]Educational Policies Commission, The Purposes of Education in American Democracy (Washington: National Education Association of the United States and the American Association of School Administrators, 1938), p. 47.

To develop pride and satisfaction in the things he makes; to develop a confidence in doing useful things; to develop systematic and logical habits in the solution of a problem, to develop habits of industry, and a willingness to work with and assist others; to develop an interest in constructive leisure-time activities; and to develop the vocational opportunities involved in basic industries.[4]

Comparison of the Objectives and Place in the Curriculum

Because industrial arts provides opportunities for developing interest in leisure-time activities, develops pride and satisfaction in the things an individual makes, promotes self-confidence, industry, and the logical approach to problem-solving, it aids in attaining the goal of Self-Realization. By teaching the value of working with others in the solution of problems, and by fostering habits of industry, the industrial arts program contributes to the goal of promoting Human Relationships. The objective of Economic Efficiency can be promoted by encouraging respect for an appreciation of the skills and knowledge that are a part of each skilled craft; by teaching the wise selection and proper care of tools; by developing habits of industry and elementary skills in the use of common hand tools and machines; and by developing the vocational opportunities involved in basic industries. In promoting the ability to work with and assist others, industrial arts is fostering and nurturing attitudes of cooperation which can promote the objective of Civic Responsibility.

---

[4]John A. Shaw, et. al., "Industrial Arts Curriculum Outline, Seventh, Eighth and Ninth Grades" (Spokane: Spokane Trade School, 1950), p. vi.

Industrial arts is important in the general education curriculum because it provides opportunities for each pupil to learn through a constructive activity in which he can succeed. "Experiences provide the basis upon which the individual becomes a more intelligent and satisfied consumer, a better producer and a more useful citizen."[5] This is the conclusion of the Board of Education, Spokane City Schools.

Commenting on the place of education in American Democracy, the Educational Policies Commission asserts:

> Most of the general mechanical competency of the people of the United States is a by-product of life in an industrial civilization. A part of it, however, comes directly from schooling. Girls are taught how to use and care for modern household equipment. Boys learn to operate and care for basic machines used in working wood and metal. Children are constantly reading about new inventions and performances of modern machinery.
>
> The schools should do a more comprehensive and conscious job in this area. . . . Some acquaintance with small-scale home power machinery and with large scale industrial power machinery is important, if one is to have appreciation of the environment in which he lives and the elementary mechanical competency prerequisite to effective living in a technological age.
>
> . . . The role of education in advancing the pattern of technology and to some extent in shaping it, to the end that social well-being is served and not retarded by it, cannot be ignored.[6]

THE PROBLEM

Statement of the Problem

It was the purpose of this study to prepare a test for measuring achievement in industrial arts instruction in the junior high school, to have the test given to a representative group of junior high school students throughout the state of Montana, and to evaluate the results.

---

[5] Ibid. p. vi

[6] Educational Policies Commission, Education and Economic Well-Being in American Democracy (Washington: National Education Association of the United States, 1940), pp. 39-40.

Importance of the Study

Industrial arts stands in an important position in elementary education because it can be a constructive force in meeting the goals of the whole curriculum. Because of its importance, some reliable means of measuring achievement is necessary. Standardized objective tests have been slow to appear in this field because the instructional content is so varied from school to school; however, if carefully written validated standardized tests in the industrial arts field could be developed, they would make a real contribution to the refinement of content, methods of teaching, and evaluation of achievement. Newkirk and Greene state it this way:

> . . . The fact that the work in industrial education is not well standardized from school to school has been pointed out by many test workers as an insurmountable obstacle in the way of the construction of standardized industrial education tests, and it has been contended that further test construction should wait until the work is more definitely standardized. On the surface this seems logical, but in fact it has little foundation because, in other fields of instruction, the research work needed to validate a test has been one of the chief influences tending to standardize curricular content and establish levels of accomplishment. . . . These validation studies have a marked influence on teaching practice because they are put in the form of a test and the teacher can determine in part whether or not his course is valid by comparing it with the items in the test and the median results obtained with those of other schools. It is obvious, therefore, that standardized tests of achievement with the attending validation studies are one of the strongest influences tending to define and set up standards of accomplishment in industrial education courses.[7]

Reliable objective tests can be devised which can measure information about tools, materials, industry, ability in reading drawings, ability to use tools and machines, mechanical aptitude, intelligence, and personality traits. The more reliable information the teacher has about the

---

[7]Newkirk and Greene, op. cit., pp. 63-64.

ability and achievement of each student, the better his evaluation and the better the counseling he can give.

DELIMITATION OF THE STUDY

This study was restricted to a comparative study by measuring achievement in the seventh and eighth grade industrial arts classes of two first-class districts, three second-class districts, and two third-class districts. The achievement test was constructed, sent out to the schools to be administered, corrected, and the results tabulated. The results were evaluated by comparing the achievement of a large group of the students with their scores on Stanford Achievement tests. As only one form of the test was used, its reliability was determined by using the split-half method.[8] This was strictly an informational test, and not a performance test. The test was not re-written and given the second time.

---

[8]cf. post.,p. 24.

CHAPTER II

REVIEW OF RELATED LITERATURE

While not very much has been written about testing in the field of industrial arts, many books have been written about testing in other fields.

HISTORY OF TESTING

Micheels and Karnes trace the history of achievement testing back to the Old Testament. They also credit the Chinese with the use of examinations about the year 200 B.C. Socrates used oral achievement testing to quiz his pupils "not primarily to find out how much they knew, but rather to provide a basis upon which the individual's knowledge and understanding could be clarified, strengthened, and broadened."[1]

Horace Mann suggested the use of written examinations in 1845, and advocated that a large number of questions be used. He also commented upon the desirability of standardization. From these beginnings came the written essay-type question test which came in for criticisms from educators because of its unreliability and subjectivity. This wide-spread discontent was largely responsible for bringing about the birth of the scientific movement in testing.[2]

---

[1]William J. Micheels and M. Ray Karnes, Measuring Educational Achievement (New York: McGraw-Hill Book Company, Inc., 1950), p. 13.

[2]Ibid., p. 14.

Dr. E. L. Thorndike is generally considered one of the foremost pioneers in the development of the testing movement. He was the instructor in the first college course in educational measurements offered at Columbia University in 1902.[3] The first standardized tests were in the field of arithmetic, and were published in 1908.[4] By 1944 twenty million people in the United States, including those in the Armed Services, had taken sixty million standardized tests.

TYPES OF TESTS

Tests may be classified according to the uses to be made of them, or the kinds of abilities being measured.[6]

Achievement Tests. These tests are designed to measure relative accomplishment in a certain field. A diagnostic test is an achievement test designed primarily to reveal weaknesses or strengths.

Scholastic-aptitude Tests. These tests are generally known as intelligence tests.

---

[3] *Ibid.*, p. 13.

[4] Micheels and Karnes, *Measuring Educational Achievement*, (New York: McGraw-Hill Book Company, 1950) p. 15, citing *Arithmetical Abilities and Some Factors Determining Them*, Contributions to Education No. 19, (New York: Teachers College, Columbia University, 1908), p. 102.

[5] Micheels and Karnes, *op. cit.*, p. 15.

[6] Micheels and Karnes, *op. cit.*, pp. 23-24.

Special Aptitude Tests. Such tests are used to measure special abilities and also for prognostic purposes.

Interest Inventories. These are designed to show the general direction of an individual's interests.

Personality Instruments. These tests are for the purpose of determining how well the individual is adjusted personally and socially.

Since this study is concerned primarily with achievement testing, it will not go into other types of tests. The most commonly used achievement test batteries are the Metropolitan and the Stanford Achievement Tests. They are much alike in that they pretty well cover the elementary school curriculum. The Iowa Every-pupil Tests of Basic Skills and the California Achievement Tests are somewhat more limited in their scope, but they provide for diagnostic analysis in each area tested. The Unit Scales of Attainment, sometimes known as the Coordinated Scales of Attainment, are used to test at every level of the elementary school. Besides the fore-going well-known achievement tests, there are the Gray-Votaw General Achievement Tests, and the Modern School Achievement Tests.[7]

There are, also, some very well known achievement tests for use at high school and college level. The United States Armed Forces Institute makes use of achievement tests to evaluate a person's ability to profit by higher education.

---

[7]A. M. Jordan, Measurement in Education, McGraw-Hill Series in Education, (New York: McGraw-Hill Book Company, 1953), pp. 82-87.

TESTS IN THE INDUSTRIAL ARTS FIELD

Following are some of the published tests in the industrial arts field:

Hunter, William L., Shop Tests. These consist of twenty-five objective questions on the particular subject measured. There are tests in woodwork, mechanical drawing, machine shop, automobile mechanics, printing, and related subjects. Published by the Manual Arts Press, 1927, Peoria, Illinois. Newkirk and Greene report that these tests are too short to have a very high reliability individually, but in using a battery of the woodworking tests, they found coefficients of reliability as high as .85.[8]

Nash, H. B., and Van Duzee, R. R., The Nash-Van Duzee Industrial Arts Tests for Junior and Senior High School. This consists of two tests, Scale A and Scale B. Published by the Bruce Publishing Company, Milwaukee, 1927. Scale A is a test designed to measure the junior- and senior-high-school student's knowledge of processes, tools, materials, and information used in woodworking. Newkirk and Greene report that its validity is satisfactory in the light of common practice, and that its reliability is a little below the best academic tests of the same type.[9]

Scale B is a companion test to the one described above, but is a performance test. It is suitable for measuring manipulative achievement in junior- and senior-high-school hand woodwork. The reliability of this test is reported as varying from .60 to .80, which is too low for a first-class standardized test.[10]

Badger, Alex. J., Standard Test in Fundamental Mechanical Drawing. This test is published by the Public School Publishing Company, Bloomington, Illinois, 1929.[11] It has one form and three parts and is designed for use in grades 7-12.

[8] Newkirk and Greene, op. cit., 68.

[9] Newkirk and Greene, op. cit., 64.

[10] Newkirk and Greene, op. cit., 65-66.

[11] Newkirk and Greene, op. cit., 69-70.

Nash, H. B., and Van Duzee, R. R., Nash-Van Duzee Industrial Arts Test. Test II, Mechanical Drawing. Bruce Publishing Company, Milwaukee, Wisconsin, 1932. This test is divided into two parts and has two closely equivalent forms which are suitable for use in junior or senior high school. A manual of directions, scoring key, and class record sheet are provided. The test has been carefully validated, and the reliability was found to be .87 by correlating Form K with Form II, which is quite satisfactory.[12]

Fischer Mechanical Drawing Tests, Parts I and II, Published by the Bruce Publishing Company, Milwaukee, Wisconsin, 1929. Part I is an information test and Part II is a performance test. It was carefully validated on the basis of teaching practice. Its reliability was determined by giving the test twice to 150 sophomores in high school. This gave a correlation coefficient of .79, which is quite low for a standardized test.[13]

---

[12]Newkirk and Greene, op. cit., p. 71.

[13]Newkirk and Greene, op. cit., p. 70.

CHAPTER III

TECHNIQUE OF THE STUDY

FACTORS TO CONSIDER IN PLANNING THE TEST

Reliability

The consistency with which a measuring instrument can be expected to perform cannot be determined at the beginning stage of planning a test. However, since a long test is considered to be more reliable than a short one, a large number of test items should be gathered together to insure adequate sampling of the course objectives.[1]

Validity

Curricular validity has to be planned for by the test-maker or teacher. In the absence of a regular course of study in an area, as was the case in this study, the teacher must have some very definite objectives as to what the instruction at a given level should accomplish. Ross states it this way:

> . . . By curricular validity is meant the extent to which the content of the test is truly representative of the content of the course. Curricular validity implies an act of judgment as to the adequacy of the sampling included in the test.[2]

Another criterion to consider in regard to validity is the discriminating value of each question. A question which could be answered correctly by all pupils, or a question which no pupil could answer correctly, would have no discriminating value. To be valid, questions should be correctly answered more often by those students who are consistently better students.

---

[1]E. F. Lindquist, et. al., Educational Measurement (Washington: American Council on Education, 1951), p. 170.

[2]C. C. Ross, Measurement in Today's Schools (New York: Prentice-Hall, Inc., 1927), p. 70.

In planning for a test, in order to insure discriminating value of the questions, the maker of the test should select items of varying difficulty. This is especially important when the test is to be given to more than one grade and when the higher grade should be expected to be able to answer more questions correctly than the lower grade. The test in this study was planned for grades seven and eight.

The best way to plan the test to meet the criteria for validity would be to accumulate quite a body of items covering each specific objective to be covered by the test. These, in the case of this study, were formulated after examining the content of the course of study of the Spokane, Washington, public schools, and the textbook, Industrial Arts Woodworking, by John L. Feirer, Associate Director in Industrial Arts, Western Michigan College of Education.[5] Essentials of Woodworking, by Ira Samuel Griffith[6] was also used. With quite a large body of materials to choose from, it was possible to discard some of the items after a careful analysis of each item.

Usability of Test

In order to assure usability of the test, the number of questions should not be so large that the test could not be given in an average school period of forty-five minutes. Another factor in achieving usability is to have the instructions for administering the test typed and sent to those who will administer the test.

---

[5]John L. Feirer, Industrial Arts Woodworking (Peoria, Illinois: Chas. A. Bennett Company, Inc., 1916).

[6]Ira Samuel Griffith, Essentials of Woodworking, Thirteenth Edition. (Peoria, Illinois: The Manual Arts Press, 1916).

Since, in the case of this study, the plan was to have the test given in several schools, a number of different teachers administered it.[2] In order to have the conditions for administering the test uniform, directions were necessary.

In making plans for having the test administered, double postal cards were typed and sent out to different schools. Teachers were asked to return the card, filled in with the number of copies needed, if they were willing to participate in this study.

CONSTRUCTION OF THE TEST

In order to construct a reliable test, a large number of items should be included. However, Micheels and Karnes warn against including more items just for the sake of adding to the total number of points. They state, in part:

> . . . The exact number to use will depend upon the purpose of the test and the types of items selected. A few carefully prepared multiple-choice items may be much more valid and reliable than a large number of true-false questions prepared in a hurry. With this qualification in mind the suggestion still holds--include a large number of items.[3]

Greene, Jorgensen, and Gerberich point out to the inexperienced test maker some points to keep in mind and some pitfalls to avoid in making up tests.[4] The multiple-choice type of test is considered the most objective, especially when four or five alternatives are given for the pupil's choice.

---

[2]Cf. ante p. 6.

[3]Micheels and Karnes, op. cit., p. 136.

[4]Harry A. Greene, Albert N. Jorgensen, J. Raymond Gerberich, Measurement and Evaluation in the Elementary School (New York: Longmans, Green and Company, 1942), pp. 170 et. seqq.

The alternative choices should be plausible so that the pupil has to use a sense of discrimination in choosing the best possible answer. Sometimes it is possible to save the wrong responses given to questions, and, from these, make up the alternatives. As a rule wrong answers are given because they seem plausible to the pupil.

True-false tests should have about the same number of answers true as false. The use of specific determiners such as "always," "never," and "entirely," tend to cause a statement to be false, while words that limit the statement, such as "may," "sometimes," "as a rule," or "in general" are much more likely to be true than false. Such expressions should be avoided. It is best to get completely away from the language used in the text, as pupils with good rote memories may get the right answer without properly understanding why it is right. The answer should be suggested by the whole content of the question instead of by a leading word.

The simple-recall type of test question requires just one word, phrase, symbol, or a number in the answer. This type of question is not quite so objective as the multiple-choice type where the answer is given, but must be identified by the pupil as being the correct response.

Matching tests should have more items in Part II than in Part I in order to eliminate chance as much as possible. It is necessary to avoid clues, such as having singular or plural forms. In such cases it is possible for a student who does not know the correct answer to pair a singular subject with a singular verb or vice versa.

The completion type of question may have a sentence with a blank which must be filled in with the proper word, or a paragraph with several blanks. Another type of question lists a number of items and asks the pupil to place them in the proper order or sequence. Another type lists several items which are related and one which is not related and asks the pupil to pick out the unrelated item.

A sequence test is another type of test in which the pupil places the different items in the proper order.

After discarding a number of questions from those originally brought together for the test, in order to eliminate those which did not seem to be very strong, and in order to make the test the right length for a forty-five minute period, thirty true-false items are used; a matching test with five items; a multiple-choice section containing seven items, a sequence test in which the pupils put the items in proper order; a short test of five questions, each containing six answers, in which the pupil selected the unrelated item; and a completion section containing eighteen questions where the pupil was asked to supply the word which should be placed in the blank.

Each section was preceded by brief directions and an example numbered "0." This test, together with the instructions for administering, and the key, will be found in Appendix B of this study.

The test was mimeographed and sent to the schools which had indicated a willingness to participate in the study.

ANALYSIS OF THE RETURNED TESTS

Many of the smaller schools had reported that they did not offer industrial arts education in the seventh and eighth grades. One school offered industrial arts to eighth graders but not to seventh graders. This resulted in the sampling from the seventh grade from the second- and third-class districts being very small, a total of only twenty-eight pupils. The number of pupils participating is shown in Table No. I, Appendix A.

Upon receipt of the pupil-marked tests, they were scored and tabulated to determine the number of correct responses to each question. This tabulation, Table No. II, Appendix A, gives the correct answers submitted by grade, from first-class districts, in one column; and from second- and third-class districts combined in another column. The "grand total" column indicates the total number of correct responses for each item. The highest score made by any pupil was 56 out of the possible 70 points. This would seem to indicate that this test might be adapted for use at the ninth grade level as well as the seventh and eighth.

No question was answered correctly by all pupils; and no question was missed by all pupils. The question which received the most correct responses was in the true-false group. This question was so easy that it could have been correctly answered from knowledge gained in another class or life situation. In other words, it might be considered a test of general intelligence instead of industrial arts knowledge. This is the question: "A tool should be used carefully and for the purpose it was intended." Ninety-three per cent of the pupils answered this question correctly.

Another question which received a high percentage of correct responses was: "Nails are usually sold by the pound." Since true-false statements containing a limiting word, such as "usually," are more often true than false, this might have been a factor in its being answered correctly by eighty-nine percent of the pupils. However, there was a question requiring a negative response which contained the word "usually," also. Just about half of the students made the correct answer to this question: "A cross-cut saw usually has less teeth per inch than a rip saw."

The question found to be the hardest was in the completion section of the test. There were several answers close to the required exact word, but they could not be accepted for several reasons. This question would have made a much better multiple-choice item. The plausible answers given by the students could then be used along with the correct answer. The question, which is No. 58 on Table II, Appendix A, reads as follows: "The age of a tree is determined by counting the _______ rings." The word to be placed in the blank was "annual." Many pupils supplied similar words, such as "age." Since the word, "age," was contained in the statement, this answer was not accepted as correct. In analyzing this question and the answers given, the conclusion has been reached that it would make a very good multiple-choice item. In this way, the correct word would be supplied to the student along with other plausible and nearly correct answers, and the pupil would have a chance to discriminate in selecting the best response.

CHAPTER IV

EVALUATION OF THE RESULTS

RELIABILITY

The method used to determine the reliability of a test when it is not possible to administer two forms, or to administer the same test to the same group twice, is the Split-Half method. This method is used in determining the reliability coefficients for the Stanford Achievement tests.[1] However, the Stanford tests are based on random samples of pupils from thirty-four school systems. Truman L. Kelley and the others who set up the directions for administering the intermediate and advanced batteries suggest that when pupils in a single class or school are used, the reliability coefficients might be slightly lower than those yielded by their tests. The corrected Split-Half Reliability Coefficients range, on the Stanford tests, from .821 on the Paragraph Meaning test (ninth grade) to .941 on the spelling test (seventh grade). The lowest reliability coefficients for the eighth grade are on the Science and Study Skills tests. The Corrected Split-Half Reliability Coefficient is .83 on both of these tests.

The eighth grade of one of the larger school districts participating in this study was used in arriving at the reliability coefficient by the Split-Half method. This method is described by Torgerson and Adams.[2] The test was split into halves, using the questions with the odd numbers

---

[1] Truman L. Kelley, et al., "Directions for Administering," Stanford Achievement Test, Intermediate and Advanced Batteries, Forms J, K, L, M, and N (Yonkers-on-Hudson: World Book Company, 1953), p. 18.

[2] Theodore L. Torgerson and Georgia Sachs Adams, Measurement and Evaluation (New York: The Dryden Press, 1954), p. 388.

for one test, and the even-numbered questions for the other. Each pupil was scored on both of these tests. There were 192 eighth grade pupils. The scores made on the halves of the test were correlated using the Pearson-Products Moments Method shown below.[3]

$$r = \frac{M \text{ of } (A \times B) - (M_A \times M_B)}{\sqrt{M_{A^2} - (M_A)^2} \times \sqrt{M_{B^2} - (M_B)^2}}$$

As the resulting coefficient of reliability pertained to only one-half of the test, the Spearman-Brown formula was used to correct the reliability coefficient for the whole test. A test is generally considered to be more reliable if it is longer. The formula used to make this correction is:

$$r_n = \frac{n.r}{1 + (n - 1)\, r}$$

In this formula, r represents the found reliability coefficient, n represents the number of times the test's whole reliability, which is to be estimated, is longer than the one whose reliability is known, r_n equals the estimated reliability coefficient for test of increased length.[4]

By using this formula, a coefficient of reliability of .70 was given for one-half of the test, and .823 for the whole test as given to the 192 eighth grade pupils of one first-class district.

According to Odell, tests yielding reliability coefficients of from .80 to .89 are "satisfactory for group measurement, but only fairly so for individuals."[5] This is because the larger the group, the smaller the probable error.

---

[3]Clark L. Hull, Aptitude Testing (Yonkers-on-Hudson: World Book Company, 1928), p. 422.

[4]Torgerson and Adams, Op. cit., 388.

[5]C. W. Odell, Educational Measurement in High School (New York: The Century Company, 1930), p. 65.

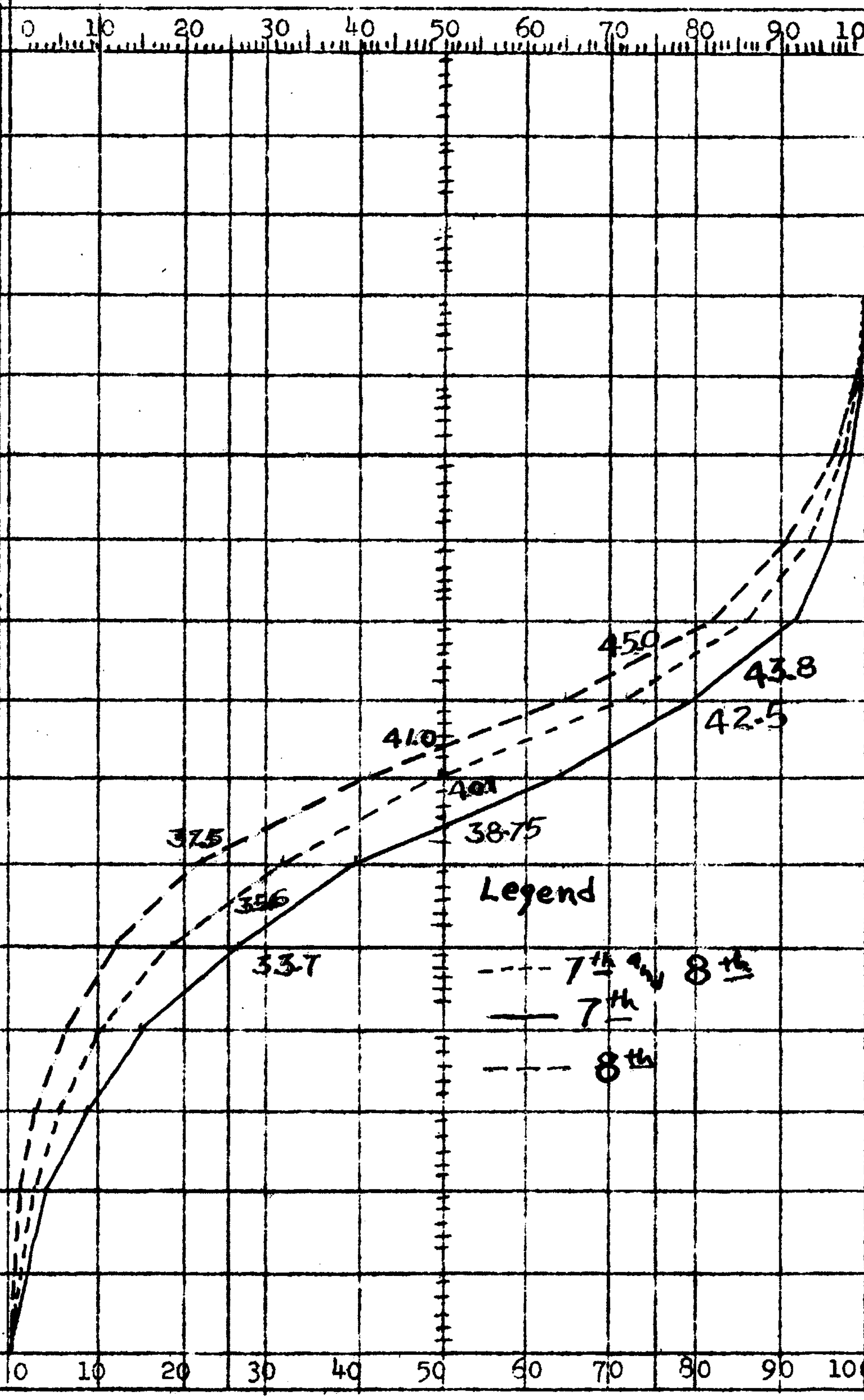
COMPARISON OF THE GROUPS TESTED

A comparison of the scores made by the 317 seventh graders and the 358 eighth graders tested is made in Percentile Graph No. 1. The lowest curve represents the seventh grade, the middle curve represents the seventh and eighth grades combined, and the upper group, the eighth grade alone. As can be noted, the eighth grade is substantially better or higher than the seventh grade. The median for the whole group was 40.1; the eighth grade median was 41; the seventh grade median, 38.75. Between the eighth grade and seventh grade medians there is a difference of 2.25 points. The range for the eighth grade is from 22 to 56, while the range for the seventh grade is from 19 to 54. The interquartile range for the eighth grade is slightly less than that of the seventh.

Percentile Graph No. 2 compares the eighth grade students from the first-class districts with the eighth grade students from the second- and third-class districts. This graph indicates that the students in the lower quartile from the smaller schools did substantially better than the students from the larger schools, while in the interquartile, the students from the larger schools did better. The smaller schools take the lead again in the upper quartile. There is less spread in the inter-quartile range of the smaller schools than that of the larger schools. Taken as a whole, this graph seems to indicate that the achievement of students of industrial arts, as measured by this test, is about the same in the smaller schools as in the larger schools. The curve for the smaller schools is a little more irregular because of the smaller number of pupils in this group.

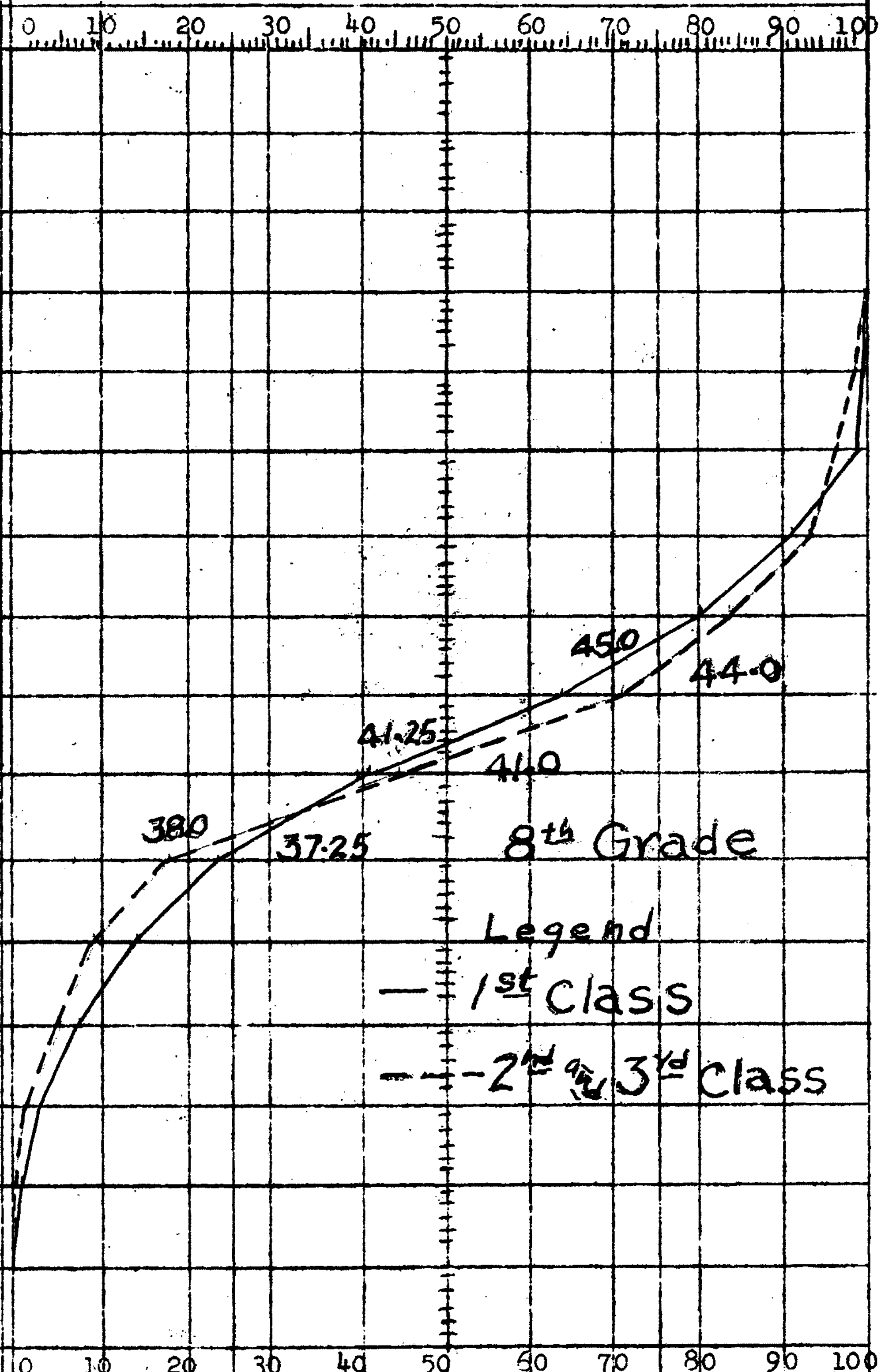
Percentile Graph No.1

Score	I	ST	I	ST
55	1	676	0	317
52	11	675	3	317
49	35	664	9	314
46	47	629	12	305
43	94	582	38	293
40	155	488	71	255
37	126	333	55	184
34	81	207	47	129
31	56	126	35	82
28	33	70	19	47
25	22	37	16	28
22	11	15	8	12
19	4	4	4	4



Percentile Graph No.2

Score	I	ST	I	ST
55	0	268	1	90
52	5	268	3	89
49	21	263	3	86
46	27	242	8	83
43	45	215	11	75
40	61	170	24	64
37	47	109	24	40
34	26	62	8	16
31	18	36	3	8
28	10	18	4	5
25	5	8	1	1
22	3	3	0	0
19	0	0	0	0



Ninety pupils in the eighth grade of the smaller schools took the test, and 268 eighth grade pupils from the larger schools.

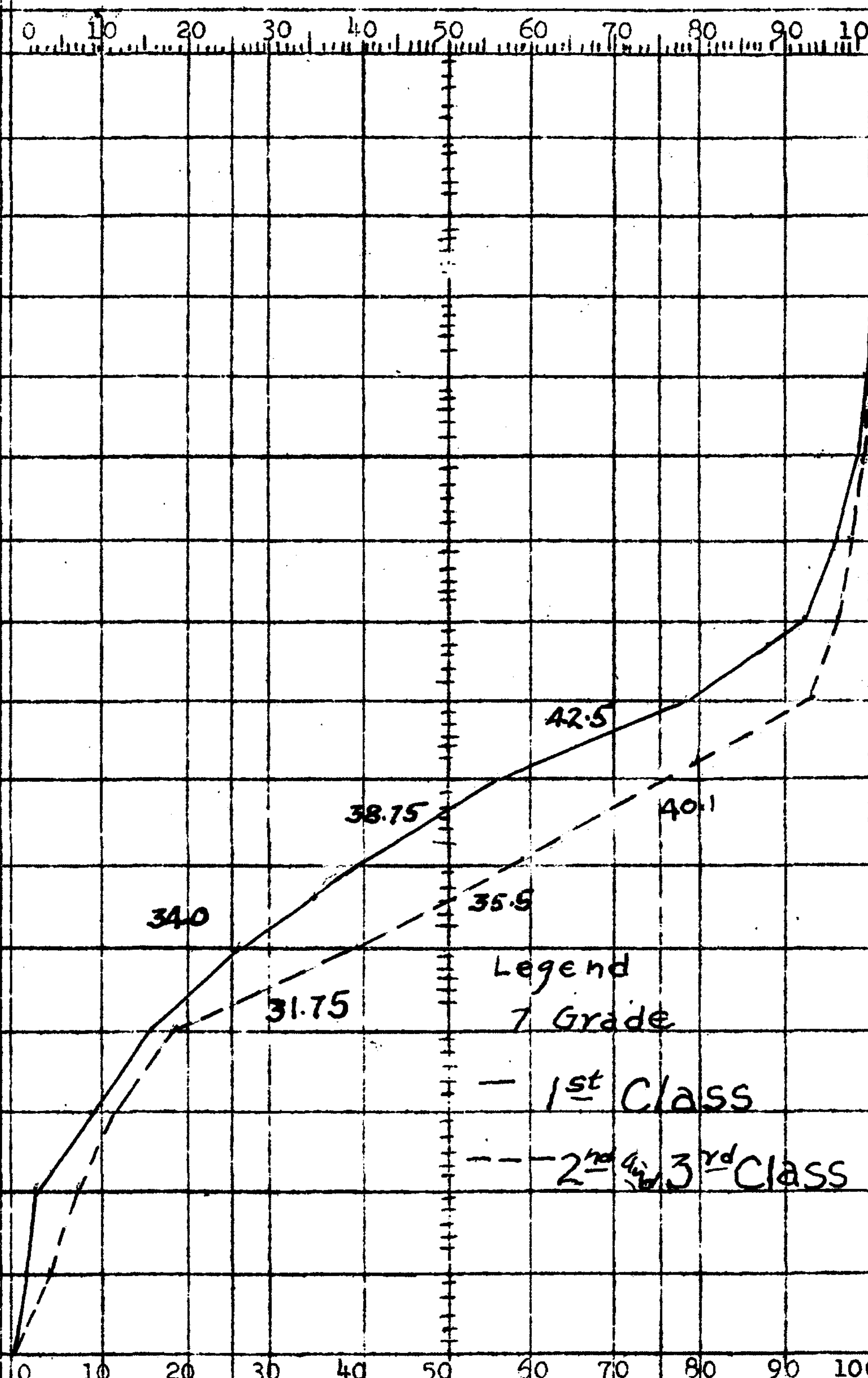
Percentile Graph No. 3 shows the seventh grade of the smaller schools as compared with the seventh grade of the larger schools. There were only 28 pupils in the seventh grade group from the smaller schools, while the larger schools had 289 seventh graders in the participating group. The fact that so few students were represented by this distribution curve for the seventh grade from the smaller schools makes it very irregular, and the scores in the interquartile range appear very much lower than those from the larger schools. This could be due to the fact that so few pupils were in this group. The lower and upper quartiles indicate that the curves might have been much closer together if the number of students in the two groups had been more nearly equal. The seventh graders from the smaller schools have a median score of 35.50, while the seventh graders from the larger schools have a median score of 38.75.

CORRELATION WITH SCORES ON STANFORD ACHIEVEMENT TESTS

It was not possible to obtain scores on Stanford Achievement tests for the whole group taking the industrial arts test. Neither was it possible to take into consideration the general intelligence of the pupils participating, except to the extent that the grade equivalent scores on Stanford tests reflect general intelligence of the 192 eighth grade pupils used. It was possible to obtain the scores made on Stanford tests for this group of 192 pupils from one first-class district. The correlation of the industrial arts score and the grade equivalent scores was determined by using

Percentile Graph No.3

Score	I	ST	I	ST
55	0	289	0	28
52	3	289	0	28
49	8	286	1	28
46	12	278	0	27
43	37	266	1	27
40	66	229	5	26
37	49	163	5	21
34	43	114	5	16
31	29	71	6	11
28	17	42	2	5
25	15	25	1	3
22	7	10	1	2
19	3	3	1	1



The same formula as was used in correlating the two halves of the test.[6] The coefficient of correlation was found to be .8914 and the probably error, ± .0141. The correlation of the industrial arts test with the Stanford Science scores was found to be .3315, and the probable error, ± .044.

[6]Cf. ante, p. 20.

CHAPTER V

SUMMARY AND CONCLUSIONS

IMPORTANCE OF INDUSTRIAL ARTS IN THE ELEMENTARY CURRICULUM

Because of the stress put upon developing the individual personality in today's schools, a definite line cannot be drawn between the objectives of general education and industrial arts education. They are the same. Because of the many changes in the last twenty-five years in today's highly mechanized society, much more is needed to fit boys and girls for citizenship and successful living than was the case a few decades ago. The Educational Policies Commission of the National Education Association states:

> Life in the United States has grown increasingly complex during the last century, and there is every indication that the complexities will multiply even further. To keep society moving forward and operating efficiently, American citizens must learn many things: They must have at hand a wide range of factual information; they must be familiar with the unwritten laws and mores of American behavior. "Know-how" in twentieth-century America is not confined to engineers and scientists; there is a "know-how" of ordinary living in our complex society which must be learned by the whole population. . . .
>
> Beyond the traditional fundamentals, however, are many additional learnings basic to American behavior. There are, for example, the essential attitudes and skills of teamwork, initiative, and honesty. There are such matters as reading newspapers with judgment, utilizing telephone and telegraph efficiently, driving trucks and automobiles safely, and handling efficiently the tools and machines essential to modern commerce and industry and agriculture. . . .[1]

Certainly, the junior high school is a good place to stress the use of tools, including their care and selection, and the ability to follow a plan to completion. Willingness to cooperate with others should also be

---

[1]Educational Policies Commission, Public Education and the Future of America (Washington: National Education Association of the United States, 1955), p. 86.

stressed, together with pride in workmanship and artistic appreciation.

There are many frustrations in school work for many boys and girls. The feeling that comes with being successful in accomplishing something worth while can be achieved many times in the industrial arts classes for those who have difficulty with academic subjects. This is not to say that those students who have difficulty with other subjects are the ones who will profit most from this type of work, but they are the ones who may sometimes become interested in school just because of this type of activity. Emotional health can best be promoted by experiencing success. The Educational Policies Commission states further:

> The public schools, with emphasis on the development of latent talents, may do much to enable all Americans to achieve the individual stature of cultivated persons. By opening up the avenues of literature, arts and sciences, of hobbies, of sports and athletics, the schools may contribute to the possibilities of self-realization."[2]

THE INDUSTRIAL ARTS ACHIEVEMENT TEST AS A MEASURING INSTRUMENT

Positive Values of the Test

This test is a good measuring instrument for industrial arts at the 7th and 8th grade level for several reasons: (1) It measures achievement at different grade levels as evidenced by the fact that the seventh graders ranked lower than the eighth. (2) The results correlate satisfactorily with scores on a standardized test.[3] (3) In making up the test items were carefully selected on the basis of their curricular validity. The opinions of other experienced teachers were solicited. (4) The test is easy to administer.

---

[2]*Ibid.*, p. 94.

[3]Cf. ante, p. 20.

SOME CRITICISMS AND RECOMMENDATIONS FOR IMPROVEMENT

In perfecting any test, some questions should be rewritten and improved. Some questions now in the true-false section might better be placed in a multiple-choice section.[3] Some questions of the true-false type, containing words like "usually," or "always," might be reworded.

Because all students were able to finish this test within the time allotted, it could be lengthened somewhat, allowing a greater number of multiple-choice items. However, as such questions take more time than true-false items, not more than ten questions should be added if all pupils are to have an opportunity to try every question.

This test may be adapted for all junior-high-school grades because many of the questions were not answered correctly by the best of the eighth grade students. There is plenty of room at the top if ninth graders performed correspondingly as well as the seventh and eighth graders. The highest score made was fifty-six out of a possible seventy points.

Further research in this field might include having the test administered to a large sampling of seventh and eighth grade students who have had no school training in industrial arts. The test could be doubled in length, making two equal forms. By the administration of equal forms to the same group of students its reliability could be more accurately determined.

---

[3]Cf. ante, pp. 22-23.

BIBLIOGRAPHY

BIBLIOGRAPHY

Educational Policies Commission, National Education Association of the United States and the American Association of School Administrators. Education and Economic Well-Being in American Democracy. Washington: National Education Association of the United States, 1940. 227 pp.

Educational Policies Commission, National Education Association of the United States and the American Association of School Administrators. Public Education and the Future of America. Washington: National Education Association of the United States, 1955. 98 pp.

Educational Policies Commission, National Education Association of the United States and the American Association of School Administrators. The Purposes of Education in American Democracy. Washington: National Education Association of the United States, 1938. 157 pp.

Feirer, John L. Industrial Arts Woodworking. Peoria, Illinois: Chas. A. Bennett Company, Inc., 1916. 295 pp.

Greene, Harry A., Albert N. Jorgensen, J. Raymond Gerberich. Measurement and Evaluation in the Elementary School. New York: Longmans, Green and Company, 1942. 639 pp.

Griffith, Ira Samuel. Essentials of Woodworking, Thirteenth Edition. Peoria, Illinois: The Manual Arts Press, 1916. 190 pp.

Hull, Clark L. Aptitude Testing. Yonkers-on-Hudson: World Book Company, 1928. 535 pp.

Jordan, A. M. Measurement in Education. New York: McGraw-Hill Series in Education, McGraw-Hill Book Company, 1953. 533 pp.

Kelley, Truman L., et al. "Directions for Administering," Stanford Achievement Test, Intermediate and Advanced Batteries, Forms J, K, L, M, and N. Yonkers-on-Hudson: World Book Company, 1953. 23 pp.

Lindquist, E. F., et. al. Educational Measurement. Washington, D. C.: American Countil on Education, 1951. 819 pp.

Micheels, William J., and M. Ray Karnes. Measuring Educational Achievement McGraw-Hill Series in Education. New York: McGraw-Hill Book Company, 1950. 496 pp.

Newkirk, Louis V. and Harry A. Greene. Tests and Measurements in Industrial Education. New York: John Wiley & Sons, Inc., 1935. 253 pp.

Odell, C. W. Educational Measurement in High School. New York: The Century Company, 1930. 620 pp.

Ross, C. C. Measurement in Today's Schools. New York: Prentice-Hall, Inc., 1947. 551 pp.

Shaw, John A., et al. "Industrial Arts Curriculum Outline, Seventh, Eighth, and Ninth Grades," Spokane: Spokane Trade School (printed) 1950. 29 pp.

Torgerson, Theodore L., and Georgia Sachs Adams. Measurement and Evaluation. New York: The Dryden Press, 1954. 489 pp.

APPENDIX A

TABLES

TABLE I

NUMBER OF TESTS RETURNED BY GRADE

AND TYPE OF SCHOOL

Grade	First-Class Schools	Second- and Third Class-Schools	Total
Seventh grade	289	28	317
Eighth grade	268	90	358
	557	118	675

TABLE II

CORRECT ANSWERS ON TEST QUESTIONS

True False	Eighth Grade				Seventh Grade			
Question No.	First-Class (268 Pupils)	Second- and Third-Class (90 pupils)	Total (358 Pupils)	First-Class (289 Pupils)	Second- and Third-Class (28 pupils)	Total (317 Pupils)	Grand Total (675 Pupils)
1	181	54	235	159	15	174	409
2	239	70	309	249	17	266	575
3	236	81	317	220	23	243	460
4	132	48	180	141	18	159	339
5	193	65	258	198	17	215	473
6	175	45	220	146	12	158	378
7	252	85	337	253	27	280	617
8	264	49	313	286	28	314	627
9	125	45	170	161	17	178	348
10	231	78	291	236	23	259	550
11	248	78	326	227	24	251	577
12	194	65	269	190	22	212	481
13	121	38	158	124	16	140	298
14	217	77	294	210	22	232	526
15	255	88	343	383	25	308	351
16	156	58	214	178	20	198	412
17	110	29	139	91	9	100	239
18	229	76	305	233	24	257	562
19	153	52	205	164	14	178	383

TABLE II (continued)

	Question No.	Eighth Grade: First-Class (268 Pupils)	Eighth Grade: Second- and Third-Class (90 pupils)	Eighth Grade: Total (358 Pupils)	Seventh Grade: First-Class (289 Pupils)	Seventh Grade: Second- and Third-Class (28 pupils)	Seventh Grade: Total (317 Pupils)	Grand Total (675 Pupils)
	20	209	70	279	236	24	260	537
	21	202	65	267	178	21	199	466
	22	256	87	343	273	25	298	641
	23	138	28	166	140	11	151	317
	24	89	35	124	74	12	86	210
	25	165	54	219	174	18	292	411
	26	146	54	200	132	18	150	350
	27	144	66	210	172	19	191	401
	28	223	69	292	186	22	208	500
	29	122	37	159	121	14	135	294
	30	147	52	199	174	12	186	385
Matching	31	101	23	124	89	8	97	221
	32	99	29	128	89	8	97	225
	33	57	33	90	76	5	81	171
	34	75	26	101	83	7	90	191
	35	59	22	81	64	5	69	150
Multiple Choice	36	233	72	305	198	20	218	523
	37	134	54	188	118	10	128	316
	38	189	70	259	176	20	196	455
	39	106	55	161	142	13	155	316
	40	104	32	136	119	7	126	262
	41	236	80	316	232	25	257	573
	42	169	49	218	160	13	173	391

TABLE II (continued)

Question No.	Eighth Grade First-Class (268 Pupils)	Eighth Grade Second- and Third-Class (90 pupils)	Eighth Grade Total (358 Pupils)	Seventh Grade First-Class (289 Pupils)	Seventh Grade Second- and Third-Class (28 pupils)	Seventh Grade Total (317 Pupils)	Grand Total (675 Pupils)
Sequence							
43	104	32	136	105	6	111	247
44	55	34	89	57	5	62	151
45	181	54	235	163	14	177	412
46	150	59	209	175	16	191	400
47	152	47	199	169	15	184	383
Unrelated							
48	174	58	232	168	15	183	415
49	234	77	311	232	23	255	466
50	45	12	57	33	3	36	93
51	182	67	249	215	20	235	484
52	78	22	100	37	4	41	141
Completion							
53	148	44	192	155	16	171	363
54	154	41	195	152	12	164	359
55	156	54	210	97	10	107	317
56	234	77	311	204	22	226	537
57	79	27	106	85	5	90	196
58	6	21	27	5	3	8	35
59	241	76	317	206	24	230	547
60	158	62	220	168	10	178	398
61	43	15	58	66	4	70	128
62	230	81	311	244	24	268	579
63	152	48	200	194	11	205	405

TABLE II (continued)

Question No.	Eighth Grade First-Class (268 Pupils)	Eighth Grade Second- and Third-Class (90 pupils)	Eighth Grade Total (358 Pupils)	Seventh Grade First-Class (289 Pupils)	Seventh Grade Second- and Third-Class (28 pupils)	Seventh Grade Total (317 Pupils)	Grand Total (675 Pupils)
64	176	57	233	170	18	188	421
65	52	25	77	86	5	91	168
66	202	63	265	153	11	164	429
67	51	26	77	53	2	55	132
68	39	5	44	31	2	33	77
69	182	53	235	157	18	175	410
70	35	20	55	46	4	50	105

APPENDIX B

THE TEST

SEVENTH AND EIGHTH GRADES INDUSTRIAL ARTS TEST

Your Name ______________________________ School ________________________

True-False

Directions: Write word "true" or "false" in blank before number.

True 0. Oily rags should be put in a metal can with air-tight lid.

_________ 1. A bench hook is a useful tool for holding a small board while it is being cut with a saw.

_________ 2. A good craftsman has tools piled on a table nearby for instant use.

_________ 3. A claw hammer should be used in removing large nails without the use of a block of wood for a fulcrum.

_________ 4. A cross-cut saw usually has less teeth per inch than a rip saw.

_________ 5. A wood chisel is not sharpened the same as a plane iron.

_________ 6. A marking gauge is used instead of a pencil to make a lay-out of a chamfer.

_________ 7. Nails are usually sold by the pound.

_________ 8. A tool should be used carefully and for the purpose it was intended.

_________ 9. A common nail is larger in diameter than a box nail of the same number.

_________10. The oak tree produces a wood that is classified as soft.

_________11. Finishes bring out the grain of the wood.

_________12. A saw and chisel are used to cut out dado joints.

_________13. Brads are similar to common nails but are very small.

_________14. Countersinking is boring a hole through the wood.

_________15. When a plane is not being used it should be placed on its side.

_________16. Scrapers are usually used on hard wood before sanding.

_________17. To apply filler first brush with the grain then across the grain.

__________18. When finishing a project where dust particles are in the air, use a fast drying finish.

__________19. It is better to clinch a nail with the grain of the wood than across the grain.

__________20. The rasp and cabinet file are used in smoothing out operations on curved surfaces.

__________21. A long plane is necessary for planing surfaces smooth and straight.

__________22. A screw driver should always be of the correct size and shape for the work.

__________23. Claw hammers are available in sizes from 5 oz. to 12 oz.

__________24. Lacquer is applied to a project in the same manner as varnish.

__________25. Enamel is applied to a project in the same manner as varnish.

__________26. Paste filler is used on close grained woods before finishing.

__________27. Water stains are cheap, have more uniform color, and are less likely to fade than oil stains, but they cause the grain of the wood to raise.

__________28. A very fine sandpaper is used to rub each coat of finish before applying the next.

__________29. The natural color of shellac is yellow.

__________30. The smallest gauge size of a $1\frac{1}{4}$" screw is No. 8.

Matching Test

Place the letter in the second column on the line to the left of number in first column for the best answer. Question No. 0 is answered for you.

__A__ 0.	Width of boards	(A)	vary by 2"
_____31.	Drill bits and gimlet bits	(B)	vary by 1/16"
_____32.	High-speed drills	(C)	vary by 1/32"
_____33.	Width of chisels and divisions on try square	(D)	vary by 1/64"
		(E)	vary by 1/4"
_____34.	Length of nails, less than No. 12	(F)	vary by 1/8"
_____35.	Auger bits	(G)	vary by 1"

Multiple-Choice

Directions: Place capital letter of the correct answer to the left of question.

Example:

__B_____ 0. A bevel is cut with a
(A) coping saw (B) plane (C) scraper (D) jack knife, (E) chisel

__________36. When striking a wood chisel, use a
(A) ball peen hammer (B) wood mallet (C) claw hammer (D) wrench (E) your hand

__________37. In cutting a 14" board to 12" width use a
(A) back saw (B) rip saw (C)cross-cut saw (D) coping saw, (E) key hole saw

__________38. The kind of wood usually used for construction of homes (rafters, sheeting, etc.)
(A) birch (B) maple (C) pine (D) bass wood (E) cedar

__________39. No. $\frac{1}{2}$ sandpaper is
(A) very smooth (B) very rough (C) medium (D) smooth

__________40. To obtain a natural finish that is not dull, use
(A) white shellac (B) stained varnish (C) white enamel (D) orange shellac (E) wax

__________41. Hammer handles are usually made of
(A) soft wood (B) hard wood (C) plastic (D) aluminum (E) fiberglass

__________42. To make a line square across a surface use a
(A) rule (B) T square (C) try-square (D) bevel square (E) yard stick

Sequence

Directions: Arrange letters for each step in the order in which you would perform the operations in squaring up stock. The first step is done for you as an example.

Example:

__________ 0. (A) Planing face side.

__________43. (B) Gauge and plane for thickness.

__________44. (C) Measure for length and square the end with face side and face edge.

__________45. (D) Plane face edge.

__________46. (E) Mark one end square, and square with face side and face edge.

__________47. (F) Measure for width, gauge, and square second edge with face side.

Unrelated

Directions: Put in space at left of number the letter of the term that does not belong in this group.

___D___ 0. Example: (A) rip (B) cross-cut (C) back (D) chisel (E) coping (F) key-hole

_________48. (A) brad (B) common (C) finish (D) casing (E) box (F) screw

_________49. (A) brace (B) auger bit (C) gimlet bit (D) drill bit (E) hand drill

_________50. (A) fore (B) smooth (C) Jack (D) spoke shave (E) joiner (F) block

_________51. (A) varnish (B) shellac (C) stain (D) thinner (E) filler (F) brush

_________52. (A) 2/0 (B) 0 (C) 1 (D) 1½ (E) 3/4 (F) 3/0

Completion

Directions: Place the correct word in the answer column which is to the left of the question number, as in No. 0.

Answer Column

__vise__ 0. Wood is held in a _(0)_ for planing the edge.

_________53. In a 2-view drawing, the _(1)_ view and the side view are shown.

_________54. In starting a saw for cutting, hold it at an angle of _(2)_ degrees.

_________55. A _(3)_ _(3)_ is used to drive a nail below the surface of the wood.

_________56. Circular lines are made with a _(4)_.

_________57. A _(5)_ saw is used for sawing where fine or close cuts are necessary.

_________58. The age of a tree is determined by counting the _(6)_ rings.

_________59. When sanding wood, sand _(7)_ the grain.

_________60. An _(8)_ is used to sharpen a shisel and plane iron.

_________61. To control the depth of the blade, use the _(9)_ adjustment.

_________62. Paint is thinned with _(10)_.

_________63. Apply pressure at the _(11)_ when starting a plane.

Completion (continued)

_________ 64. Chatter marks are caused by a __(12)__ blade or by not holding the plane firmly.

_________ 65. A No. 9 screw is __(13)__ in diameter than a No. 7 screw.

_________ 66. The parts of a project should be sanded __(14)__ before being assembled.

_________ 67. Straight shank drills are usually used in a __(15)__.

_________ 68. Drill pilot hole if assembling soft wood pieces __(16)__ the depth the screw is to go.

_________ 69. A screw driver should fit the slot of the screw and be the same width as the __(17)__ of the head.

_________ 70. When cutting with a chisel always cut with or __(18)__ the grain.

KEY

True-False

1. True
2. False
3. False
4. False
5. False
6. True
7. True
8. True
9. True
10. False
11. True
12. True
13. False
14. False
15. True
16. True
17. True
18. True
19. True
20. True
21. True
22. True
23. False
24. False
25. True
26. False
27. True
28. True
29. False
30. False

Matching Test

31. (C)
32. (D)
33. (F)
34. (E)
35. (B)

Multiple Choice

36. (B)
37. (B)
38. (C)
39. (C)
40. (A)
41. (B)
42. (C)

Sequence

43. (D)
44. (E)
45. (B), (F), or (C)
46. (F), (C), or (B)
47. (C), (B), or (F)

Unrelated

48. (F)
49. (F)
50. (D)
51. (F)
52. (E)

Completion

53. front
54. 40, 45, or 50, or 60, 65, 70 (about 45° or 65°
55. nail set
56. compass or dividers
57. back
58. annual
59. with
60. oil stone, whetstone, carborundum stone
61. adjustment, screw adjustment
62. thinner (paint) turpentine (water)
63. knob, front
64. loose
65. larger, greater
66. before
67. hand drill electric drill
68. one-half
69. diameter or width
70. across

DIRECTIONS FOR ADMINISTERING INDUSTRIAL ARTS TEST

Before beginning this test, have each student write his name and school in the spaces provided on the first page. Then have him put the class he is in (seventh or eighth) above the school name.

This test is designed to be completed in a forty-five minute period. Direct your students to try to answer all questions. Before beginning go over the sample questions. There is one provided at the beginning of each part of the test. When you are sure they know just how to indicate their answers have them begin writing.