1959

A Study to Determine the Order in Which Major Tools are Desired by Industrial Arts Instructors in South Dakota

Dwight J. Gertsen

A STUDY TO DETERMINE THE ORDER IN WHICH MAJOR TOOLS ARE DESIRED BY INDUSTRIAL ARTS INSTRUCTORS IN SOUTH DAKOTA

BY

DWIGHT J. GERTSEN

A problem submitted
in partial fulfillment of the requirements for the
degree Master of Education, Department of
Education, South Dakota State
College of Agriculture
and Mechanic Arts

August, 1959

ACKNOWLEDGMENTS

The writer wishes to extend sincere thanks to Dr. Harry Huls of the Education Department and to Professor Herold for their advice and help in the preparation and writing of this research problem. Appreciation is also expressed to the participating Industrial Arts teachers in South Dakota who answered the questionnaire which formed the basis for this problem.

D.J.G.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

INTRODUCTION

This problem was carried on in conjunction with the Industrial Arts Department of South Dakota State College upon the suggestion of Professor Herold. Superintendents throughout South Dakota had been contacting Professor Herold in regards to which major tools should be purchased for the Industrial Arts Department in their particular school.

The tool purchased by a school upon the recommendation of Professor Herold would be of little value if it did not fit the need of the course as taught by an industrial arts instructor. The selection of equipment in industrial arts or any course should be left up to the instructors and not the school administrator.

Statement of the Problem

The problem of this study was to father information necessary in establishing a rank order of major tools as desired by the industrial arts instructors in South Dakota. It was felt that the instructors in industrial arts were having little if anything to say regarding purchase of equipment for their departments.

Importance of the Study

The majority of the administrators and members of the Board of Education insist on an instructor to be properly trained in the area in which he is to teach, but at the same time it is quite often the case, that they will not let him select the equipment needed. This condition probably occurs more often in the area of industrial arts than in any other. Some of the reasons could possibly be: 1) Every administrator and board member has a preference of their own towards a particular tool, 2) The cost of equiping an industrial arts shop, 3) Lack of knowledge as to the purpose of industrial arts. They fail to realize that industrial arts is an exploratory field and this can not be accomplished if the proper equipment is not available.

It was felt that this study would contribute to the fact that the industrial arts instructors in South Dakota were in agreement and capable of selecting the equipment most essential in fitting an industrial arts department.

Professor Herold upon recommending a tool purchase can use the information obtained from this study as a basis for his recommendations.

Objectives

The primary objective of this study was to formulate a guide for school administrators or industrial arts instructors to consult when deciding which major tools are necessary for an industrial arts program. The study concerned the following factors:

1. The order of preference of major tools.
2. The size of tools desired.

Definition of Terms

Major tools as used in this survey refers to tools with a new value of $50 or more and those which are not classified as individual student equipment.

Rank order or mean rank is the order of desirability as determined by this research through information gathered from industrial arts instructors.

Scope and Limitations

This problem was confined to the 13 major tools used by industrial arts department in the area of advanced woodworking. The survey covers all secondary schools offering advanced woodworking in South Dakota.

It includes the order of preference and the size desired of each major tool without reference as to brand or manufacture.

Procedure

One questionnaire was prepared for this study. The questionnaire, appendix A, and a cover letter, appendix B, were mailed to 124 industrial arts instructors in South Dakota. The list of industrial arts instructors was taken from information obtained in a recent survey conducted by Wayne E. Salmen.[1] This survey was designed to obtain the order of preference and the size of the 13 major tools used in industrial arts departments. The first mailing was followed by a second to those instructors not responding to the first.

The information obtained from the questionnaires was tabulated, Table I, to facilitate easier handling. The mean rank of each tool was determined statistically, example on page 8. The chi square test of significance, page 2, was used to determine the probability of chance. The results were compiled into the tables and reports used in this problem.

---

[1] Wayne L. Salmen, "Industrial Arts Teacher Preparation and Curriculum Content in the Public Secondary Schools of South Dakota", M. S. Thesis Submitted to Faculty of South Dakota State College, (1959).

CHAPTER II

REVIEW OF LITERATURE

Literature in the industrial arts field was reviewed to determine what research had been previously carried on related to this problem. The reader will note that no research had been done on determining the order of desirability of major tools in the woodworking area. The books reviewed either listed and discussed the tools in alphabetical order or in order of work performed.

The only reference as to which tools are necessary was in, Advanced Woodworking and Furniture Making.[2] This quotation is found:

> You will find that it is not absolutely necessary to have all the different machines. It is essential, though, to have a circular saw, jointer, drill press with attachments, and a sander of some type.[2]

In regard to research in industrial arts in general this statement is to be found in the Education Research Encyclopedia.

> Research in industrial education has, to the present, played a minor part in the formulation of administrative policies and the development of methods. The whole field is in a state of constant change, making only fundamental kinds of research of any value.[3]

---

[2] John L. Feirer, Advanced Woodworking and Furniture Making. (Peoria, Illinois: Chas. A. Bennett Co., Inc., 1954) P. 156.

[3] Walter S. Monroe, (ed). Encyclopedia of Educational Research. 2 vols. New York: The Macmillan Co., 1950.

In review of the Educational Index and Readers Guide to Periodicals there were several articles in the industrial arts field but not any related to this problem in any way.

Summary

After reviewing 23 books; Educational Research Encyclopedia, Education Index, and Readers Guide to Periodiacals; it was quite evident that previous research related to this problem had not been conducted.

CHAPTER III

PRESENTATION AND ANALYSIS OF DATA

The main problem of this survey as stated in Chapter I was to determine the order of preference and the size of major tools desired by industrial arts instructors in South Dakota Secondary Schools. A questionnaire, appendix A, accompanied by a cover letter, appendix B, was sent to industrial arts instructors in South Dakota.

In preparing the questionnaire, tools costing over $50 were used as the basis for establishing them as major tools, as these seem to be the most difficult to get purchase approval on from the Board of Education.

The tools were listed alphabetically on the questionnaire and the industrial arts instructors were to number each tool in order of preference; the size they would desire in each tool; and whether a tilt table or tilt arbor circular saw was most desired. Questionnaires were sent to 124 industrial arts instructors teaching in South Dakota Secondary Schools. The first mailing resulted in 76 questionnaires, or 61%, being returned within two weeks. The questionnaire was again sent out to the 48 industrial arts instructors failing to respond to the first mailing. The second mailing resulted in the return of 22 questionnaires, bringing the total returns to 98, or 79%. Of the 98 re-

turned six were returned blank, two of which were marked so as to indicate that advance woodworking was not offered in those particular schools. This left 92 questionnaires of value for the analysis of this problem.

Several of the questionnaires returned had a tool marked not desirable. To make it possible to compute the results statistically, the not desirable results were ranked as number 14. The reader will keep in mind that rank number 14 as it appears in Tables I, III through XV indicates that the tool was not desired. Using Table III as an example there are two returned in fo column, frequency obtained, ranked fourteenth. Indicating that two industrial arts instructors do not desire a drill press. The preference results were tabulated, Table I, to facilitate easy handling in computing the results. After the tabulation the rank order, Table II, was established. The formula used was as follows:[4]

$$M = \frac{fx}{N}$$

in which f is the frequency of desirability; x is the rank; N is the total of number of returns.

The mean rank of the circular saw, jointer, and

---

[4]Henry E. Garrett, Statistics in Psychology and Education, pp. 28-30, Longmans, Green and Co.: New York., 1958.

drill press follow John L. Feirer's[5] recommendation that an industrial arts woodworking shop should not be without these three pieces of equipment.

The probability of the mean rank was treated statistically using the chi square test of significance.[6] (Table III - XV). The equation used is as follows:

$$\text{chi-square} = \Sigma\left[\frac{(fo - fe)^2}{fe}\right]$$

in which fo is the frequency of occurrence of observed facts; fe is the expected frequency of occurrence. Yates' correction for continuity was used throughout on Tables III - XV. Using Table XV as an example, the use of the chi square test of significance may be further explained as follows:

	Tilt Arbor	Tilt Table	Total
Observed (fo)	89	3	92
Expected (fe)	46	46	92
(fo - fe)	43	-43	
Correction (-.5)	42.5	-43.5	
$(fo - fe)^2$	1806.25	1892.25	
$\frac{(fo - fe)^2}{fe}$	19.63	20.56	

---

[5] Feirer, loc. cit.

[6] Garrett, op. cit., pp. 254-258.

Chi-square = 40.19
Degrees of freedom = 1
Probability (P) - .01 as found in the Chi-square Table.[7]

Chi square of Table XVI is 40.19 therefore the probability is very significant at the .01 level of significance.

The chi square of Tables III, IV, VI, VII, VIII, X, XI, XII, XIII, XIV, and XV far exceed the .01 level of significance at 13 degrees of freedom.[8] The chi square for Tables V and IX lies between probability .05 and .02 therefore the probability is significant at the five per cent but not at the two per cent level. By looking at Tables III through XV the reader will be able to better understand the level of significance of mean rank of each tool.

The second part of the questionnaire relating to the size of the tools desired was of little value as this part was not completed on the majority of the returns. Of the 92 questionnaires returned, the size was indicated on only 14, seven were left blank as to size, and on 71 returns the industrial arts instructors indicated that they were not familiar with the various sizes of machines available. This appears to be in agreement with Salmen's[9] findings

---

[7] Ibid., p. 450 (Table E).
[8] Ibid.
[9] Salmen, op. cit., pp. 48-49

concerning the lack of preparation by industrial arts instructors.

The results of the completed returns with the minimum and the maximum are as follows:

Tool	Size
Drill Press	16" - 28"
Jointer	6" - 8" 28" - 42" bed
Lathe	8" - 12" swing 24" - 36" bed
Mitre Box	6" x 24" - 6" x 30"
Router	½ - 1½ hp.
Sander, Finishing	3" x 5" - 4" x 9"
Sander, Belt & Disc	6" - 8" disc 4" - 6" belt
Sander, Belt Portable	3" x 24" - 4" x 28"
Saw, Band	12" x 16"
Saw, Circular	6" - 12"
Saw, Jig	14" - 24"
Shaper	12" x 24" - 27" x 28" Table size
Surface Planer	5" x 13" - 6" x 24"

The comments on the questionnaire generally stated that heavy duty tools should always be purchased as light tools will not stand the use and abuse they receive in a school shop.

TABLE I. PREFERENCE RESULTS TABULATED FROM QUESTIONNAIRE

	RANK ORDER AS OBTAINED FROM QUESTIONNAIRE													
Tool	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Drill Press	1	14	14	20	13	8	10	9	1	0	0	0	0	2
Jointer	0	32	25	5	11	4	6	6	1	1	0	0	0	1
Lathe	1	4	13	19	14	14	5	6	5	5	1	2	1	2
Mitre Box	14	3	7	12	9	7	7	6	4	6	7	1	6	3
Router	0	0	1	2	2	3	10	16	19	12	10	10	4	3
Sander, Finishing	0	1	1	4	5	4	12	12	4	6	14	17	6	6
Sander, Belt & Disc	0	0	4	3	1	5	9	2	17	13	11	9	14	4
Sander, Belt Portable	1	3	4	6	14	17	9	4	7	6	6	8	4	3
Saw, Band	1	5	8	11	10	13	17	11	6	3	2	3	1	1
Saw, Circular	71	14	3	1	2	0	0	0	0	0	0	0	0	1
Saw, Jig	5	13	14	10	7	11	6	4	7	9	2	2	0	2
Shaper	0	0	0	0	1	2	3	10	16	18	14	13	8	7
Surface Planer	0	2	2	0	2	3	4	5	9	9	13	17	20	6

TABLE II MEAN RANK OF DESIRABILITY OF TOOLS BY INDUSTRIAL ARTS INSTRUCTORS

Tool	Mean Rank
Circular Saw	1.475
Jointer	3.926
Drill Press	4.913
Jig Saw	5.520
Lathe	5.782
Mitre Box	6.287
Band Saw	6.467
Belt Sander, Portable	7.597
Shaper	9.282
Router	9.260
Planer	9.435
Finishing Sander	9.630
Belt & Disc Sander	9.710

TABLE III. CHI-SQUARE TEST OF SIGNIFICANCE FOR THE RESPONSES TO QUESTION PERTAINING TO DRILL PRESS

Rank	fo	fe	(fo-fe)	(-.5)	$(fo-fe)^2$	$\frac{(fo-fe)^2}{fe}$
1	5	6.57	-1.57	-2.07	4.28	.65
2	13	6.57	6.43	5.93	35.16	5.37
3	14	6.57	7.43	6.93	48.02	7.32
4	10	6.57	3.43	2.93	8.58	1.31
5	7	6.57	.43	-.07	.0049	.01
6	11	6.57	4.43	3.93	15.44	2.33
7	6	6.57	-.57	1.07	1.14	.17
8	4	6.57	-2.57	-3.07	9.42	1.43
9	7	6.57	.43	-.07	.0049	.01
10	9	6.57	2.43	1.93	3.72	.57
11	2	6.57	-4.57	-5.07	25.70	3.92
12	2	6.57	-4.57	-5.07	25.70	3.92
13	0	6.57	-6.57	-7.07	49.98	7.61
14	2	6.57	-4.57	-5.07	25.70	3.92
	92	92				38.54

df = 13

for P .01 Chi square is 27.688[10]

Drill Press = Chi square 54.40

Very significant at .01

[10] Ibid., p 450 (Table E).

TABLE IV. CHI-SQUARE TEST OF SIGNIFICANCE FOR THE RESPONSES TO QUESTION PERTAINING TO JOINTER

Rank	fo	fe	(fo-fe)	(-.5)	$(fo-fe)^2$	$\frac{(fo-fe)^2}{fe}$
1	0	6.57	-6.57	-7.07	49.98	7.61
2	32	6.57	25.43	24.93	620.01	94.37
3	25	6.57	18.43	17.93	320.41	48.76
4	5	6.57	-1.57	-2.07	4.28	.65
5	11	6.57	4.43	3.93	15.44	2.33
6	4	6.57	-2.57	-3.07	9.42	1.43
7	6	6.57	-.57	-1.07	1.14	.17
8	6	6.57	-.57	-1.07	1.14	.17
9	1	6.57	-5.57	-6.07	36.84	5.60
10	1	6.57	-5.57	-6.07	36.84	5.60
11	0	6.57	-6.57	-7.07	49.98	7.61
12	0	6.57	-6.57	-7.07	49.98	7.61
13	0	6.57	-6.57	-7.07	49.98	7.61
14	1	6.57	-5.57	-6.07	36.84	5.60
	92	92				195.12

Very significant at the one per cent level.

TABLE V. CHI-SQUARE TEST OF SIGNIFICANCE FOR THE RESPONSES TO QUESTION PERTAINING TO LATHE

Rank	fo	fe	(fo-fe)	(-.5)	$(fo-fe)^2$	$\frac{(fo-fe)^2}{fe}$
1	1	6.57	-5.57	-6.07	36.84	5.60
2	4	6.57	-2.57	-3.07	9.42	1.43
3	13	6.57	6.43	5.93	31.16	5.37
4	19	6.57	12.43	11.93	141.61	21.60
5	14	6.57	7.43	6.93	48.02	7.32
6	14	6.57	7.43	6.93	48.02	7.32
7	5	6.57	-1.57	-2.07	4.28	.65
8	6	6.57	-.57	-1.07	1.11	.17
9	5	6.57	-1.57	-2.07	4.28	.65
10	5	6.57	-1.57	-2.07	4.28	.65
11	1	6.57	-5.57	-6.07	36.84	5.60
12	2	6.57	-4.57	-5.07	25.70	3.92
13	1	6.57	-5.57	-6.07	36.84	5.60
14	2	6.57	-4.57	-5.07	25.70	3.92
	92	92				69.80

Very significant at the one per cent level.

TABLE VI. CHI-SQUARE TEST OF SIGNIFICANCE FOR THE RESPONSES TO QUESTION PERTAINING TO MITRE BOX

Rank	fo	fe	(fo-fe)	(-.5)	$(fo-fe)^2$	$\frac{(fo-fe)^2}{fe}$
1	14	6.57	7.43	69.3	48.02	7.32
2	3	6.57	-3.57	-4.07	16.56	2.52
3	7	6.57	.43	-.07	.0049	.01
4	12	6.57	5.43	4.93	24.30	3.70
5	9	6.57	2.43	1.93	3.72	.57
6	7	6.57	.43	-.07	.0049	.01
7	7	6.57	.43	-.07	.0049	.01
8	6	6.57	-.57	-1.07	1.14	.17
9	4	6.57	-2.57	-3.07	9.42	1.43
10	6	6.57	-.57	-1.07	1.14	.17
11	7	6.57	.43	-.07	.0049	.01
12	1	6.57	-5.57	-6.07	36.84	5.60
13	6	6.57	-.57	-1.07	1.14	.17
14	3	6.57	-3.57	-4.07	16.56	2.52
	92	92				24.21

Significant at the .05 but not at the .02 level.

TABLE VII. CHI-SQUARE TEST OF SIGNIFICANCE FOR THE RESPONSES TO QUESTION PERTAINING TO ROUTER

Rank	fo	fe	(fo-fe)	(-.5)	$(fo-fe)^2$	$\frac{(fo-fe)^2}{fe}$
1	0	6.57	-6.57	-7.07	49.98	7.61
2	0	6.57	-6.57	-7.07	49.98	7.61
3	1	6.57	-5.57	-6.07	36.84	5.60
4	2	6.57	-4.57	-5.07	25.70	3.92
5	2	6.57	-4.57	-5.07	25.70	3.92
6	3	6.57	-3.57	-4.07	16.56	2.52
7	10	6.57	3.43	2.93	8.58	1.31
8	16	6.57	9.43	8.93	79.74	1.21
9	19	6.57	12.43	11.93	141.61	21.60
10	12	6.57	5.43	4.93	24.30	3.70
11	10	6.57	3.43	2.93	8.58	1.31
12	10	6.57	3.43	2.93	8.58	1.31
13	4	6.57	-2.57	-3.07	9.42	1.43
14	3	6.57	-3.57	-4.07	16.56	2.52
	92	92				65.57

Very significant at the one per cent level.

TABLE VIII. CHI-SQUARE TEST OF SIGNIFICANCE FOR THE RESPONSES TO QUESTION PERTAINING TO SANDER, FINISHING

Rank	fo	fe	(fo-fe)	(-.5)	$(fo-fe)^2$	$\frac{(fo-fe)^2}{fe}$
1	0	6.57	-6.57	-7.07	49.98	7.61
2	1	6.57	-5.57	-6.07	36.84	5.60
3	1	6.57	-5.57	-6.07	36.84	5.60
4	4	6.57	-2.57	-3.07	9.42	1.43
5	5	6.57	-1.57	-2.07	4.28	.65
6	4	6.57	-2.57	-3.07	9.42	1.43
7	12	6.57	5.43	4.93	24.30	3.70
8	12	6.57	5.43	4.93	24.30	3.70
9	4	6.57	-2.57	-3.07	9.42	1.43
10	6	6.57	-.57	-1.07	1.14	.17
11	14	6.57	7.43	6.93	48.02	7.32
12	17	6.57	10.43	9.93	98.60	1.50
13	6	6.57	-.57	-1.07	1.14	.17
14	6	6.57	-.57	-1.07	1.14	.17
	92	92				40.48

Very significant at the one per cent level.

TABLE IX. CHI-SQUARE TEST OF SIGNIFICANCE FOR THE RESPONSES TO QUESTION PERTAINING TO SANDER, BELT & DISC

Rank	fo	fe	(fo-fe)	(-.5)	$(fo-fe)^2$	$\frac{(fo-fe)^2}{fe}$
1	0	6.57	-6.57	-7.07	49.98	7.61
2	0	6.57	-6.57	-7.07	49.98	7.61
3	4	6.57	-2.57	-3.07	9.42	1.43
4	3	6.57	-3.57	-4.07	16.56	2.52
5	1	6.57	-5.57	-6.07	36.84	5.60
6	5	6.57	-1.57	-2.07	4.28	.65
7	9	6.57	2.43	1.93	3.72	.57
8	2	6.57	-4.57	-5.07	25.70	3.92
9	17	6.57	10.43	9.93	98.6	1.50
10	13	6.57	6.43	5.93	35.16	5.37
11	11	6.57	4.43	3.93	15.44	2.33
12	9	6.57	2.43	1.93	3.72	.57
13	14	6.57	7.43	6.93	48.02	7.32
14	4	6.57	-2.57	-3.07	9.42	1.43
	92	92				51.93

Very significant at the one per cent level.

TABLE X. CHI-SQUARE TEST OF SIGNIFICANCE FOR THE RESPONSES TO QUESTION PERTAINING TO SANDER, BELT PORTABLE

Rank	fo	fe	(fo-fe)	(-.5)	$(fo-fe)^2$	$\frac{(fo-fe)^2}{fe}$
1	1	6.57	-5.57	-6.07	36.84	5.60
2	3	6.57	-3.57	-4.07	16.56	2.52
3	4	6.57	-2.57	-3.07	9.42	1.43
4	6	6.57	-.57	-1.07	1.11	.17
5	14	6.57	7.43	6.93	48.02	7.32
6	17	6.57	10.43	9.93	98.6	1.50
7	9	6.57	2.43	1.93	3.72	.57
8	4	6.57	2.57	-3.07	9.42	1.43
9	7	6.57	.43	-.07	.0049	.01
10	6	6.57	-.57	-1.07	1.11	.17
11	6	6.57	-.57	-1.07	1.11	.17
12	8	6.57	1.43	.93	.86	.13
13	4	6.57	-2.57	-3.07	9.42	1.43
14	3	6.57	-3.57	-4.07	16.56	2.52
	92	92				24.97

Significant at the .05 but not at the .02 level.

TABLE XI. CHI-SQUARE TEST OF SIGNIFICANCE FOR THE RESPONSES TO QUESTION PERTAINING TO SAW, BAND

Rank	fo	fe	(fo-fe)	(-.5)	$(fo-fe)^2$	$\frac{(fo-fe)^2}{fe}$
1	1	6.57	-5.57	-6.07	36.84	5.60
2	5	6.57	-1.57	-2.07	4.28	.65
3	8	6.57	1.43	.93	.86	.13
4	11	6.57	4.43	3.93	15.44	2.33
5	10	6.57	3.43	2.93	8.58	1.31
6	13	6.57	6.43	5.93	35.16	5.37
7	17	6.57	10.43	9.93	98.60	1.50
8	11	6.57	4.43	3.93	15.44	2.33
9	6	6.57	-.57	-1.07	1.11	.17
10	3	6.57	-3.57	-4.07	16.56	2.52
11	2	6.57	-4.57	-5.07	25.70	3.92
12	3	6.57	-3.57	-4.07	16.56	2.52
13	1	6.57	-5.57	-6.07	36.84	5.60
14	1	6.57	-5.57	-6.07	36.84	5.60
	92	92				39.55

Very significant at the one per cent level.

TABLE XII. CHI-SQUARE TEST OF SIGNIFICANCE FOR THE RESPONSES TO QUESTION PERTAINING TO SAW, CIRCULAR

Rank	fo	fe	(fo-fe)	(-.5)	$(fo-fe)^2$	$\frac{(fo-fe)^2}{fe}$
1	71	6.57	64.43	63.93	4089.04	622.37
2	14	6.57	7.43	6.93	48.02	7.32
3	3	6.57	-3.57	-4.07	16.56	2.52
4	1	6.57	-5.57	-6.07	36.84	5.60
5	2	6.57	-4.57	-5.07	25.70	3.92
6	0	6.57	-6.57	-7.07	49.98	7.61
7	0	6.57	-6.57	-7.07	49.98	7.61
8	0	6.57	-6.57	-7.07	49.98	7.61
9	0	6.57	-6.57	-7.07	49.98	7.61
10	0	6.57	-6.57	-7.07	49.98	7.61
11	0	6.57	-6.57	-7.07	49.98	7.61
12	0	6.57	-6.57	-7.07	49.98	7.61
13	0	6.57	-6.57	-7.07	49.98	7.61
14	1	6.57	-5.57	-6.07	36.84	5.60
	92	92				708.21

Very significant at the one per cent level.

TABLE XIII. CHI-SQUARE TEST OF SIGNIFICANCE FOR THE RESPONSES TO QUESTION PERTAINING TO SAW, J1G

Rank	fo	fe	(fo-fe)	(-.5)	$(fo-fe)^2$	$\frac{(fo-fe)^2}{fe}$
1	5	6.57	-1.57	-2.07	4.28	.65
2	13	6.57	6.43	5.93	35.16	5.37
3	14	6.57	7.43	6.93	48.02	7.32
4	10	6.57	3.43	2.93	8.58	1.31
5	7	6.57	.43	-.07	.0049	.01
6	11	6.57	4.43	3.93	15.44	2.33
7	6	6.57	-.57	-1.07	1.14	.17
8	4	6.57	-2.57	-3.07	9.42	1.43
9	7	6.57	.43	-.07	.0049	.01
10	9	6.57	2.43	1.93	3.72	.57
11	2	6.57	-4.57	-5.07	25.70	3.92
12	2	6.57	-4.57	-5.07	25.70	3.92
13	0	6.57	-6.57	-7.07	49.98	7.61
14	2	6.57	-4.57	-5.07	25.70	3.92
	92	92				48.54

Very significant at the one per cent level.

TABLE XIV. CHI-SQUARE TEST OF SIGNIFICANCE FOR THE RESPONSES TO QUESTION PERTAINING TO SHAPER

Rank	fo	fe	(fo-fe)	(-.5)	$(fo-fe)^2$	$\frac{(fo-fe)^2}{fe}$
1	0	6.57	-6.57	-7.07	49.98	7.61
2	0	6.57	-6.57	-7.07	49.98	7.61
3	0	6.57	-6.57	-7.07	49.98	7.61
4	0	6.57	-6.57	-7.07	49.98	7.61
5	1	6.57	-5.57	-6.07	36.84	5.60
6	2	6.57	-4.57	-5.07	25.70	3.92
7	3	6.57	-3.57	-4.07	16.56	2.52
8	10	6.57	3.43	2.93	8.58	1.31
9	16	6.57	9.43	8.93	79.74	1.21
10	18	6.57	11.43	10.93	118.81	18.10
11	14	6.57	7.43	6.93	48.02	7.32
12	13	6.57	6.43	5.93	31.16	5.37
13	8	6.57	1.43	.93	.86	.13
14	7	6.57	.43	-.07	.0049	.01
	92	92				75.93

Very significant at the one per cent level.

TABLE XV. CHI-SQUARE TEST OF SIGNIFICANCE FOR THE RESPONSES TO QUESTION PERTAINING TO SURFACE, PLANER

Rank	fo	fe	(fo-fe)	(-.5)	$(fo-fe)^2$	$\frac{(fo-fe)^2}{fe}$
1	0	6.57	-6.57	-7.07	49.98	7.61
2	2	6.57	-4.57	-5.07	25.70	3.92
3	2	6.57	-4.57	-5.07	25.70	3.92
4	0	6.57	-6.57	-7.07	49.98	7.61
5	2	6.57	-4.57	-5.07	25.70	3.92
6	3	6.57	-3.57	-4.07	16.56	2.52
7	4	6.57	-2.57	-3.07	9.42	1.43
8	5	6.57	-1.57	-2.07	4.28	.65
9	9	6.57	2.43	1.93	3.72	.57
10	9	6.57	2.43	1.93	3.72	.57
11	13	6.57	6.43	5.93	35.16	5.37
12	17	6.57	10.43	9.93	98.60	1.50
13	20	6.57	13.43	12.93	166.41	25.30
14	6	6.57	-.57	-1.07	1.11	.17
	92	92				65.06

Very significant at the one per cent level.

TABLE XVI PREFERENCE BETWEEN TILT ARBOR AND TILT TABLE CIRCULAR SAW

Tilt Arbor	Tilt Table
89	3
97%	3%

Chi square 40.19

Very significant at the one per cent level.

It is very evident that the industrial arts instructors desire the tilt arbor circular saw. It would be unwise for an administrator to purchase a tilt table circular saw for the school shop as it would not fit the program of the industrial arts instructor.

Summary

The results obtained from the 92 questionnaires returned from the 124 industrial arts instructors to whom they were sent were treated statistically with the exception of the desirability of size.

It was evident by computing the mean rank of each tool that the industrial arts instructors were in definite agreement as to their choice of the circular saw, jointer, and drill press as the first three tools desired in a shop. The jig saw and the lathe ranked closely as to fourth and fifth choice. The ranking of the sixth and seventh choice between the mitre box and the band saw. The portable belt sander was eighth in the mean rank. The shaper, router, planer, finishing sander and belt & disc sander in this order ranked closely in nine through thirteen.

The following is the order in which the major tools are desired by industrial arts instructors: 1) Circular saw, 2) Jointer, 3) Drill press, 4) Jig saw, 5) Lathe, 6) Mitre box, 7) Band saw, 8) Belt sander, portable, 9) Shaper, 10) Router, 11) Planer, 12) Finishing sander, and 13) Belt & disc sander.

Ninety seven per cent of the industrial arts instructors preferred the tilt arbor circular saw over the tilt table circular saw.

The results obtained as to sizes desirable are inconclusive due to the lack of response towards this part of the questionnaire. The sizes desired by those having a preference were too varied to establish a definite choice. The remainder of the industrial arts instructors indicated they were not familiar enough with the sizes available to make a selection as to the most desirable size for their program.

CHAPTER IV

SUMMARY, RECOMMENDATIONS, AND FUTURE STUDIES

Summary

This study has brought out the fact that industrial arts instructors are capable of deciding upon the necessary equipment and that they are also in agreement with Feirer[11] as to the three most necessary tools. The high level of confidence established by the chi square test of significance supports the agreement among instructors.

The lack of knowledge as to sizes available is not necessarily a factor to be used in taking the selection of tools away from the industrial arts instructor as this information could be readily obtained if the need should arise.

There appeared to be considerable interest in this problem as 47 of the 92 industrial arts instructors returning questionnaires indicated they desired the results obtained. The industrial arts instructors at General Beadle State Teachers College and Southern State Teachers College desired the results of this study and commented on the need of such a research undertaking.

---

[11] Ibid., loc. cit.

The following is the order in which the major tools are desired by industrial arts instructors: 1) Circular saw, 2) Jointer, 3) Drill press, 4) Jig saw, 5) Lathe, 6) Mitre box, 7) Band saw, 8) Belt sander, portable, 9) Shaper, 10) Router, 11) Planer, 12) Finishing sander, and 13) Belt & disc sander.

Recommendations

The following recommendations are presented for the improvement of major tool purchases by Secondary Schools in South Dakota.

1. If possible, to completely equip a shop with all major tools so as to carry out the purpose of Industrial Arts. If a school cannot afford to equip a shop, it could be an indication as to the inefficiency of the school.

2. Industrial arts instructors should be allowed to select the equipment for their program.

Future Studies

The results of this research problem indicate the degree of agreement by industrial arts instructors as to the preference of major tools in the area of woodworking. It would probably be worth while for future research to be conducted covering each area of industrial arts with a composite report to serve as a guide for instructors in in-

dustrial arts. Professor Herold has indicated that he desires a similar survey conducted related to the hand tools necessary in a course for beginning woodworkers.

LITERATURE CITED

Books

Feirer, John L., Advanced Woodworking and Furniture Making. (Peoria, Illinois: Chas. A. Bennett Co., Inc., 1954).

Monroe, Walter S. (ed). Encyclopedia of Educational Research, The Macmillan Company: New York, N. Y., 1950.

Garrett, Henry E., Statistics in Psychology and Education, Longmans, Green and Co.: New York, N. Y., 1958.

Unpublished Materials

Salmen, Wayne L., "Industrial Arts Teacher Preparation and Curriculum Content in the Public Secondary Schools of South Dakota, M. S. Thesis Submitted to Faculty of South Dakota State College, (1959).

APPENDIX

APPENDIX A

LETTER SENT TO INDUSTRIAL ARTS INSTRUCTORS IN SOUTH DAKOTA SECONDARY PUBLIC SCHOOLS

Dear Industrial Arts Instructor:

I am doing a research problem for the Industrial Arts Department of South Dakota State College for the purpose of aiding Industrial Arts instructors throughout the state of South Dakota.

We are endeavoring to point out to administrators and Board of Education members that Industrial Arts instructors know which tools are most beneficial and that they are in agreement; by establishing the order in which major tools would be added to wood shops operating on a limited budget.

I have listed the major tools in alphabetical order and request you to establish a rank order by numbering the tools in order which you believe most necessary to your program.

I realize the rush at the closing of the school year, but if possible please complete the questionnaire today so that I could have the results compiled for the coming school year.

If you desire a copy of the results of this research please indicate on the bottom of the questionnaire.

Sincerely,

Dwight J. Gertsen
I. A. Instructor
Estelline, South Dakota

APPENDIX B

QUESTIONNAIRE SENT TO INDUSTRIAL ARTS INSTRUCTORS IN SOUTH DAKOTA SECONDARY PUBLIC SCHOOLS

SCOPE: ORDER in which major tools are desired in the area of a wood shop in an Industrial Arts program.

Directions: Place the desired number in order of desirability in the blank provided, also indicate preferred size.

Order in which tools are desired.

Rank

_____ Drill Press
size _____

_____ Jointer
size _____

_____ Lathe
size _____

_____ Mitre Box
size _____

_____ Router
size _____

_____ Sander, Finishing
size _____

_____ Sander, Belt & Disc
size _____

_____ Sander, Belt Portable
size _____

_____ Saw, Band
size _____

_____ Saw, Circular (Check One)
size _____ Tilt Table__ Tilt Arbor__

_____ Saw, Jig
size _____

_____ Shaper
size _____

_____ Surface Planer
size _____

COMMENTS: