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A basis for evaluation of students of industrial arts in Indiana

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A BASIS FOR EVALUATION OF STUDENTS OF INDUSTRIAL ARTS IN INDIANA

A Thesis

Presented to

the Faculty of the School of Education

In Partial Fulfillment

of the Requirements for the Degree

Master of Science in Education

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by

John R. Dunk

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The thesis of John R. Dunk,

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is hereby approved as counting toward the completion of the Master's degree in the amount of 8 hours' credit.

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John R. Dunk

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CHAPTER I

THE PROBLEM AND DEFINITIONS OF TERMS USED

For many years a difference of opinion has existed regarding the basis for evaluating students in Industrial Arts. Some reasons for the importance attached to these problems seem to be: the need for some method to determine factors in setting up grading systems; the need for a better means of placing value on factors; and the need for determining the basis for evaluating. The following study was made in connection with basis for evaluation.

I. THE PROBLEM

The purpose and importance of the study. Grades or marks are the usual means of indicating merit of school work. Until just a few years ago no one questioned either the fairness or the validity of grades as a means of rating school achievement. It is the purpose of the study to determine important factors to be used for a basis for grades in Industrial Arts. In the light of the data collected, this study will:

(1) Attempt establishment of criteria whereby greater reliability of shop grading may be achieved.

(2) Attempt to determine the traits or factors that should be used in grading students in Industrial Arts.

(3) Attempt to determine the weights that should be given the main factors of grading.

II. DEFINITION OF TERMS

The teacher's task is a very delicate one when it comes to giving grades. Suppose a pupil has been working at the best of his ability and is given a failing grade. This is an indication to the pupil that at his best he is a failure. This attitude is strong enough to defeat even the strongest of personalities. Grading is one of the most effective potential factors in education, not from the fact-finding standpoint, but from the standpoint of the development of attitude and self-confidence. Sometimes it seems that too much of a premium is placed on grade getting and not enough on the essentials and indirect learning that is to be measured.[1]

Giving a shop student a grade on the same basis as that used for other classes is sure to present some difficulty.

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[1]Allen A. Cooper, "Grading the Industrial Arts Student," Industrial Arts and Vocational Education, 27:47, February, 1939.

In all fairness to the shop student, a means must be devised to transfer several requirements into a single numerical grade. The academic phase alone plays only a limited part in determining a shop grade while it may be the sole factor in other classes. Shopwork must in addition be evaluated with a practical grade.[2]

The shop student is constantly dealing with equipment and therefore should not be graded alone on knowledge gained and its application in the shop. Such factors as dexerity, care of equipment, safety, orderliness, and spirit of cooperation should all be taken into consideration in determining the shop student's grade.

III. ORGANIZATION OF THE REMAINDER OF THE THESIS

The remainder of the thesis is organized as follows:

Review of the literature

The data

Presentation of the data

Summary and conclusions

Bibliography

Appendix

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[2]Herbert K. Iverson, "Industrial Arts Testing and Project Grading," Industrial Arts and Vocational Education, 28:243, June, 1939.

CHAPTER II

REVIEW OF THE LITERATURE

In the Industrial Arts field very little has been done toward setting up uniform objective standards. A brief summary of some of the studies which were related to the present study is included in this review.

Some studies were concerned with a ranking process. Caveny and Werchelt[1] indicated that in spite of the fact that the grading system is not perfect it is necessary to have grades for many reasons, and among them are: to give rank to a group, to provide an incentive for the students, to check progress of students, to provide a basis for analyzing instructional problems, and to evaluate the teacher. Caveny and Werchelt continued by stating that a fair standard to be used for ranking students on a relative basis would be the expected performance of the average student, commonly referred to as the norm. The opinion seemed to be that there are many types of grading errors. The study disclosed the more common grading errors are due to:

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[1]C. C. Caveny and J. A. Werchelt, "Reliability of Shop Grades," Industrial Arts and Vocational Education, 34:233, June, 1945.

(1) Difference in average grades of two instructors.

(2) Difference in spread.

(3) Difference in grades due to difference in opinion, a difference in factors taken into consideration in arriving at the grade, a difference in the importance attached to each factor (weight), and difference in number of oversights.

Norton[2] devised a rating scale to meet specific standards or requirements. The grading factors in the scale listed certain qualifications for each letter grade. In order to earn an "A" it was necessary to meet all the qualifications listed under "A". This was an attempt to make grading a more logical and helpful method of getting a true picture of the student.

Other studies were concerned with the use of tests as useful instruments in aiding the teacher in discovering the student and also in testing teaching efficiency. Leighbody[3] considered testing and recording the results of great importance in measuring accomplishment. He listed the purposes for which tests may be used as: a pre-teaching

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[2]John M. Norton, "A Rating Scale," Industrial Arts and Vocational Education, 29:161, April, 1940.

[3]Gerald B. Leighbody, Methods of Teaching Industrial Subject, (New York: Delmar Publishing Company, 1946), pp. 116-159.

measure of achievement; a help in diagnosing learning difficulties; a measure of teaching success; a measure of standards of achievement, and as a means for rating. Young[4] applied the performance test method in teaching Industrial Arts subjects. By this method the student is given a project to make on which he will receive a grade when completed. He performs the skills taught him in making the project. The basis for evaluating performance should be made clear and the objectives stressed in the process of construction.

Hayes[5] found in discussing the method of grading with other instructors of shop projects that the most commonly used method for grading was the more or less hit or miss method based entirely on the finished project. He concluded by stating how much more nearly an accurate grade could be reached if the grades were divided into several elements leading up to and including the finished project.

Along this same line of thought, Ericson[6] suggested that the Industrial Arts teachers use the following main

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[4]O. L. Young, "Testing Procedure," Industrial Arts and Vocational Education, 34:254, June, 1944.

[5]C. J. Hayes, "A Systematic Method Grading Shop Work," Industrial Arts Magazine, 18:376, October 1929.

[6]Emanuel E. Ericson, Teaching of Problems in Industrial Arts, (Peoria, Ill: The Manual Arts Press, 1930) pp. 196-227

factors when grading student accomplishment: quantity of work, quality of work, effort put forth, knowledge acquired and applied, proper attitude, regular attendance, and care of tools. He suggested that twenty-five per cent be given to quantity of work, twenty-five per cent to quality of work; twenty per cent to effort, twenty per cent to knowledge acquired and applied, and ten per cent to the care of tools. While Erickson included "regular attendance" and "proper attitude" in his factors, he did not include it in his rating achievement.

Blomey[7] found in a questionnaire study of sixty-four experienced Industrial Arts teachers at Pennsylvania State College in 1935 that the following factors were listed for determing the student's grades and from the factors listed a percentage rating was also derived toward the total grade: initiative 16%; accuracy 16%; application 15%; mechanical sense 14%; dependability 14%; quality of product 10; care of tools 8% and time 7%. The response from the questionnaires showed that there were few who used the same factors with the same percentage weights.

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[7]Kenneth L. Blomey, "A Study of the Grading Systems as Applied to the Industrial Arts and Vocational Industrial School Shops," (unpublished Master's Thesis, Pennsylvania State College, State College, Pennsylvania, 1935).

A similar study of the factors used as a basis for grades in Industrial Arts classes was made by Falgren[8] who collected information from one hundred thirty-six questionnaires sent to all members of the Epsilon Pi Tau fraternity of Kansas State Teacher's College, Pittsburg, Kansas. Falgren based his percentages on the tabulations of the questionnaires and listed the weight of the respective factors: knowledge acquired and applied 25%; effort and habit formation 22%; quality of work 21%; desirable attitudes 18%; and quantity of work 14%.

In a later study Falgren[9] attempted to devise a means of eliminating, in so far as possible, some of the unreliability and subjectivity involved in present methods of marking, also to determine important factors to be used for a basis for grades, and to suggest scales and profiles that may be used to make the grade a more objective rating achievement.

Johnsen[10], assistant professor of Industrial Arts at Kent State University, stated that the finished project

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[8]Leon E. Falgren, "A Study of Grading or Marking in Industrial Arts Courses," (unpublished Master's Thesis, Ohio State University, Columbus, Ohio, 1932).

[9]L. Falgren, "Grading Industrial Arts Courses," Industrial Arts and Vocational Education, 39:41, February, 1950

[10]M. O. Johnsen, "A Method in Grading Shop Projects in Metalwork," Industrial Arts and Vocational Education, 39:154, April, 1950.

is the total of the operations the student is to master and, upon this basis, should not be graded as a whole but on the work accomplished by each and every operation involved in the making of it. He found that as a rule projects were turned in for grading as the students completed them and it was rather difficult to grade them the same way day in and day out without a rating scale to grade by. He, therefore, devised a grading sheet which has been in operation for about a year. On this grading sheet there are four divisions of work. Under each heading are listed the operations done. When a project is graded the various parts of it should be graded. The student is credited with the highest score. From the grading sheet it may be noted that the student received a "7" in the first operation of the project, a "9" in the second operation and "10" in the third. The student is credited with "10" in the operation as it is his highest grade. By using this grading system, a picture of the student's abilities and weaknesses in each phase of the work may be obtained. Combining the grades from tests with grades in shopwork and the notebook gives the final grade in the course.

The range of the grading scale used in recording permanent grades differs greatly in different school systems. A study made by Odell[11] on the marking systems in two

[11] C. W. Odell, "High School Marking Systems," School Review, 33:5, May, 1925.

hundred eighty-one schools in the state of Illinois reveals approximately one hundred different systems were in use.

Ruggs[12] in his publication observes that teachers' marks are variable and inconsistent, first, because the teachers do not measure the same traits when grading or marking students, and secondly, teachers do not use a common scale for the determination of certain amounts of the traits that are measured.

Dr. Homer J. Smith[13], commenting on teachers' marks wrote that he felt that it would be a distinct help to the field of Industrial Arts if some rather standard method of grading could be devised.

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[12]Harold O. Rugg, Statistical Methods Applied to Education (New York: Houghton Mifflin Company, 1917), pp. 233-309.

[13]Homer J. Smith, Industrial Education; Administration and Supervision (New York: The Century Company, 1927), pp. 230-250.

CHAPTER III

I. THE DATA

Source of the data. Data for this study were obtained from questionnaires[1] which were sent to all the Industrial Arts teachers in Indiana listed in the 1949 State Directory. The six hundred and ninety-five teachers listed for Industrial Arts were mailed questionnaires to determine objective basis for evaluating students in the field.

Collecting the data. Replies were received from two hundred ninety-three individuals, or in terms of percentage, approximately forty-three per cent. Twenty-four of this number were unusable due to the fact that the per cent did not total one hundred per cent, or the statements of factors used for evaluating were unclear. Therefore, the returns used for this study totaled thirty-eight and seven tenth (38.7) per cent of the questionnaires sent. Forty different factors were listed in tabulation for determining a basis for grades. A map of Indiana[2] shows the geographical return of questionnaires.

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[1]See appendix, p. 34-35

[2]See appendix, p. 36

CHAPTER IV

PRESENTATION OF THE DATA

Rank order, total points, percentage weights of total grade, and factors or basis for grades from returned questionnaires. In Table I, column one, the tabulated results show the factors in rank order. In column two the percentage of basic factors listed in the questionnaire totaled one hundred; therefore, the total possible points for all factors listed is 26,900, since there were two hundred sixty-nine returns. This column gives the total of the possible number of points. Column three lists percentages of total points given to a factor for grade. In column four, eighteen of the basic factors are listed. The remainder of the factors are listed under one heading, miscellaneous, since each of their percentage values is less than one per cent. The factors included in miscellaneous are listed following Table I. The number of factors listed by the teachers on the questionnaires returned totaled forty.

TABLE I

RANK ORDER, TOTAL POINTS, PERCENTAGE WEIGHTS OF TOTAL GRADE, AND FACTORS OR BASIS FOR GRADES FROM RETURNED QUESTIONNAIRES.

Rank Order	Points	Per Cent	Factors or Basis for Grades
1	4693	17.446	Quality
2	3630	13.494	Skill
3	3621	13.460	Knowledge
4	1872	6.973	Quantity
5	1691	6.286	Use and Care of Tools
6	1676	6.230	Effort
7	1468	5.457	Attitude
8	1245	4.628	Performance of Duty
9	1098	4.081	Safety
10	921	3.423	Cooperation
11	673	2.501	Application, Self Direction
12	502	1.866	Ability, Solve and Analyze
13	481	1.788	Industry, Work Habitd
14	415	1.542	Creative Ability
15	376	1.397	Initiative
16	308	1.107	Technique, Follow Instruction
17	295	1.096	Progress
18	278	1.029	Attendance
19	1621	6.017	Miscellaneous

MISCELLANEOUS FACTORS

1. Related Achievement
2. Reliability
3. Dependability
4. Interest
5. Honesty
6. Trustworthiness
7. Character
8. Work to Capacity
9. Citizenship
10. Economical
11. Responsibility
12. Judgment
13. Appreciation
14. Aptitude
15. Personality
16. Achievement
17. Common Sense
18. Economy
19. Attendance
20. Responsibility
21. Self-Direction
22. Equipment

TABLE II

Number of times factors were rated the highest and number of times factors were rated the lowest. The data in Table II were computed as follows: column one reveals the number of times that each factor was given more weight than other factors that were rated by the teachers. Since some factors were given equal weight they were not classified either high or low. Column two gives the number of times the teacher rated the factor lower than any other factors that were rated by the teachers.

TABLE II

NUMBER OF TIMES FACTORS WERE RATED THE HIGHEST AND NUMBER OF TIMES FACTORS WERE RATED THE LOWEST

Factors For Grades	No. Times Factor Rated Highest	No. Times Factor Rated Lowest
Quality	50	1
Skill	30	4
Knowledge	32	2
Quantity	6	8
Use & Care of Tools	4	9
Effort	7	3
Attitude	3	7
Performance of Duty	4	7
Safety	2	6
Cooperation	2	5
Application, Self Direction	1	2
Ability, Solve, Analyze	4	2
Industry, Work Habits	0	1
Creative Ability	1	1
Initiative	1	1
Technique, Follow Instruction	2	1
Progress	2	0
Attendance	0	2

TABLE III

Range from high to low number of times factor was given no weight and number of times factor was given weight. Columns one and two show the range for the basis in evaluating from the highest total of points any one teacher rated the factor to the lowest number of points the same factor was rated. Column three lists the number of times the factor was given no weight by the teachers and column four lists the number of times the factor was given weight toward the total grade.

TABLE III

RANGE FROM HIGH TO LOW NUMBER OF TIMES FACTOR WAS GIVEN NO WEIGHT AND NUMBER OF TIMES FACTOR WAS GIVEN WEIGHT.

Factors Considered For Grades	Highest Rated	Lowest Rated	No. Times Given no Weight	No. Times Factor Given Wt.
Quality	90	3	115	154
Skill	80	1	120	149
Knowledge	75	5	123	146
Quantity	55	4	175	94
Use & Care of Tools	55	2	144	125
Effort	90	4	169	100
Attitude	50	3	165	104
Perf. of Duty	50	2	187	82
Safety	50	2	172	97
Cooperation	30	3	189	80
Application	75	3	219	50
Ability, Solve, Analyze	50	2	240	29
Industry, Work Habits	50	3	242	27
Creative Ability	50	5	244	25
Initiative	50	2	240	29
Technique, Follow Instr.	50	5	255	14
Progress	30	5	250	19
Attendance	30	5	242	27

TABLE IV

Number of factors considered in evaluating and number of teachers who used considered factors. The median number of factors used in evaluating is five. However, only sixty teachers of the two-hundred sixty-nine used five factors. A range from two factors to twelve was used in evaluating by the teachers. Table IV is to show the number of factors a given number of teachers used.

TABLE IV

NUMBER OF FACTORS CONSIDERED IN EVALUATING AND NUMBER OF TEACHERS WHO USED CONSIDERED FACTOR

Number of Factors Considered In Evaluating	Number of Teachers Who Used Considered Factors in Evaluating
1	0
2	14
3	15
4	47
5	60
6	71
7	32
8	11
9	13
10	3
11	2
12	1

TABLE V

Length of class periods taught by Industrial Arts teachers per day. The data in Table V were arranged to show the length of time in minutes of the class periods. The median time which constitutes a period was found to be fifty-three minutes. Figures across the top of the chart reveal periods in minutes. Any length of period which was given between those figures was classified to the period it rated the nearest. Number of teachers illustrates the number who teach that particular length of time.

TABLE V

LENGTH OF CLASS PERIODS TAUGHT

BY

INDUSTRIAL ARTS TEACHERS PER DAY

Period Length	40	45	50	55	60	Over
No. Teachers	7	7	40	183	25	7

TABLE VI

Number of classes taught in Industrial Arts by teachers per day. Since there has been some discussion among Industrial Arts teachers concerning their teaching load, the number of classes taught was checked in the questionnaires and the median was found to be four classes taught in Industrial Arts. This does not mean that they only teach four classes per day. Table VI presents the number of periods and the number who teach classes that many times per day. One supervisor who answered the questionnaire, however, taught no classes. Figures across the top illustrate periods taught per day and, below this number, the teachers teaching the above number of periods.

TABLE VI

NUMBER OF CLASSES TAUGHT IN INDUSTRIAL ARTS

BY TEACHERS PER DAY

Periods Per Day	0	1	2	3	4	5	6	7	8
No. of Teachers	1	12	27	55	40	55	74	4	1

TABLE VII

Number of teachers teaching the general shop and unit shop. In the general shop the majority of the teachers taught from two to six areas. Each area is taught as a separate class and the individual time spent on each subject varied from one semester to one year.

The general shop has several subjects being taught simultaneously. One teacher, for example, teaches four areas and in the period of a year they are rotated in order to give equal time in all areas taught. This is used mainly on the freshmen and junior high level where the student is becoming familar with the areas of Industrial Arts. The unit shop allots one semester or year to one particular subject.

Table VII was compiled to indicate more clearly the general and unit shop and the number of teachers teaching those particular shops in Indiana. A few teachers taught both kinds of shops, and therefore, the "yes" and "no" is used to illustrate the type and number of shops taught.

TABLE VII

NUMBER OF TEACHERS TEACHING

THE GENERAL SHOP AND

UNIT SHOP

	General Shop		Unit Shop	
	Yes	No	Yes	No
No. of Teachers	143	126	148	121

TABLE VIII

Factors listed having the same percentage value in the first, second, third, and fourth years of Industrial Arts work. One part of the questionnaire was concerned with the same factors used in evaluating the first, second, third, and fourth years of work if approximately the same percentage values were given to each factor. If the same factor's relative weight and per cent differed for all levels a brief explanation of the factors, weight, and per cent was made for the various grade levels by the rater. The main reason for the difference is that less credit was given skill and quality in the first year.

Table VIII will show the variation in evaluating students at different grade levels.

TABLE VIII

FACTORS LISTED HAVING THE SAME PERCENTAGE VALUE IN THE FIRST, SECOND, THIRD, AND FOURTH YEARS OF INDUSTRIAL ARTS WORK.

	Use same factors and per cent in Evaluating	Do not use Same Factors In Evaluating	Did Not Answer
No. of Teachers	189	35	45

CHAPTER V

SUMMARY AND CONCLUSION

This study was an attempt to determine the basis for evaluating Industrial Arts students in the state of Indiana.

Data for this study were obtained from questionnaires sent to all Industrial Arts teachers in Indiana listed in the 1949 State Directory. A two page objective type of questionnaire was used and the returns were tabulated for the study. Six-hundred and ninety-five questionnaires were mailed to the teachers of the school in which they taught. Replies were received from two-hundred and ninety-three, or forty-three per cent. However, twenty-four were unusable due to the per cent not totaling one hundred or the statements not being clearly defined for use in the tabulation. Thirty-eight and seven tenths (38.7) per cent of the questionnaires sent were used for the study.

The study indicated that teachers in Indiana used forty different factors in evaluating Industrial Arts students. The highest per cent given any single factor by all teachers for the basis in evaluating work was seventeen, and the lowest per cent was practically zero.

Eighteen factors were given percentage weights over one per cent by all teachers who furnished ratings. The number of times one factor was rated highest of all factors rated by the teachers was fifty, and the number of times any one factor was rated lowest by the raters was nine. In case equal weight was given any two or more factors they were not classified either high or low.

In connection with factors considered for evaluation, the range was also given along with the number of times the factors were given any per cent toward the total grade. The median number of factors used in evaluating was five. The median in the length of periods is fifty-three minutes, and the median for the number of classes taught in Industrial Arts was four.

One hundred forty-three teachers said they taught in a general shop, and one hundred forty-eight taught in a unit shop. However, some teachers taught both types of shops. Using the same basis with approximately the same percentage weight for all levels, one hundred eighty-nine stated they used the same factors and weights in evaluating all levels; thirty-five did not, and forty-five did not answer. The majority who did not use the same factors and percentages toward total grade for all levels stated that they gave less weight to quality and skill in the first year of Industrial Arts work.

Finally, the data indicate the following: the data secured through questionnaires indicate that Industrial Arts teachers' marks are variable and inconsistent, because teachers do not measure the same factors when grading students. Results indicate there is apparently a lack of agreement among teachers as to the weight given each factor. The response from the questionnaires showed that there were few who use the same factors with the same percentage weights. In some incidents the range of the weights given differs greatly, which is probably due to the locality in which the school is located.

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APPENDIX

I am making a study of the various factors used in evaluating the work of students in Industrial Arts. I trust that you will cooperate by providing me with the information requested on the enclosed data sheet and form. To compensate for your assistance I would be glad to send to you a summary of the results if you desire. Please accept my thanks in advance for your interest and cooperation.

John R. Dunk

How many years have you taught Industrial Arts? _____.

How many classes do you teach in Industrial Arts? _____.

What is the length of your class periods? _____.

Do you teach a general shop? Yes _____. No _____.

What areas are included (wood, drawing, metal, etc.) Please list areas included in your general shop program. _____

_____ _____ _____ _____

_____ _____ _____ _____

Do you teach unit shop? Yes _____. No _____.

If so what area (machine shop, printing, etc.) _____.

Evaluating, or grading, the work of Industrial Arts pupils is an important responsibility of every teacher of this subject. Many factors are no doubt considered by every teacher of Industrial Arts. I am attempting to determine the basis or factors used by Industrial Arts teachers in evaluating the work of their pupils and the relative weight given to each factor.

Such factors as knowledge of subject, skill, care of tools, safety habits, effort, etc. are no doubt representative of factors considered by teachers in grading.

Would you please cooperate in making this study by listing in the first column factors that you consider in evaluating the work of your student in Industrial Arts. In the second column make any explanation you care to make regarding any or all of the factors listed. In the third column please indicate the relative weight given each factor in percent. The total of the percentage weight then should be 100%.

Factors	Explanation	Percentage Weight
		Total 100%

Do you use the same factors you listed above with approximately the same percentage values in the first, second, third and fourth years of Industrial Arts work? Yes _____. No _____.

If you do not use the same factors and relative weight and percent for all your levels would you explain briefly the factors you do use in evaluating the work of your pupils on the various grade levels. _____

_____

_____

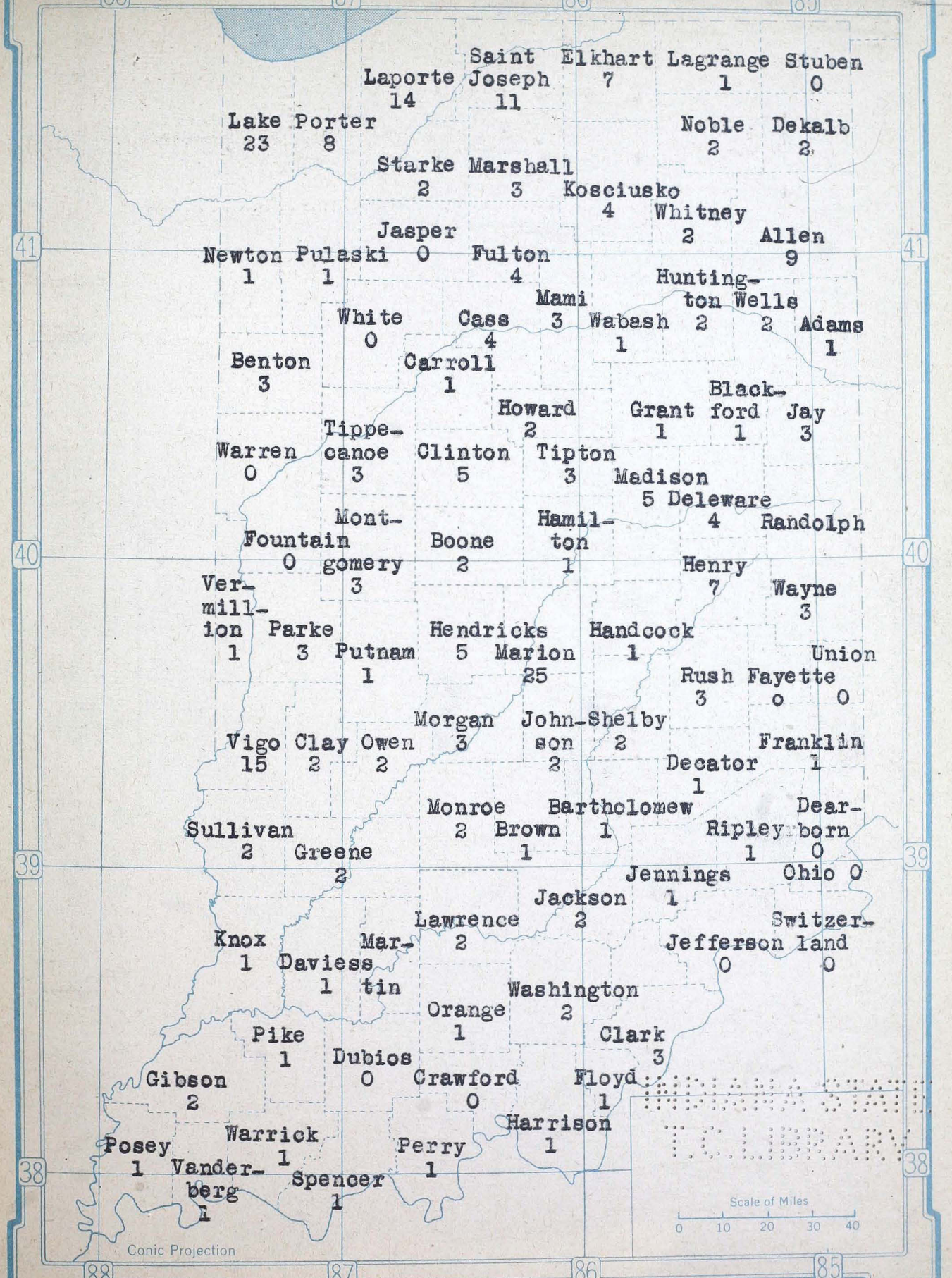
Do you desire the results of the study when completed? Yes __ No ___

Enclosed you will find a stamped addressed envelope for returning this questionnaire.

Name: _____

School: _____

City and County: _____



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