THE DEVELOPMENT OF BASIC AGRICULTURAL MECHANICS SKILLS BY BUILDING A SMALL PROJECT

by 680

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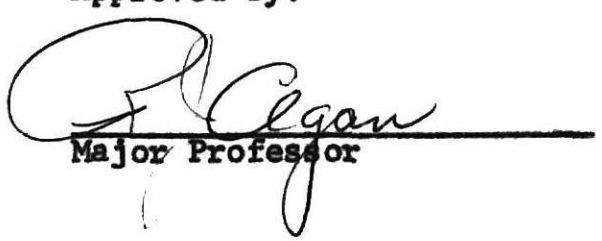

Major Professor

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CHAPTER I

INTRODUCTION

This report and study was based on an observation by the writer that in the field of agricultural education as well as the other fields of education, there had been considerable work on teaching methods. It was assumed that one of the areas of agricultural education which had had consideration had been agricultural mechanics. It was felt that this consideration had come about due to an observation of the great expansion of farm mechanization and the steadily rising costs of farm machinery and equipment. Dr. Lloyd J. Phipps stated that "with the increasing mechanization of work, a person employed in agriculture cannot be a success unless he posses considerable mechanical knowledge and skill."[1]

The study resulted from a belief on the part of the writer that the unit of agricultural mechanics which had received the greatest amount of concern had been farm machinery repair and maintenance, but a unit equally important, basic mechanics skills, had not changed to a great extent during the past years. This unit had been the basis

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[1]Lloyd J. Phipps, Mechanics in Agriculture (Danville: The Interstate Printers and Publishers, Inc., 1967), p. 4.

of all mechanics repair jobs and in the opinion of the writer should have been revised and updated to meet the needs of Agriculture at the time of the study.

The writer had been employed by the Washington Schools from July 1966, to the time of the study. Washington was a small community in North Central Kansas. The Vocational Agriculture One enrollment had been about ten boys yearly at the time of the study.

It had been observed by the writer that among some of the vocational agriculture instructors in Kansas, there had been a feeling that small projects could be used as a method of teaching the basic agricultural mechanics skills. Other instructors had felt that a drill method was the most efficient method for teaching the same basic skills.

I. STATEMENT OF THE PROBLEM

The purpose of this study was to compare the small project and the drill method of instruction. The statement of the problem then became the question of which method (small project method or drill method)[2] of teaching the basic agricultural mechanics skills in arc welding and farm carpentry was best suited for the 1967-68 Vocational Agriculture One class in the Washington High School, Washington,

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[2]See definitions on page 4.

Kansas, when applied to boys who were grouped for agricultural mechanics instruction.

II. OBJECTIVE

The objective of the study was to compare the results of the small project method of teaching agricultural mechanics with the drill method of teaching agricultural mechanics as measured by the ability of Vocational Agriculture One students to become proficient in performing selected basic agricultural mechanics skills.

III. ASSUMPTIONS

In instrumenting this study the writer made several assumptions as follows:

1. Small groups were an effective method of handling Agricultural Mechanics One students;
2. Arc Welding and Carpentry were basic elements of an Agricultural Mechanics One course;
3. The selection of a small project by the student indicated an interest in skill development;
4. Upon completion of the project the students would have a feeling of accomplishment;
5. The project would serve as a stimulant for skill development; and,
6. Visual testing and the judgment of the graders was

an appropriate method of measuring each group.

IV. HYPOTHESIS

The hypothesis for the study was that the students who had the small project method of instruction would exceed the accomplishments of the students using the drill method of instruction in the performance of basic arc welding and basic farm carpentry skills.

V. LIMITATIONS

Limitations of the study were:

1. The groups were limited to four subjects each;
2. The equipment used in the study was limited to that which was available in the local school;
3. The pre-test and post-test used were limited to those developed by the writer; and,
4. The evaluation of skill development was limited to the visual testing of evaluators who were staff members of the Washington High School.

VI. DEFINITION OF TERMS

The following definitions were used in planning, conducting and evaluating the study and were not necessarily those definitions or common usage at the time of the study.

Small project method. Small project method was a

term used for the development of basic arc welding and farm carpentry skills by the construction of a small project.

Drill method. Drill method was a term used for the development by continuous practice or repetition of basic arc welding and farm carpentry skills.

Small project. A small project was a project that could be constructed in a short time as well as being economical (less than $5.00).

Visual testing. The evaluation of mechanical work formed by the subjective observations of the work by a grader.

CHAPTER II

REVIEW OF SELECTED LITERATURE

The writer in his search for literature related to the study reviewed literature from the Kansas State University Library, the Washington High School library, the Washington Vocational Agriculture library, and his personal library.

The writer found very little reading material which he felt was directly related to the study. There were no reports of studies found on the use of small projects as a method of teaching agricultural mechanics skills. Although there was found like studies relating to experimental work done with the basic theories of learning, no work was found to involve the comparison of the small project and drill method of teaching basic arc welding and farm carpentry skills.

It has been stated in psychology ". . . the child must do his own learning. . . . Thus all education is self-education."[1] In order for the child to learn there must be a stimulating factor which will encourage him to ". . . want something, notice something, do something and get

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[1]George J. Mouly, Psychology for Effective Teaching (New York: Holt, Rinehart and Winston, 1960), p. 13.

something."[2]

The National Future Farmers of America Organization for boys studying Vocational Agriculture in the public Secondary school adopted and upheld a motto containing the line . . . "Doing to Learn . . ."[3] which showed the thinking of the youth themselves as well as the educators of the time of adoption.

Lloyd J. Phipps, Professor in Agriculture Education, University of Illinois, recommended that a student should obtain experience in agriculture mechanics skills by starting with a project which has practical value but which was not too difficult.[4] Dr. Phipps further emphasized that "with the increasing mechanization of work, a person employed in agriculture cannot be a success unless he possesses considerable mechanical knowledge and skill."[5]

Although the psychology of learning literature appeared to the writer to favor a small project method of instruction, the amount of reference to this method was found to be meager. However, there was not much literature

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[2] Ibid., p. 220.

[3] _____, Official Manual Future Farmers of America (Alexandria: Future Farmers Supply Service, 1967), p. 13.

[4] Lloyd J. Phipps, Mechanics in Agriculture (Danville: The Interstate Printers and Publishers, Inc., 1967), p. 13.

[5] Ibid., p. 4.

found relating to the drill method.

In reviewing the text-books which were available for Agricultural Mechanics One courses there appeared to the writer to be merit in both methods, because both the drill procedure and the small project method were included.

In Mechanics in Agriculture by Phipps, emphasis had been placed on the technique of performing skills with reference to projects which require the skills in their construction. For example in arc welding the skills were selecting welding equipment, selecting electrodes, setting amperage, striking and holding an arc running a bead and constructing different joints. The projects which required the skills were a welding seat and a barrel stand.[6]

In carpentry some of the skills a student should develop were selecting and using measuring tools, selecting and using hand saws, selecting and using fastening devices, and selecting and applying finishes. The project which required the skills were a nail box, a sawhorse, a file rack and miter box.[7]

In Farm Mechanics Text and Handbook by Phipps, McCally, Scranton, and Cook the same arc welding skills and projects

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[6]Lloyd J. Phipps, Mechanics in Agriculture (Danville: The Interstate Printers and Publishers, Inc., 1967), pp. 226, 228, 231, 232, 234, and 239.

[7]Ibid., pp. 64, 70, 173, and 194.

were emphasized. However, there was a complete chapter devoted to farm carpentry projects. The small projects listed in the chapter were a bench nook, egg candler and sawhorse.[8]

Farm Shop Skills in Mechanized Agriculture by Sampson, Mowery and Kugler was found to be a book which dealt with the correct technique of performing shop skills. The skills covered in arc welding were the selection of welding electrodes, the types of welding joints, striking the arc, setting amperage and running a bead.[9] The skills covered in farm carpentry were measuring and marking wood, using handsaws, methods of wood planing, selecting and using wood chisels, boring holes in wood and fastening lumber.[10] In addition to the skill development the authors have included a chapter on farm shop projects. Among the projects included were several small arc welding and carpentry projects as follows:

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[8]Lloyd J. Phipps and others, Farm Mechanics Text and Handbook (Danville: The Interstate Printers and Publishers, Inc., 1959), pp. 193, 195, 196, and 197.

[9]Harry D. Sampson, Albert S. Mowery and Harold L. Kugler, Farm Shop Skills in Mechanized Agriculture (Chicago: American Technical Society, 1955), pp. 229, 233, 234, 235, and 238.

[10]Harry D. Sampson, Albert S. Mowery and Harold L. Kugler, Farm Shop Skills in Mechanized Agriculture (Chicago: American Technical Society, 1955), pp. 20, 22, 26, 32, 33, 35, and 40.

1. Welding jigs for holding elevator and conveyor flights,
2. Trailer hitch,
3. Saw vices,
4. Push stick,
5. Nail box,
6. Small tool box, and
7. Sawhorse.[11]

In Shopwork on the Farm by Jones very little emphasis was found to be placed on small arc welding projects but a great deal was written on the technique of performing arc welding skills. While the technique of performing farm carpentry skills was emphasized there was also emphasis placed on small carpentry projects such as:

1. Tool box,
2. Nail box,
3. Miter box,
4. Bench hook,
5. Sawhorse,
6. Flower box,
7. Wood float, and
8. Saw filing clamp.[12]

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[11] Ibid., p. 356.

[12] Mack M. Jones, Shopwork on the Farm (New York: McGraw-Hill Book Company, Inc., 1955), p. 135.

Arc Welding Lessons For School and Farm Shop by Harold L. Kugler was found to be completely devoted to arc welding technology and skills. The book consisted of three parts. The first being informational lessons. The second was operations to develop skill in using arc welding equipment and part three was devoted to arc welding projects. Some of the projects were shoescrapers, metal sawhorses, steel post driver, clothesline posts, gates and many more.[13]

Another book found to be completely devoted to arc welding was Farm Arc Welding by Morford. This book consisted of three parts. The first being on welding information, the second on repair, alteration and construction of farm equipment and the third on useful information. Here again emphasis was placed on the technique with reference to project construction.[14]

Although not much literature was found directly related to the use of the small project method or the drill method of teaching agricultural mechanics skills, there was enough evidence for both methods so that the writer felt it appropriate to compare the two methods in the Washington Agricultural Mechanics One course.

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[13]Harold L. Kugler, Arc Welding Lessons for School and Farm Shop (Cleveland: The Jones F. Lincoln Arc Welding Foundation, 1950), pp. 310, 311, 312 and 313.

[14]V. J. Morford, Farm Arc Welding (Cleveland: The Jones F. Lincoln Arc Welding Foundation, 1966).

CHAPTER III

DESIGN AND PROCEDURE

I. THE GROUPS

The study was conducted during the second semester of 1967-68 school year in the Vocational Agriculture One class of eight boys. In order to compare the equality of the two groups of four boys each, three criterion factors were used as follows:

1. The Intelligence Quotient Scores of each individual obtained from the Slossen Intelligence Test for Children and Adults.
2. The students' grade point average at the end of the first semester 1967-68 school year.
3. The students' scores on the written pre-test covering arc welding and farm carpentry.

This class was divided into two groups. The class members were asked to select which project they would like to construct, an arc welding project or a carpentry project. This selection placed them into one of two groups. One group being the group which constructed an arc welding project, and the other group being the one which constructed the farm carpentry project. The arc welding project group was given the small project method of instruction in arc welding and

the drill method of instruction in farm carpentry. The carpentry project group was given the drill method of instruction in arc welding and the small project method in farm carpentry.

The individuals were assigned numbers for this study. Numbers 1 through 4 made up the arc welding project, carpentry drill group, and numbers 5 through 8 made up the arc welding drill, carpentry project group.

II. PROCEDURE

Lesson plans. The same lesson plans were used for both groups in order to cover the same material and giving equal time to each group for individual instruction.

The following lesson plans were used to cover the arc welding phases: (See Appendix A)

1. Determining the types of welders and electrical currents used in arc welding.
2. Classifying and selecting electrodes.
3. Selecting amperages to be used.
4. Setting up an arc welder.
5. Striking and holding an arc.
6. Determining the types of welds and positions.
7. Running a stringer bead in the flat position.
8. Preparing metal to be welded.
9. Making a butt, lap and "tee" weld in the flat

position.

Also, the following phases in farm carpentry were covered by lesson plans: (See Appendix B)

1. Determining the types and grades of lumber most commonly used on the farm.
2. Learning the hand tools used in farm carpentry.
3. Measuring and marking lumber to be cut.
4. Sawing lumber square with a cross-cut saw.
5. Laying out angles with a framing square.
6. Determining the fastening devices used in farm carpentry.
7. Fastening lumber.

Demonstrations. The students received demonstrations in all the mechanical phases of the unit as follows:

A. Arc Welding
   1. Setting up an arc welder.
   2. Striking and holding an arc.
   3. Running a stringer bead in the flat position.
   4. Making a butt, lap, and "tee" weld in the flat position.

B. Farm Carpentry
   1. Measuring and marking lumber to be cut.
   2. Sawing lumber square with a cross-cut saw.
   3. Laying out compound angles with a framing square.
   4. Sawing compound angles.

5. Fastening lumber.

Practice. Each of the groups were given fifteen hours in which to become proficient in the skills previously listed. The arc welding project group constructed a shoe scraper (See Appendix C) for their small arc welding project, to learn the basic arc welding skills. This group used the drill method in learning the farm carpentry skills. The carpentry project group constructed a sawhorse (See Appendix D) for their small farm carpentry project, for the development of the basic farm carpentry skills. This group used the drill method in learning the basic arc welding skills.

Tests. There was a pre-test and post-test given to each of the students. (See Appendix E) These two tests were the same, consisting of two parts. One part was an objective test in arc welding and farm carpentry and the second part was a mechanical performance test in arc welding and farm carpentry. The writer developed the arc welding and farm carpentry test which was used for the pre-test and post-test in the study. The questions were compiled from text-books, F.F.A. district agricultural mechanics contest tests and from tests previously used in the writers classes. The test was used for the North Central Kansas F.F.A. district agricultural mechanics contest in 1968.

Scoring tests. The industrial arts instructor

(See Appendix F) in the Washington Unified School District Number 222 graded the pre-tests and post-tests in arc welding and farm carpentry. The Farm Mechanics Text and Handbook, and Shopwork on the Farm was used for the construction and scoring of the tests.

The following scoring system was used to score the performance of each of the basic skills in arc welding.

Skill	Grade	Requirements for the grade
A. Setting up arc welder	1.	Welder incorrectly set up.
	2.	Welder correctly set up.
B. Selecting electrodes	1.	Selecting electrode not designed for the type of metal, incorrect size, incorrect electrode for type of weld, incorrect electrode for welding position.
	2.	One of the above correct.
	3.	Two of the above correct.
	4.	Three of the above correct.
	5.	All the above correct.
C. Selecting amperage	1.	Amperage incorrect by more than 30 ampers.
	2.	Amperage incorrect by 20 to 30 ampers.

Skill	Grade	Requirements for the grade
	3.	Amperage incorrect by 10 to 20 ampers.
	4.	Correct amperage.
D. Striking and holding an arc	1.	Strikes and holds an arc less than two times out of ten attempts.
	2.	Strikes and holds an arc two to four times out of ten attempts.
	3.	Strikes and holds an arc four to six times out of ten attempts.
	4.	Strikes and holds an arc six to eight times out of ten attempts.
	5.	Strikes and holds an arc eight to ten times out of ten attempts.
E. All welds	1.	Incorrect width, penetration, speed, and uniformity.
	2.	Any three incorrect.
	3.	Incorrect penetration and speed.

Skill	Grade	Requirements for the grade
	4.	Incorrect penetration.
	5.	All the above correct.

The following scoring system was used to score the performance of each of the basic skills in farm carpentry.

Skill	Grade	Requirements for the grade
A. Tool selection	1.	Less than two of the following tools correctly selected: Crosscut saw Framing square Jack plane Claw hammer Try or combination square
	2.	Two of the above tools correctly selected.
	3.	Three of the tools correctly selected.
	4.	Four of the tools correctly selected.
	5.	All the tools correctly selected.
B. Measurements	1.	Less than one correct measurement.
	2.	One measurement correct.

Skill	Grade	Requirements for the grade
	3.	Two measurements correct.
	4.	Three measurements correct.
	5.	All the measurements correct.
C. All other skills	1.	Four mistakes.
	2.	Three mistakes.
	3.	Two mistakes.
	4.	One mistake.
	5.	No mistakes.

CHAPTER IV

PRESENTATION OF DATA

The students selected one of two small projects (one in arc welding and one in farm carpentry) and were placed in one of the two groups. The two groups then were tested for equality. The following criterion factors were used:

1. The Intelligence Quotient Scores.
2. The students' grade point average at the end of the first semester of the 1967-68 school year.
3. The students' scores on the written pre-test on arc welding and farm carpentry.

The data in Table I shows that the Intelligence Quotients for the two groups ranged from 99 to 140. The average Intelligence Quotient for the arc welding project, carpentry drill group was 126.25. While the average Intelligence Quotient for the arc welding drill, carpentry project group was 118.25. This difference between the two groups in Intelligence Quotient was 8 per cent.

Based on a four point grading system, the arc welding project, carpentry drill group had an average grade point of 2.4 and the arc welding drill, carpentry project group had an average grade point of 1.6. This difference was a grade point difference of .8 of a grade point.

TABLE I

COMPARISON OF INTELLIGENCE QUOTIENTS, GRADE POINT AVERAGES AND WRITTEN PRE-TEST SCORES FOR THE ARC WELDING PROJECT, CARPENTRY DRILL AND ARC WELDING DRILL, CARPENTRY PROJECT GROUPS

Arc Welding Project, Carpentry Drill Group				Arc Welding Drill, Carpentry Project Group			
Individual	Intelligence Quotient	Grade Point Average[1]	Written Pre-test Per cent	Individual	Intelligence Quotient	Grade Point Average	Written Pre-test Per cent
1	117	1.5	64	5	136	2.4	60
2	140	3.5	52	6	99	1.0	44
3	116	1.25	52	7	112	1.25	70
4	132	3.5	64	8	126	2.0	66
Average	126.25	2.4	58	Average	118.25	1.6	60

[1]The grade point was figured on a 4 point system with 4 equalling an A and 1 equalling a D.