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A Study of the Farm Mechanics Program as Being Taught in the Vocational Agriculture Shops in the State of Utah

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A STUDY OF THE FARM MECHANICS PROGRAM AS BEING TAUGHT IN THE VOCATIONAL AGRICULTURE SHOPS IN THE STATE OF UTAH

by

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Daniel R Zohner

TABLE OF CONTENTS

LIST OF TABLES

Table | Page

THE PROBLEM AND ITS SETTING

The numerous influences which are so greatly changing rural life in America are having their effect upon the farm shopwork which farmers perform. New farm machines and tools are being introduced and used, causing the farmer to learn new operations and to acquire new skills in the maintenance, repair and use of this equipment. The farm shop is becoming an essential part of every farm. In order to carry on the farming business more economically, and thereby meet competition which is necessary in present day farming, the farmer must know how to properly use his farm mechanics needs to the best advantage.

A well equipped shop is usually necessary to keep farm equipment in good working condition. Mechanical training is most necessary for using tools to the best advantage. Since the majority of farmers today complete high school, this is the most logical place for their training.

Farm machinery operation, care and repair have always had a place in the vocational agriculture program; yet with a varying degree of emphasis, depending upon the training, philosophy and influence of the teacher (9).

In many instances in the past the programs have been inadequate because of insufficient working space and lack of tools with which to carry on a suitable teaching program. Today, largely due to the national emergency caused by the second world war, many of these handicaps have been overcome (9).

The census report of 1941 shows that the average life of all farm machinery is 15.2 years. Farmers found that with the aid of a repair program, machines last much longer. The farmer can, through repair, proper

operation and maintenance, cut down the "cost per bushel" which is the primary interest of each farmer.

Many farmers in prewar days left their equipment in the weather. If it wasn't in working order the next spring, they could very economically have it repaired or trade it in on a new model. The war took the new equipment off the market and the repairman off to war or defense work; as a result, the farmer had to be his own mechanic. This emphasized the need of the farm mechanics program in the high school as an essential part of vocational agriculture. Machinery which could not be purchased was repaired or even constructed in the shop, thus resulting in the addition of adult classes to the course. The farmers not only wanted their sons to receive this training, but they could see the necessity in knowing how to repair and construct machinery themselves.

This new emphasis on farm machinery repair helped, but did not solve all the problems for the farmer. There is still a considerable amount of farm machinery that needs repairing, and this would indicate that something is lacking in the program. Much of the necessity for farm machinery repair can be relieved if the cause of the trouble is removed instead of waiting until trouble has developed before applying a cure. Proper operation and maintenance should be part of every farm mechanics course in vocational agriculture.

The trend for our rural high schools to become more and more community centers necessitates that the teacher in vocational agriculture increase the scope of his teaching. If he is to take advantage of these opportunities, it is necessary for him to formulate a definite set of objectives. In the field of farm mechanics, he must remember that first and foremost he should teach the farmers and prospective farmers the use of tools and methods that they may reasonably be expected to use in doing their own

farm and home construction, repair and maintenance work (5).

In the smaller high schools with limited enrollment the vocational agriculture teacher, there being only 1, teaches the complete program including farm mechanics. What he does or does not teach is limited only by his abilities and willingness, or the facilities of the school and needs of the community. In the larger high schools, where more than 1 teacher is necessary to handle the students, there is a problem of how the duties of the department should be distributed. This is especially true of the farm mechanics program where industrial arts teachers are given the job of teaching farm mechanics as well as their industrial arts classes. Usually this is their only connection with the vocational agriculture program. Project visiting, F. F. A. Advisor, record keeping, etc., are taken care of by the vocational agriculture teacher.

A second method of organizing the multiple teacher department is to have 1 vocational agriculture instructor teach the agriculture science phase of the program, and a second vocational agriculture instructor to teach farm mechanics. Other duties are divided equally between the 2 instructors. Foote (5) says that the time may come when many of our departments of vocational agriculture will employ 2 teachers. One of these teachers will be a man who has specialized in farm mechanics and who is equipped by his training to handle instruction in this subject primarily.

The third method of assigning duties is to have 1 teacher follow 1 or more groups throughout their high school careers, teaching them all of their vocational agriculture. This method of teaching and organization is similar to the single teacher department. Duties are either assigned by a head teacher or jointly planned and assigned to each teacher according to his contact with the students (6).

In the Utah vocational agriculture departments all 3 programs of teaching are used. They range from schools where no farm mechanics is being taught to those where 1 instructor teaches the whole program and to the department with a vocational agriculture instructor who specializes in farm mechanics.

With the varied backgrounds and training of the teachers in farm mechanics in vocational agriculture in Utah, there are 2 questions as to the success of the program being taught. First, are the industrial arts instructors who are also teaching farm mechanics teaching the course as completely as those vocational agriculture instructors who were trained in this field? Second, do the vocational agriculture instructors who specialized in farm mechanics teach farm mechanics more successfully than those who teach the complete program in vocational agriculture?

A major problem for the instructor of farm mechanics is deciding what should be taught in his particular community. With this in mind a committee of vocational agriculture instructors has been working on a list of farm mechanics units to be taught to vocational agriculture students in Utah. Based upon the list of jobs, problems and activities prepared by the committee, the author undertook the present study to determine how completely the program is being carried out by teachers presenting different backgrounds and preparation.

The state staff members and teachers in agriculture education are concerned about the farm mechanics being taught in vocational agricultural departments in high schools. Teachers with varied backgrounds and preparation may stress different phases of farm mechanics or include different units. Some were prepared in vocational agriculture, which includes farm mechanics, others graduated in industrial arts and still others specialized in mechanical work.

This study was an attempt to determine:

1- If a practical program is being carried out, based upon the recommendations of the state committee of vocational agriculture teachers of farm mechanics.

2- If there is a difference in the units being taught by farm mechanics instructors with varied backgrounds who teach only farm mechanics, industrial arts teachers who also teach farm mechanics and vocational agriculture teachers who teach the complete program including farm mechanics.

DELIMITATIONS

The area for the study was limited to the state of Utah. Only courses in the farm mechanics program in vocational agriculture, which were taught during the school year of 1954-55 in the classroom and shop were used. The instruction of both individuals or groups of students was used.

Because this was a lengthy questionnaire, 100 percent returns were not expected. The length was necessary in order to include all abilities, experiences, and skills that were recommended by the committee.

The investigation was not undertaken to formulate a course of study which should be taught, such has already been prepared. It was to ascertain if the recommended abilities, experiences, and skills were being taught; and if there was a difference in the instruction by the various teachers.

DEFINITION OF TERMS

For the purpose of this study the following classifications and definitions were used.

Vocational Agriculture - Systematic instruction in agriculture for those persons who are engaged in agriculture or who are preparing for an agricultural career. It is usually considered of less than college level.

Farm Mechanics - Shop activities taught as a part of the vocational agricultural program which includes all the unspecialized mechanical activities that a progressive farmer should perform on his home farm with the kinds of tools and equipment he will have accessible.

Areas - Five groups into which the farm mechanics program was divided by the (4) "sub-committee on agricultural teacher training" and called areas of instruction.

Units - Areas of instruction as further divided into similar groups of abilities, experiences, and skills for identification.

Group 1 - Instructors of farm mechanics who devote their full time as a teacher to the instruction of farm mechanics in vocational agriculture.

Group 2 - Vocational agriculture instructors who teach the complete program of vocational agriculture, including farm mechanics.

Group 3 - Industrial arts instructors employed primarily as industrial arts teachers, but also teach farm mechanics in vocational agriculture.

More than 50 percent - If taught to the whole class to the extent that more than 50 percent of the graduates developed the ability, experiences, and skills to an acceptable degree.

25 percent to 50 percent - If taught to the whole class, but only 25

percent to 50 percent of the graduates developed the ability, experience, and skill to an acceptable degree.

Not taught - If not taught to the extent that it meets none of these requirements.

REVIEW OF LITERATURE

A review of studies of farm mechanics being taught in high schools has been made by the author with special emphasis being placed on the background and preparation of the teacher. Several of these studies most closely related to the problem considered here are reviewed briefly.

One of the most significant and basic ideas of the review was brought out by Cook (4) in discussing the training needs of prospective teachers in vocational agriculture. He conveys the idea that they must be trained in scientific information and also have an opportunity to develop skills which they will need in providing instruction for present and prospective farmers. Teachers must know how to apply the knowledge they have gained. Cook states that "teachers teach like they are taught." If this is the case, then teachers must be taught desirable methods in their training if they are to use desirable methods.

Bail's (1) survey further emphasizes the idea brought out by Cook in reporting a vocational agriculture teacher is unique in that he must have both the theoretical and practical end of farming. He points out that the curriculum for the training of vocational agriculture teachers must attempt to keep a balance between scientific agriculture on one hand and humanities and professional education on the other. His studies show that vocational agriculture teachers thought that a strong groundwork of courses in technical agriculture was desirable. In the survey, agricultural mechanics received the highest rating in the essential column.

These reports indicate that if a strong, complete program is wanted, that the instructor must be trained to teach in that kind of program.

He must have both a theoretical and working knowledge of what he is going to teach.

Teachers of vocational agriculture in performing their duties are required to engage in a wide variety of skills of which the teaching of organized classes are often considered more important. The teachers, therefore, need a broad understanding and knowledge of most phases of farming if they are to teach effectively.

Since farm mechanics is the phase of vocational agriculture this study deals with, it seems very significant to note that in a workshop in farm mechanics for teachers of vocational agriculture, held at Alabama Polytechnic Institute in Auburn, Alabama during the summer of 1953 (3), a substantial group of teachers frankly admitted that the reason they were not doing a better job of teaching farm mechanics was that they did not possess many of the mechanical skills needed. This report seems to indicate that the development of skills would go a long way in providing better teaching.

Kugler (7) reports that skills alone are not enough. Teacher training in farm mechanics quite often consists in the development of skills for using small hand tools and the study and selection of farm equipment. This type of program is satisfactory as far as it goes, but is not adequate to meet the needs of the present farm operator. If a teacher is to teach on a "doing basis", it would be advantageous to him if he were trained in the same manner.

Kugler's (7) study was substantiated in a non-thesis study by Scarbrough (11) made in the state of Tennessee. It was to determine the farm mechanics situation in 149 departments of vocational agriculture distributed throughout the state. This study revealed that teachers even though they had the skills, were in need of instruction in planning,

conducting, and evaluating their farm mechanics program.

Vocational agriculture being vocational would indicate that skills alone are not enough. Skills can easily be taught in a general shop. They have to be applied if they are going to be useful to the student in his everyday work on the farm. In order to make these skills practical, a teacher must teach them in a practical manner. In as much as previous reports state that a teacher teaches as he is taught (4), he must be taught correctly.

Sullivan (12) brings out in his thesis study that the farm mechanics needs of teachers of vocational agriculture in Alabama reveals that more than half the total farm mechanics program is devoted to shop work; whereas the teachers need training most in the areas of farm building and sanitation, farm power and machinery and rural electrification.

In reviewing the foregoing studies it was evident that there is a great need for more training in certain phases of farm mechanics. The question is raised, "How can an adequate program be taught with these deficiencies?" In reviewing other studies, the author found that Miller (8) gave an excellent explanation of this in his thesis study. He reports that the older teachers, those having taught 10 years or more, obtained most of their training on the job (44 percent) and in college they received a smaller part (36 percent). In contrast, the younger teachers, those with less than 10 years experience, obtained 35 percent of their training in college with training obtained on the farm, on the job, and in vocational agriculture classes being about equal (23, 22, and 20 percent respectively). The younger teachers received considerably more training in vocational agriculture classes and on the farm than did the older teachers. In summary, it was found that most training for skills was obtained on the job by the teachers as a whole, closely followed by that

received in college. Training received on the farm as a boy was third and that of vocational agriculture classes last.

Barton (2) reported that the ineffectiveness of the farm mechanics program may frequently be traced to a lack of good background in farm mechanics on the part of the teacher. Possibly he is limited in the number of courses he obtained in the training center or he has not been trained to properly organize his instruction. Barton's explanation to overcome these conditions is to provide a situation in the training center that is similar to a farm mechanics setup in a department of vocational agriculture; namely, a farm mechanics shop arranged to provide areas of instruction which are common to the section or the state.

No one program of instruction can be adopted that will cover all areas. For this reason there is always a problem as to what particular jobs should be taught in each area. This has been the object of many studies. In fact, each vocational agriculture instructor should make a survey (4) of the community in which he is to teach before his course is planned.

In making a study of this nature, but on a larger scale, the University of Illinois (10) directed 5 teachers of vocational agriculture in interviewing a sample of farmers in their communities to determine the content of farm mechanics instruction. The following types of evidences were collected: equipment used on the farm, the kinds of farm mechanics work being performed by the farmers, the kinds of farm mechanics jobs being referred to experts, the farm mechanics jobs which the farmers would do on their farm if they had the "know how", and the opinion of the farmers regarding the relative importance of each type of farm mechanics instruction. Areas of farm mechanics instruction that these farmers rank near the top of the list in importance in all 5 communities are

listed in order of their importance as follows: farm safety, repairing and adjusting of farm machinery, farm carpentry, farm tractor maintenance and adjustment, soil and water management, sharpening and using hand tools, wiring for electricity and welding.

Studies of this type provide a teacher with some information besides his own opinion which he can use in planning the content in farm mechanics for his various courses.

Young (13) reported another study made in Illinois on course content. It was based on time devoted to each area of instruction in farm mechanics during the course in vocational agriculture. Forty good teachers of farm mechanics were selected for the survey. No attempt was made, however, to select the 40 "best" teachers. He prepared Table 2 showing how areas have been ranked according to the total number of days devoted to the area. The average amount of time spent on farm mechanics during the course in vocational agriculture is 191 days with an average of 82 minutes per day. Woodwork and field machinery are at the top of the list since more than a fourth of the total time spent on farm mechanics is devoted to these areas. The areas of electric wiring, electric welding, and gasoline motors are near the top of the list. These 5 areas count for about half the time spent on farm mechanics.

It will be noted that in the following table, woodwork is taught twice as long as the area next in line. This covers a wide range of jobs where the rest of the areas are more specific. Tool sharpening is eleventh in rank which emphasizes that skills alone are not sufficient in a vocational agriculture program. Harness repairing is last in rank with a total of only 8 days spent in this area.

Table 1. A tabulation of results showing total days spent in each area of instruction

Areas	Days spent on this area	Areas	Days spent on this area
Woodwork	1093	Safety	127
Field machinery	573	Pipe fitting	126
Electric wiring	443	Saw fitting	119
Electric welding	370	Establishing farm shop	101
Gasoline motors	331	Drainage	99
Cold metal work	289	Reading drawing	98
Oxy-acetylene	252	Finishing & refinishing	
Painting	248	furniture	85
Concrete work	241	Fencing	83
Soldering	234	Electricity	72
Tool sharpening	220	Household mechanics	72
Making drawings	205	Plumbing	53
Forging	173	Buildings	45
Rope work	162	Wood lathe	32
Contouring	153	Metal lathe	20
Electric motors	144	Harness repairing	8

It is not assumed that studies of this nature will give the answer to what to teach in farm mechanics and how much time to spend on each area. However, the information should be useful as a guide for the experienced teacher and especially useful to the beginning teacher.

A few basic ideas stand out in this review of related literature. They are summarized as follows:

1. Teachers teach like they are taught and therefore if a good teacher is expected, there must be good preparation.

2. The teaching of farm mechanics in vocational agriculture requires such a wide variety of skills that the teachers need a broad understanding and knowledge of both the scientific and practical end of most phases of farming if they are to teach effectively.

3. Teachers of farm mechanics obtain most of their skills on the job, closely followed by training received in college.

4. No one program of instruction can be adopted that will cover all the different communities where farm mechanics in vocational agriculture is being taught.

The studies reviewed here are those seemingly most typical of the investigations carried out in this particular field. No attempt has been made to review exhaustively the literature which is related to the subject.

METHOD OF PROCEDURE

It was proposed to make a survey of the units being taught by farm mechanics instructors in vocational agriculture in the state of Utah. The purpose of this study was to determine if a practical program is being carried out, and, if there is a difference in the units being taught by farm mechanics instructors with varied backgrounds who teach only farm mechanics, industrial arts teachers who also teach farm mechanics and vocational agriculture instructors who teach the complete program, including farm mechanics.

Names and addresses of all instructors of farm mechanics in vocational agriculture were obtained from the agricultural education office at the Utah State Agriculture College. In the cases of industrial arts teachers whose names and addresses weren't available, the questionnaire was sent to the vocational agriculture instructor with instructions to hand it to the teachers of farm mechanics. Being an indirect method, this may have been one of the reasons why response was poor from this group of instructors. Forty-five questionnaires were mailed. Two of these were returned reporting no farm mechanics was being taught in the school; these questionnaires were discarded. One questionnaire was discarded because of incomplete information; therefore, it could not be used.

The questionnaire used in this study was constructed with the aid of the members of the graduate committee. Trial questionnaires were validated by farm mechanics instructors in high school vocational agricultural departments. It was based on the list of abilities, skills, and experiences prepared by the state committee of vocational agriculture teachers

in farm mechanics. This list had previously been sent to members of the committee as a survey; therefore, questions selected from it were those listed as "musts" and "desirables" in a majority of the questionnaires.

A summary of returns by groups is presented in the following table.

Table 2. Summary of responses to questionnaire

Teaching Groups	Questionnaires mailed	Questionnaires returned	Percent returns
Group 1 (farm mechanics instructors who teach farm mechanics only)	10	8	80
Group 2 (vocational agriculture instructors teaching complete program)	24	18	75
Group 3 (industrial arts teachers who also teach farm mechanics)	8	4	50
Questionnaires discarded	3	3	
Total questionnaires	45	34	76

The questionnaire was divided into 2 parts: first, questions on background and preparation of the instructor who teaches farm mechanics, and second, questions to determine which units are being taught.

In part 1, there are 4 questions. Question number 1 was designed to determine the formal schooling and field of teaching of the instructor. A teacher usually teaches as he is taught which would indicate that he is better prepared to teach in his own field. This was also used to classify the teachers according to groups.

Question 2 provides information on what additional training the teacher has had to aid him in teaching in this field. This is important due to the fact reported in Miller's study (8) that most of the training of farm mechanics instructors was obtained on the job or after they had started teaching.

Question 3 was designed to determine the number of years each instructor had taught farm mechanics. This information and question number 4, which asks to list experiences such as farm machinery repairman, farming after 18 years of age, would indicate the practical experience a teacher has had in applying and supplementing his training.

The second part of the questionnaire is comprised of a list of 120 experiences, abilities, and skills and is divided into the following 5 areas of instruction: farm shop work, farm power and machinery, farm buildings and conveniences, soil and water management, and rural electrification.

The response was broken down into 4 columns. The first 3 columns were used to stimulate thought in answering the positive side, and the fourth column called for a negative answer to determine what is being taught.

This questionnaire included units taught in Agriculture I, II, III, and IV during the last full year of the farm mechanics program. It was confined to instruction in farm mechanics in the classroom and shop only. In other words, individual instruction on farms was not included.

The questionnaire, with a stamped, self-addressed envelope, was mailed to all instructors of farm mechanics in vocational agriculture in the state. A follow-up questionnaire was sent out in 10 weeks. Two weeks later a post card was sent as a reminder.

ANALYSIS OF DATA

As previously stated, the farm mechanics instructors of the state of Utah were classified into 3 groups as follows:

1. Farm mechanics instructors who teach farm mechanics only
2. Vocational agriculture instructors teaching the complete program
3. Industrial arts instructors who teach farm mechanics along with their industrial arts classes

These groups are identified by the above numbers throughout the study. As previously defined, the degrees to which the abilities, skills, and experiences being taught are represented as follows:

1. More than 50 percent - If taught to the whole class to the extent that more than 50 percent of the graduates developed the ability, experience, and skill to an acceptable degree
2. 25 percent to 50 percent - If taught to the whole class, but only 25 percent to 50 percent of the graduates developed the ability, experience, and skill to an acceptable degree
3. Less than 25 percent - If taught only to a few on an individual basis--less than 25 percent developed the ability, experience, and skill to an acceptable degree
4. Not taught - If not taught to the extent that it meets none of these requirements

The questions in part 1 were designed to determine the background and training of the instructors teaching farm mechanics. Question number 1 was asked to determine the field in which they had received their B. S. degree.

As shown in Table 3, 62.5 percent of the instructors teaching farm mechanics only received their degree in vocational agriculture; 12.5 percent in industrial arts; 12.5 percent in the different fields of agriculture (i.e. agronomy, animal husbandry, etc.,) and 12.5 percent in other

fields. Of those instructors who taught the complete vocational agriculture program, 77.7 percent received their degree in vocational agriculture. The industrial arts instructors teaching farm mechanics were 100 percent industrial arts graduates. Since teachers tend to teach the way they are taught, the industrial arts teachers would be expected to follow a definite pattern, while the instructors of farm mechanics and those who teach the complete program might vary.

The following chart, expressed in percentages, indicates the field in which teachers in farm mechanics received their B. S. degree.

Table 3. Comparison of farm mechanics teachers according to the field in which they received their B. S. degree

	Group 1	Group 2	Group 3
B. S. Degree	Farm mechanics only	Complete program	Industrial arts
Vocational agriculture	62.5	77.7	0
Industrial arts	12.5	0	100
Agriculture (i.e. agronomy, etc.)	12.5	22.2	0
Other	12.5	0	0

Question number 2 asked for a list of special training which aided the instructors in teaching farm mechanics (i.e. summer conferences, short courses, etc.). Group 1 listed from 1 to 4 types of courses per teacher with only 1 teacher listing none. Group 2 listed similar courses to group 1, with but 1 new instructor listing none. Group 3 showed a significant difference in that they listed only 2 types of courses taken, and 50 percent of them listed none.

Question number 3, which asks for the teaching experience each instructor has had in farm mechanics, showed results which were quite similar. The data in Table 4 shows the average teaching experience was 8.12 years. The vocational agriculture teachers teaching the complete courses having the least teaching experience with 7.67 years; and the highest of the group was the industrial arts teachers who also taught farm mechanics, with a 9.25 average.

Table 4. A summary, expressed in years, of the years of teaching in farm mechanics

	Group 1 Farm mechanics only	Group 2 Complete program	Group 3 Industrial arts
Average year teaching farm mechanics	8.06	7.67	9.25

Question number 4 was designed to obtain practical experience which aided in teaching farm mechanics. The information in the questionnaire shows that 88 percent of group 1 had previous farm experience, with group 2 having 73 percent, and group 3 had 25 percent. It can be seen in group 3 that the practical end of farming which Bail (1) stated as being so important is missing. According to the report, these instructors would lack the ability to apply their technical knowledge to the farming situation.

Part 2 of the questionnaire deals with the abilities, experiences, and skills taught by the teachers in their respective groups. The units being taught were divided into 5 areas of instruction. These 5 areas were classified into units to further identify the abilities, experiences, and skills.

Response to the individual questions was very good. Questions were rarely left out, but when any one question or even units were omitted, an explanation was usually given so that the author could accurately check the appropriate answer. For example, if an instructor didn't have the equipment to teach a skill, he often made a notation of this and omitted the check. To the author, this was an indication of the teacher being conscientious in what he was doing.

Tables 5 through 10 show the 5 areas of instruction divided into areas and units. These units were further divided into abilities, skills, and experiences which were taught in Agriculture I, II, III, and IV during the school year of 1954-55 by farm mechanics instructors of vocational agriculture in Utah. The data in the tables are expressed in percentages.

Table 5a. Farm shop work - A comparison, expressed in percentages, of experiences, abilities, and skills taught in Agriculture I, II, III, and IV during the school year of 1954-55 by farm mechanics instructors of vocational agriculture in Utah according to teaching groups

Hot and Cold Metals	More than 50%			25% to 50%			Less than 25%			Not taught		
	Groups			Groups			Groups			Groups		
Experiences, abilities, and skills	1	2	3	1	2	3	1	2	3	1	2	3
1. Select fuel	50	34	25	25	0	0	0	22	25	25	44	50
2. Make forge fire	75	73	25	12	6	25	12	6	25	0	17	25
3. Use common forge tools	62	62	25	25	11	25	12	11	25	0	17	25
4. Upsetting	38	22	0	38	34	25	25	17	50	0	28	25
5. Drawing	38	38	25	38	34	25	25	11	25	0	17	25
6. Shape and bend hot and cold metal	62	56	25	25	17	25	12	11	25	0	17	25
7. Punch - hot and cold	25	34	25	50	17	25	25	22	25	0	28	25
8. Temper and anneal	62	45	25	25	28	25	12	11	25	0	17	25
9. Identify metals	62	22	0	25	22	50	12	28	25	0	28	25
10. Cut - hot, chisel and hacksaw	75	62	25	25	22	25	0	11	25	0	6	25
11. File	88	62	25	12	28	50	0	6	0	0	6	25
12. Rivet	62	28	25	38	34	50	0	11	0	0	28	25
13. Solder	76	50	25	12	22	50	12	17	0	0	11	25

Table 5a. Farm shop work (continued)

Experiences, abilities, and skills	More than 50%			25% to 50%			Less than 25%			Not taught		
	Group			Group			Group			Group		
	1	2	3	1	2	3	1	2	3	1	2	3
14. Select solder and flux	50	39	25	12	28	25	38	22	0	0	11	50
15. Lay out sheet metal	25	11	25	38	11	50	38	17	0	0	62	25
16. Generate and operate blow torch	50	34	25	12	11	50	25	11	0	12	45	25
17. Shape, tin and care of soldering copper	38	34	75	38	22	25	25	22	0	0	22	0
18. Sharpen knife, hoe, shovel, cultivating tools, auger bit, plane shears, twist bit, etc.	75	73	100	25	22	0	0	6	0	0	0	0
19. Thread and tap	25	50	100	62	28	0	12	11	0	0	11	0
20. Remove broken stud	0	6	50	12	17	25	12	50	25	25	28	0
21. Recondition and replace broken handles in an axe, shovel, etc.	88	73	100	0	6	0	12	17	0	0	6	0
22. Drill and operate various types of drills	100	62	100	0	28	0	0	11	0	0	0	0

Table 5b. Farm shop work - A comparison, expressed in percentages, of experiences, abilities, and skills taught in Agriculture I, II, III, and IV during the school year of 1954-55 by farm mechanics instructors of vocational agriculture in Utah according to teaching groups

Electric Welding	More than 50%			25% to 50%			Less than 25%			Not taught		
	Group			Group			Group			Group		
Experiences, abilities, and skills	1	2	3	1	2	3	1	2	3	1	2	3
1. Care for and operate equipment	100	84	75	0	11	25	0	6	0	0	0	0
2. List precautions	88	78	100	0	17	0	0	6	0	12	0	0
3. Select proper rods	62	78	75	25	17	25	12	6	0	0	0	0
4. Weld in different positions	38	45	50	38	39	50	0	11	0	25	6	0
5. Set up work	75	67	75	25	11	25	0	17	0	0	6	0
6. Figure cost	38	45	25	64	22	50	0	6	25	0	28	0
7. Braze	38	17	25	25	34	50	25	22	25	12	28	0
8. Hardface	0	6	25	38	17	25	25	39	25	38	39	25
9. Cut	100	66	50	0	34	50	0	0	0	0	0	0

Table 5c. Farm shop work - A comparison, expressed in percentages, of experiences, abilities, and skills taught in Agriculture I, II, III, and IV during the school year of 1954-55 by farm mechanics instructors of vocational agriculture in Utah according to teaching groups

Acetylene Welding	More than 50%			25% to 50%			Less than 25%			Not taught		
	Groups			Group			Group			Group		
Experiences, abilities, and skills	1	2	3	1	2	3	1	2	3	1	2	3
1. Set up instructions in safety	75	78	75	0	11	0	0	00	0	25	11	25
2. Set up tanks, gauges, welding and cutting outfits	75	73	75	25	11	0	0	6	0	0	11	25
3. Select proper tips for cutting and welding	62	67	75	38	22	0	0	0	0	0	11	25
4. Determine costs	12	28	25	50	0	50	38	45	0	0	28	25
5. Select rods for different kinds of work	25	45	25	25	17	25	38	28	0	12	11	50
6. Select fluxes	25	34	25	25	6	50	38	39	0	12	22	25
7. Weld	50	39	25	25	34	50	12	17	0	12	11	25
8. Braze	25	28	25	25	28	50	50	28	0	0	17	25
9. Hardface	12	6	25	38	11	25	25	39	25	25	45	25
10. Cut	62	67	50	25	22	25	0	0	0	25	11	25

Table 5d. Farm shop work - A comparison, expressed in percentages, of experiences, abilities, or skills taught in Agriculture I, II, III, and IV during the school year of 1954-55 by farm mechanics instructors of vocational agriculture in Utah according to teaching groups

Plumbing	More than 50%			25% to 50%			Less than 25%			Not taught		
	Group			Group			Group			Group		
Experiences, abilities, and skills	1	2	3	1	2	3	1	2	3	1	2	3
1. Select, measure and cup pipe	38	34	0	25	11	50	38	22	0	0	34	50
2. Select pipe fittings and couplings	25	28	0	50	6	50	25	28	0	0	39	50
3. Ream pipe and cut threads	25	28	0	75	22	25	0	28	50	0	22	25
4. Select common fixtures	25	11	0	62	22	50	0	17	25	12	50	25
5. Replace gaskets	12	22	0	62	17	50	12	17	25	12	45	25
6. Clean traps	12	11	0	25	11	50	50	11	0	12	67	50
7. Open plugged drains	12	6	0	25	11	25	38	11	0	25	73	75
8. Wipe a joint	12	11	0	12	17	0	38	0	0	38	73	100

Table 5e. Farm shop work - A comparison, expressed in percentages, of experiences, abilities, and skills taught in Agriculture I, II, III, and IV during the school year of 1954-55 by farm mechanics instructors of vocational agriculture in Utah according to teaching groups

Farm Carpentry	More than 50%			25% to 50%			Less than 25%			Not taught		
	Group			Group			Group			Group		
Experiences, abilities, and skills	1	2	3	1	2	3	1	2	3	1	2	3
1. Select lumber	62	34	75	0	17	0	0	0	0	38	50	25
2. Classify and select nails, screws, bolts, and hardware items	75	67	100	12	34	0	12	0	0	0	0	0
3. Classify, select and use farm carpentry tools a. square	88	78	100	12	17	0	0	0	0	0	6	0
b. saw	88	78	100	12	17	0	0	0	0	0	6	0
c. plane	88	73	100	12	17	0	0	6	0	0	6	0
4. Make a list of safety practices	64	67	100	12	11	0	12	6	0	12	17	0
5. Figure bill of materials	50	84	100	25	17	0	25	0	0	0	0	0
6. Build common farm W. W. devices-- gate, feeder, panel, etc.	62	62	75	25	39	0	12	0	25	0	0	0
7. Repair farm devices	50	62	75	50	34	0	0	0	25	0	6	0
8. Use power equipment	62	84	100	25	17	0	12	0	0	0	0	0
9. Cut common rafters	25	22	100	50	45	0	25	22	0	0	11	0

Table 5f. Farm shop work - A comparison, expressed in percentages, of experiences, abilities, and skills taught in Agriculture I, II, III, and IV during the school year of 1954-55 by farm mechanics instructors of vocational agriculture in Utah according to teaching groups

Rope and Leatherwork	More than 50%			25% to 50%			Less than 25%			Not taught		
	Group			Group			Group			Group		
Experiences, abilities, and skills	1	2	3	1	2	3	1	2	3	1	2	3
1. Select rope	50	45	25	12	28	25	12	6	0	25	22	0
2. Select leather	25	22	25	12	11	25	12	11	0	50	56	50
3. Make rope halter	50	56	25	12	17	25	12	17	0	25	11	50

Table 5g. Farm shop work - A comparison, expressed in percentages, of experiences, abilities, and skills taught in Agriculture I, II, III, and IV during the school year of 1954-55 by farm mechanics instructors of vocational agriculture in Utah according to teaching groups

Painting and Glazing	More than 50%			25% to 50%			Less than 25%			Not taught		
	Group			Group			Group			Group		
Experiences, abilities, and skills	1	2	3	1	2	3	1	2	3	1	2	3
1. Select paint for inside and outside	50	39	25	38	34	75	0	17	0	12	11	0
2. Mix paint - ready mix	38	50	25	38	22	75	0	17	0	25	11	0
3. Prepare surface	75	50	25	25	28	50	0	11	25	0	11	0
4. Make repairs	38	39	25	50	28	50	0	11	25	12	22	0
5. Replace broken glass	50	28	0	12	17	50	25	6	25	12	50	25
6. Select, use and care for brushes	38	67	0	50	6	50	12	22	50	0	6	0
7. Apply paint with brush and gun	25	67	25	75	11	25	0	17	50	0	6	0
8. Operate and care for spray gun	25	38	25	64	28	25	0	11	50	12	22	0
9. Use and care of roller	12	0	0	25	17	25	25	11	50	38	73	25

Table 5h. Farm shop work - A comparison, expressed in percentages, of experiences, abilities, and skills taught in Agriculture I, II, III, and IV during the school year of 1954-55 by farm mechanics instructors of vocational agriculture in Utah according to groups

Fences	More than 50%			25% to 50%			Less than 25%			Not taught		
	Group			Group			Group			Group		
Experiences, abilities, and skills	1	2	3	1	2	3	1	2	3	1	2	3
1. Determine kind of fence needed	38	22	0	0	11	50	25	17	0	38	50	50
2. Figure costs of various kinds of fences	12	22	0	50	17	50	12	11	0	25	50	50
3. Select, prepare and treat posts	12	11	0	12	6	25	25	11	25	50	73	50

Table 6a. Farm power and machinery - A comparison, expressed in percentages, of experiences, abilities, and skills taught in Agriculture I, II, III, and IV during the school year of 1954-55 by farm mechanics instructors of vocational agriculture in Utah according to teaching groups

Farm Tractors, Trucks and Gas Engines	More than 50%			25% to 50%			Less than 25%			Not taught		
	Group			Group			Group			Group		
Experiences, abilities, and skills	1	2	3	1	2	3	1	2	3	1	2	3
1. Clean and adjust carburetor	38	22	0	38	32	50	25	22	0	0	34	50
2. Repair ignition system	25	22	0	64	22	0	12	22	50	0	34	50
3. Trouble shoot	25	28	0	64	28	0	12	22	50	0	22	50
4. Service air cleaner	88	39	0	12	22	50	0	17	0	0	22	50
5. Service cooling system	75	45	0	25	17	50	0	11	0	0	28	50
6. Care for batteries and tires	62	50	0	38	22	25	0	11	25	0	17	50
7. Time a gasoline engine	25	22	25	38	22	25	25	28	0	0	28	50
8. Lubricate	75	39	0	25	34	50	0	0	0	0	28	50
9. Operate tractor safely	75	39	0	25	28	25	0	0	0	0	34	50
10. Apply power	38	39	0	50	17	25	12	6	25	0	39	50
11. Winterize	75	45	0	25	34	25	0	0	25	0	22	50
12. Clean fuel system	75	28	0	25	28	50	0	11	0	0	34	50
13. Clean and adjust spark plugs	75	39	0	25	17	50	0	17	0	0	28	50

Table 6b. Farm power and machinery - A comparison, expressed in percentages, of experiences, abilities, and skills taught in Agriculture I, II, III, and IV during the school year of 1954-55 by farm mechanics instructors of vocational agriculture in Utah according to teaching groups

Farm Machinery	More than 50%			25% to 50%			Less than 25%			Not taught		
	Group			Group			Group			Group		
Experiences, abilities, and skills	1	2	3	1	2	3	1	2	3	1	2	3
1. Repair or replace worn or broken parts	50	34	0	12	28	50	25	22	25	12	17	25
2. Operate and lubricate properly	50	39	0	38	45	50	12	11	25	0	6	25
3. Select suitable tools and equipment to make needed repairs or construct needed devices	38	45	0	50	22	25	12	22	50	0	11	25
4. Install pulleys and belts	12	11	0	38	22	25	50	28	50	0	39	25

Table 7a. Farm buildings and conveniences - A comparison, expressed in percentages, of experiences, abilities, and skills taught in Agriculture I, II, III, and IV during the school year of 1954-55 by farm mechanics instructors of vocational agriculture in Utah according to teaching groups

Farm Drawing	More than 50%			25% to 50%			Less than 25%			Not taught		
	Group			Group			Group			Group		
Experiences, abilities, and skills	1	2	3	1	2	3	1	2	3	1	2	3
1. Make a lettering plate	12	17	50	25	11	25	25	17	25	37	56	0
2. Make and read conventional lines and symbols	25	22	50	50	6	50	13	28	0	13	45	0
3. Draw to scale	50	39	50	25	6	50	13	17	0	13	39	0
4. Read blueprints	50	28	50	25	6	50	0	28	0	25	39	0
5. Make workable sketches	62	39	50	38	17	50	0	17	0	0	28	0

Table 7b. Farm buildings and conveniences - A comparison, expressed in percentages, of experiences, abilities, and skills taught in Agriculture I, II, III, and IV during the school year of 1954-55 by farm mechanics instructors of vocational agriculture in Utah according to teaching groups

Farm Buildings	More than 50%			25% to 50%			Less than 25%			Not taught		
	Group			Group			Group			Group		
Experiences, abilities, and skills	1	2	3	1	2	3	1	2	3	1	2	3
1. Make repairs a. Replace boards	50	45	0	38	34	50	12	0	25	0	22	25
b. Hang doors	25	17	0	38	34	25	25	17	30	12	34	25
c. Repair roof	25	17	0	38	34	25	12	17	50	25	34	25
2. Determine costs	12	28	25	62	28	25	25	22	25	0	22	25
3. Prepare footings	38	11	0	38	11	50	25	22	0	0	56	50
4. Put in foundation	38	6	0	38	17	30	12	28	0	12	50	50
5. Frame a building	25	6	25	38	6	25	38	11	0	0	78	50
6. Complete a frame building	25	6	0	38	6	25	25	11	25	12	78	50
7. Make a portable building	12	6	0	25	6	25	38	28	0	25	62	75
8. Paint a building	38	38	0	50	22	25	12	28	25	0	11	50

Table 7c. Farm buildings and conveniences - A comparison, expressed in percentage, of experiences, abilities, and skills taught in Agriculture I, II, III, and IV during the school year of 1954-55 by farm mechanics instructors of vocational agriculture in Utah according to teaching groups

Concrete	More than 50%			25% to 50%			Less than 25%			Not taught		
	Group			Group			Group			Group		
Experiences, abilities, and skills	1	2	3	1	2	3	1	2	3	1	2	3
1. Run a silt test on gravel or sand	12	17	25	50	11	0	12	11	25	25	62	50
2. Build and set forms	12	6	25	50	11	0	12	22	25	25	62	50
3. Mix and pour concrete--including reinforcing	12	6	0	62	17	0	25	17	50	0	62	50
4. Finish concrete	25	6	0	38	0	0	38	34	25	0	62	75

Table 7d. Farm building and conviences - A comparison, expressed in percentages, of experiences, abilities, and skills taught in Agriculture I, II, III, and IV during the school year of 1954-55 by farm mechanics instructors of vocational agriculture in Utah according to teaching groups

Masonry	More than 50%			25% to 50%			Less than 25%			Not taught		
	Group			Group			Group			Group		
Experiences, abilities, and skills	1	2	3	1	2	3	1	2	3	1	2	3
1. Select and lay concrete blocks	25	0	0	0	6	0	25	0	50	50	95	50

Table 8. Farm soil and water management - A comparison, expressed in percentages, of experiences, abilities, and skills taught in Agriculture I, II, III, and IV during the school year of 1954-55 by farm mechanics instructors of vocational agriculture in Utah according to teaching groups

Irrigation and Drainage	More than 50%			25% to 50%			Less than 25%			Not taught		
	Group			Group			Group			Group		
Experiences, abilities, and skills	1	2	3	1	2	3	1	2	3	1	2	3
1. Lay out a grade for irrigation or land leveling	12	11	0	38	17	0	12	6	25	38	67	75
2. Build head gates, weirs and dividers	12	6	0	38	28	0	12	22	25	38	45	75
3. Use canvas dams	28	22	0	12	22	0	12	11	25	50	45	75
4. Measure water from ditches or weirs	0	11	0	25	11	0	25	17	0	50	62	100
5. Plan a drain system	12	0	0	0	6	0	38	17	0	50	78	100

Table 9. Rural electrification - A comparison, expressed in percentages, of experiences, abilities, and skills taught in Agriculture I, II, III, and IV during the school year of 1954-55 by farm mechanics instructors of vocational agriculture in Utah according to teaching groups

Electricity	More than 50%			25% to 50%			Less than 25%			Not taught		
	Group			Group			Group			Group		
Experiences, abilities, and skills	1	2	3	1	2	3	1	2	3	1	2	3
1. Read meters and compute bill	75	22	75	12	11	0	0	39	25	12	28	0
2. Make wiring diagram	38	17	75	38	11	0	12	28	25	12	45	0
3. Wire yards, barns, granaries, etc.	12	6	50	50	22	0	25	39	25	12	34	25
4. Repair electric cords	50	45	75	50	39	0	0	6	25	0	11	0
5. Make splices and other connections	62	56	75	38	38	0	0	11	25	0	6	0
6. Replace motor brushes, reverse motors	25	17	50	38	17	25	25	28	25	12	39	0
7. Select wire and insulation	25	34	50	75	22	0	0	28	25	0	17	0

A summary of the data of the abilities, experiences, and skills taught in all 5 areas is presented in Table 10. In hot and cold metal, it is noted that group 1 ranked highest with 55 percent of the teachers reporting in the more than 50 percent column, and groups 2 and 3 having about the same average percent. However, if it were not for the skills such as thread and tap, etc. being so high in group 3, the average for group 2 would have been considerably higher than group 3. In groups 1 and 2 the skills were more evenly taught, with group 3 going to the extreme in a number of cases. In the teaching of hot and cold metal by group 1, 82 percent of the instructors reported having taught to the extent that over 25 percent of the students mastered this skill to an acceptable degree; for group 2 was reported 64 percent, and 66 percent was reported for group 3.

In the teaching of electric welding, it is noted that as a whole it was taught equally to all groups. The average of group 1, 2, and 3 in the more than 50 percent column was 57 percent; their individual percentages being 60, 64, and 56 percent respectively. The equality of teaching showed here carried on consistently through the degree to which the skills were taught. In this unit, the teaching of hardfacing was an exception for it was only taught by 10 percent of all the instructors in the more than 50 percent column.

To the extent that acetylene welding was reported taught, it was not rated as high as electric welding by the teachers. In acetylene welding, the average of all 3 groups in the more than 50 percent column was 43 percent, and electric welding was 57 percent. There seems to be very little distinction among the groups in the teaching of these skills.

The teaching of plumbing showed a distinct difference in the emphasis placed on it by the different groups. It was a phase of instruction

Table 10. A summary, expressed in percents, of comparisons of abilities, experiences, and skills taught in Agriculture I, II, III, and IV during the school year of 1954-55 by farm mechanics instructors of vocational agriculture in Utah according to teaching groups

Teaching Areas	More than 50% Groups			25% to 50% Groups			Less than 25% Groups			Not taught Groups		
	1	2	3	1	2	3	1	2	3	1	2	3
Farm shop work												
1. Hot and cold metal	55	44	40	27	20	26	14	16	14	3	20	20
2. Electric welding	60	54	56	24	22	33	7	12	8	10	12	3
3. Acetylene welding	42	46	42	28	16	28	16	20	25	11	18	22
4. Plumbing	20	19	0	42	15	38	25	17	12	12	50	50
5. Farm carpentry	65	65	93	21	24	0	9	3	5	5	9	2
6. Rope and leatherwork	42	41	25	12	18	25	12	11	0	33	30	50
7. Painting and glazing	39	41	17	42	21	47	7	13	31	12	34	6
8. Fences	21	18	0	21	11	42	21	13	8	38	58	50
Average	43	41	24	26	18	24	14	13	10	16	28	26
Farm power and machinery												
1. Farm tractor, truck, and gasoline engines	58	35	2	35	24	33	7	13	13	1	28	50

Table 10. (continued)

Teaching Areas	More than 50% Groups 1	2	3	25% to 50% Groups 1	2	3	Less than 25% Groups 1	2	3	Not taught Groups 1	2	3
2. Farm machinery	38	32	30	35	29	38	25	21	38	3	16	25
Average	48	34	1	35	26	36	16	17	26	2	22	38
Farm buildings and conveniences												
1. Farm drawing	40	29	50	33	9	45	10	21	5	18	41	0
2. Farm buildings	29	18	5	40	20	32	32	16	20	9	45	42
3. Concrete	15	9	12	50	10	0	22	21	31	12	62	56
4. Masonry	25	0	0	0	6	0	25	0	50	50	95	50
Average	27	14	17	31	11	19	22	14	26	20	61	37
Soil and water management												
1. Irrigation and drainage	12	10	0	23	17	0	20	15	15	45	59	85
Rural electrification												
1. Electricity	41	28	64	43	21	7	9	25	25	7	26	3

highly neglected by groups 2 and 3 who reported 50 percent of their instructors not teaching it. Group 1 was also low for only 42 percent of the instructors reported the skills being taught in the 25 percent to 50 percent column.

The data of farm carpentry as shown in Table 10 is rated high in the more than 50 percent column by all 3 groups. Group 3 was outstanding with 93 percent of the instructors reporting in this column. The other 2 groups followed with 65 percent each. Table 5e shows all skills in this section were taught with an amazing amount of equality.

Rope and leatherwork were taught equally by groups 1 and 2, being 42 and 51 percent respectively in the more than 50 percent column. Group 3 fell low with only 25 percent of the instructors indicating the skills taught to that degree. Fifty percent of the teachers in group 3 indicated that rope and leatherwork were not taught. Groups 1 and 2 were lower in the not taught column having 33 and 30 percent respectively.

The teaching of painting and glazing followed closely the pattern set by rope and leatherwork in the column of more than 50 percent, but showed a decidedly different result in skills not being taught. Group 3 had only 6 percent here as compared with 50 percent in rope and leatherwork. Again, group 1 reported more frequently that more than 25 percent of the skills were learned to an acceptable degree.

Group 3 considered fencing of little importance as is shown where 50 percent of these teachers taught no skills pertaining to this. Group 2 was even lower with 58 percent reporting the abilities, experiences, and skills not taught. Even though a majority of group 1 teachers did not fall into this category, 38 percent did indicate, however, not having taught the skills.

As a whole, the area of farm shop work was taught more completely by the farm mechanics instructors of group 1. It was closely followed by group 2, who were the vocational agriculture instructors teaching the complete program, and last was group 3, the industrial arts teachers.

The section of farm power and machinery deals more with the operation and maintenance part of farm work. Group 1 taught a strong program in farm tractor, truck, and gasoline engines. This was indicated by 50 percent of the instructors teaching the skill to the extent that more than 50 percent of the students acquired the skills, abilities, and experiences. Group 2 followed with 35 percent of its teachers falling in this category, and group 3 was low with only 2 percent of the teachers participating in this unit. This is the work a farmer deals with every day as he goes about his farming. It could be classified as a practical phase of farming. A comparison of the data in Table 10 show that the 3 groups of teachers are decidedly different in their patterns of teaching. The 3 groups in the farm machinery unit follow closely the pattern set by the unit of farm tractor, truck, and gasoline engines with the exception of group 1 who dropped from 58 percent to 38 percent in the more than 50 percent column.

The farm buildings and conveniences area could be placed in 2 categories with farm drawing in the first, because it is taught wholly in the classroom or shop, and second, farm buildings, concrete, and masonry because of their being taught away from the school. It is noted that farm drawing was taught to a greater extent by group 3, with 50 percent of the instructors having taught it in the more than 50 percent column. Group 1 followed with a 40 percent, and group 2 was last with only 29 percent. It will be observed from the data in Table 10, that group 3 placed in the upper 2 columns 95 percent of the time. This would indicate they had a

very strong program of farm drawing, while on the other hand, group 2 showed a deficiency with 41 percent of its instructors not teaching farm drawing. In farm buildings it was reported group 1 is doing a more complete job, with 69 percent of its instructors teaching the skills to the point where over 25 percent of the students acquired it to an acceptable degree. Groups 2 and 3 were both deficient in teaching these skills with 45 percent and 42 percent respectively, falling into these groups.

Teaching concrete followed very closely the pattern set by farm buildings, with group 1 teaching the abilities, experiences, and skills while groups 2 and 3 did not.

Observation shows that masonry is being taught very little. Ninety-five percent of group 2 reported no instruction, and the other 2 groups reported 50 percent not taught. The important observation in the area of farm buildings and conveniences is that group 2, which is the most typical of vocational agriculture instructors, taught it least.

The data in soil and water management shows it was not taught to a large majority of the students; 63 percent being the average of all 3 groups in the not taught column. Group 2 should be expected to rank high in this area for they teach a complete program of vocational agriculture. This may not be included as part of the teaching program of groups 1 and 3 for it may be taught by the agriculture science teacher, but Table 10 shows group 2 is below group 1 and not higher than group 3. This is the least taught area of the survey.

In rural electrification, the data shows the teachers in group 3, without an exception, teaching the area more completely. Sixty-four percent of the teachers reported more than 50 percent of the students are acquiring the skills, experiences, and abilities. Group 1 came next with a 41 percent, and it is noted here that 74 percent of group 2 reported

having taught to the degree that over 25 percent of the students mastered the abilities, experiences, and skills.

A summary of the data in Table 10 shown in Table 11 reveals that the instructors who taught farm mechanics only excelled in all areas of instruction. They placed a greater emphasis on teaching the recommended abilities, experiences, and skills as a whole, by reporting a greater percentage of their instructors taught to the extent that more than 25 percent of their students acquired them.

In the individual areas, the data shows emphasis was given in teaching of farm shop work by 69 percent of the preceeding unit, while 30 percent gave it little emphasis. Teaching of farm power and machinery was emphasized by 83 percent of the group, with 18 percent not emphasizing it. The same pattern was followed in farm buildings with 58 percent of the group emphasizing it and 42 percent not placing emphasis on it. The area on soil and water management was least emphasized for only 35 percent of the instructors who taught farm mechanics only emphasized it, while 65 percent of them did not. Rural electrification again fell into the pattern set by the first three areas for 84 percent of the instructors emphasized it, with 16 percent reporting it not emphasized.

Table 11. A summary, expressed in percents, of the teaching areas in farm mechanics showing courses emphasized and courses not emphasized

	Emphasized			Not Emphasized		
	Group			Group		
Areas of Instruction	1	2	3	1	2	3
Farm shop work	69	59	63	30	41	36
Farm power and machinery	83	60	37	18	39	64

Table 11. (continued)

Areas of Instruction	Emphasized Groups 1	2	3	Not Emphasized Groups 1	2	3
Soil and water management	35	27	0	65	74	100
Rural electrification	84	49	71	16	51	28

The data shows that the vocational agriculture instructors who taught a complete course and the industrial arts instructors who also taught farm mechanics ranked about equal. However, the vocational agriculture instructors were more consistant in their teaching while the instruction of the industrial arts teachers fluctuated. An example of this fluctuation is shown in the instruction of the soil and water management area where none of the industrial arts teachers reported teaching it, while in rural electrification 71 percent of them reported it being taught.

SUMMARY AND CONCLUSIONS

The purpose of this investigation was to determine how completely the program of farm mechanics in vocational agriculture, as recommended by the committee of vocational agriculture instructors of farm mechanics, was being carried out by teachers of different backgrounds and preparation.

The objectives were to determine: first, if a practical program is being carried out which is based upon the recommendations of the committee, and second, if there is a difference in units being taught by farm mechanics instructors with varied backgrounds who teach only farm mechanics, industrial arts teachers who also teach farm mechanics and vocational agriculture instructors who teach the complete program including farm mechanics.

Data were collected by the use of a questionnaire. This was sent to instructors who were teaching farm mechanics in vocational agriculture. Forty-five were sent out with 31 usable questionnaires returned. Of those questionnaires sent out to 10 instructors who teach farm mechanics only, 8 were returned making a 80 percent return. Eighteen of the 24 instructors who teach the complete program in vocational agriculture returned their questionnaires making a 75 percent return. Eight industrial arts teachers who also teach farm mechanics were sent questionnaires. Four questionnaires were returned.

As a result of this study the following conclusions are made by the author. Group 1, the farm mechanics instructors teaching farm mechanics only, and group 2, the vocational agriculture instructors teaching the

complete program, had a varied background in college; a majority reported having received their B. S. degree in vocational agriculture. One hundred percent of the industrial arts instructors teaching farm mechanics, group 3, received their degree in industrial arts.

Most of the teachers in group 1 and 2 indicated practical experience in the field of farming and farm machinery repair; group 3 did not. The study shows group 3 did not teach the applied areas such as farm power and conveniences, as groups 1 and 2 with the practical experience did.

An important part of the training necessary to teach farm mechanics is acquired on the job and by attending short courses, summer conferences, etc. The industrial arts teachers did not report participating in any of this training. The other 2 groups reported attendance at short courses and summer conferences.

Soil and water management was the least taught area of the study. This phase of farm mechanics was least emphasized for the data showed the following: group 1, 65 percent; group 2, 74 percent; and group 3, 100 percent not emphasizing it.

It was significant that teachers tend to teach according to their background of training. The data showed group 1 teaching a broader program; group 2 rated next, and group 3 last.

RECOMMENDATIONS

1. Inservice training program for all farm mechanics instructors. This training to be given by districts where small groups would make possible individual instruction. A survey of the group would be taken to show what is wanted in the course. This should be guided by suggestions from supervisors on weak areas of instruction. Practical training such as farming, pouring and finishing concrete, use of farm level, etc., should be emphasized.

2. More emphasis should be placed on farm mechanics as part of a vocational agriculture teacher's training. The part of training devoted to farm mechanics in college should be proportional to the amount of his total teaching time he spends in farm mechanics.

3. Provide a situation in the training center that is similar to a farm mechanics set-up in a department of vocational agriculture. This is similar to what is being taught at the present time at the Utah State Agriculture College, but should be more inclusive. It should cover the areas of soil and water management, etc. The instruction to be given by an individual having adequate training and experience in teaching farm mechanics in vocational agriculture.

4. Close supervision and follow-up during the first year on the job by a supervisor or teacher trainer who is able to devote the necessary time to oversee this.

5. Require that all instructors in farm mechanics have a practical background.

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APPENDIX

Providence, Utah
December 23, 1955

Dear Sir

May I have about fifteen minutes of your time in filling out the enclosed questionnaire? Realizing that your time is valuable, the questionnaire has been made as brief as the nature of the information would permit. Even so, it is quite lengthy.

This questionnaire is based on the list of farm mechanics skills needed by the instructor of farm mechanics, as worked out by the state committee of vocational agriculture instructors on farm mechanics. With the aid of Professor Stanley S. Richardson and the graduate committee and using this list as a basis I have compiled the questionnaire. It is being used in a study to determine how adequate a program is being carried out by teachers of different backgrounds and preparations.

Because the analysis will be based on the background and preparation of instructors, names were not asked for. If you desire, feel free to make comments on the reverse side of the questionnaire.

The enclosed self-addressed, stamped envelope is for your convenience in returning the questionnaire. An early reply would be greatly appreciated as the information is being used for a thesis here at the Utah State Agricultural College.

Thank you for your time.

Sincerely

Daniel R Zohner

DRZ:glb

Enclosure

P. S. If you would like a summary of this questionnaire, please place a check in the square provided.

☐ Yes

QUESTIONNAIRE

Part I

The following questions are being asked to determine the background and preparation of each instructor of farm mechanics in vocational agriculture.

Questions:

1. Received your B.S. Degree in: (check one)
   A. Vocational Agriculture_____.
   B. Industrial Arts_____.
   C. Agriculture (animal husbandry, agronomy, etc.)_____.
   D. Others (specify)_____.

2. List special training which has aided you in teaching farm mechanics (i.e. summer conferences, short courses, etc.)_____

   _____

   _____

   _____

   _____

3. Give the number of years of teaching experience you have had in farm mechanics._____

4. List practical experience you have had in farm mechanics, such as farm machinery repairman, farming after 18 years of age, etc.

   _____

   _____

   _____

   _____

   _____

Part II

The following skills, abilities or experiences have been declared essential by the state committee of vocational agriculture teachers in farm mechanics. The author is attempting through this questionnaire to determine which of the recommended units are being taught.

The section for answers has been divided into four columns. Check only one column for each question. Column (1) should be checked if taught to the whole class to the extent that more than 50% of the graduates developed the skill or ability to an acceptable degree; Column (2) if taught to the whole class but only 25% to 50% of the graduates developed the skill or ability to an acceptable degree; Column (3) if only taught to a few on an individual basis--less than 25% developed the skill or ability to an acceptable degree; and Column (4) if not taught to the extent that it meets any of these requirements. It is understood that very few, if any, teachers will teach all the units. For this reason the fourth column has been added.

This questionnaire should include units taught in Ag. I, II, III, and IV during the last full year of your farm mechanics program. It should be confined to classroom and shop instruction only.

Experiences, Abilities or Skills

	1 more than 50%	2 25% to 50%	3 less than 25%	4 not taught
I. FARM SHOP WORK				
A. Hot and Cold Metal				
1. Select fuel				
2. Make a forge fire				
3. Use common forge tools				
4. Upsetting				
5. Draw				
6. Shape and bend hot & cold metal				
7. Punch--hot and cold				
8. Temper and anneal				
9. Identify metals				
10. Cut--hot, chisel & hacksaw				
11. File				
12. Rivet				
13. Solder				
14. Select solder and flux				
15. Lay out sheet metal				

	1 more than 50%	2 25% to 50%	3 less than 25%	4 not taught
16. Generate and operate blow torch				
17. Shape, tin & care of soldering copper				
18. Sharpen knife, hoe, shovel, cult, tools, auger bit, plane, shears, twist bit, etc.				
19. Thread and tap				
20. Remove broken stud				
21. Recondition and replace broken handles in an axe, shovel, etc.				
22. Drill and operate various types of drills				

B. Electric Welding

1. Care for and operate equipment				
2. List precautions				
3. Select proper rods				
4. Weld in different positions				
5. Set up work				
6. Figure cost				
7. Braze				
8. Hardface				
9. Cut				

C. Acetylene Welding

1. Set up instructions in safety				
2. Set up tanks, gauges, welding & and cutting outfits				
3. Select proper tips for cutting & welding				
4. Determine costs				
5. Select rods for different kinds of work				
6. Select fluxes				
7. Weld				
8. Braze				
9. Hardface				
10. Cut				

D. Plumbing

1. Select, measure and cut pipe				
2. Select pipe fittings & couplings				

	1 more than 50%	2 25% to 50%	3 less than 25%	4 not taught
3. Ream pipe and cut threads				
4. Select common fixtures				
5. Replace gaskets				
6. Clean traps				
7. Open plugged drains				
8. Wipe a joint				

E. Farm Carpentry

1. Select lumber					
2. Classify & select nails, screws, bolts & hardware items					
3. Classify, select & use farm carpentry tools	a. square				
	b. saw				
	c. plane				
4. Make a list of safety practices					
5. Figure a bill of materials					
6. Build common farm W.W. devices--gate, feeder, panel, etc.					
7. Repair farm devices					
8. Use power equipment					
9. Cut common rafters					

F. Rope and Leatherwork

1. Select rope				
2. Select leather				
3. Make rope halter				

G. Painting and Glazing

1. Select paing for inside & outside				
2. Mix paint--ready mix				
3. Prepare surface				
4. Make repairs				
5. Replace broken glass				
6. Select, use & care for brushes				
7. Apply paint with brush or gun				
8. Operate and care for spray gun				
9. Use and care of roller				

H. Fences

1. Determine kind of fences needed				
2. Figure costs of various kinds of fences				
3. Select, prepare and treat posts				

	1 more than 50%	2 25% to 50%	3 less than 25%	4 not taught
II. FARM POWER AND MACHINERY				
A. Farm Tractors, Trucks and Gas Engines				
1. Clean and adjust carburetor				
2. Repair ignition system				
3. Trouble shoot				
4. Service air cleaner				
5. Service cooling system				
6. Care for batteries and tires				
7. Time a gas engine				
8. Lubricate				
9. Operate tractor safely				
10. Apply power				
11. Winterize				
12. Clean fuel system				
13. Clean and adjust spark plugs				
B. Farm Machinery				
1. Repair or replace worn or broken parts				
2. Operate & lubricate properly				
3. Select suitable tools and equipment to make needed repairs or construct needed devices				
4. Install pulleys and belts				
III. FARM BUILDINGS AND CONVENIENCES				
A. Farm Drawing				
1. Make a lettering plate				
2. Make and read conventional lines and symbols				
3. Draw to scale				
4. Read blue prints				
5. Make workable sketches				
B. Farm Buildings				
1. Make repairs — a. Replace boards				
b. Hang doors				
c. Repair roof				
2. Determine costs				
3. Prepare footings				
4. Put in foundation				
5. Frame a building				
6. Complete a frame building				
7. Make a portable building				
8. Paint the building				

	1 more than 50%	2 25% to 50%	3 less than 25%	4 not taught
C. Concrete				
1. Run a silt test on gravel or sand				
2. Build and set forms				
3. Mix and pour concrete--including reinforcing				
4. Finish concrete				
D. Masonry				
1. Select and lay concrete blocks				
IV. SOIL AND WATER MANAGEMENT				
A. Irrigation and Drainage				
1. Lay out a grade for irrigation or land leveling				
2. Build head gates, weirs & dividers				
3. Use canvas dams				
4. Measure water from ditches or weirs				
5. Plan a drainage system				
V. RURAL ELECTRIFICATION				
A. Electricity				
1. Read meters and compute bill				
2. Make wiring diagram				
3. Wire yards, barns, granaries, etc.				
4. Repair electric cords				
5. Make splices & other connections				
6. Replace motor brushes, reverse motors				
7. Select wire and insulation				