A COMPARISON OF MECHANICAL ABILITIES BETWEEN STATE F.F.A. INTERSCHOLASTIC FARM SHOP CONTEST PARTICIPANTS AND NON-PARTICIPATING OKLAHOMA VOCATIONAL AGRICULTURE STUDENTS

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To my daughter, Kellye, this work is dedicated.

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CHAPTER I

THE PROBLEM

Introduction

Every year in April, Oklahoma State University sponsors the State Interscholastic Farm Shop Contest, as well as fourteen other agricultural contests for members of the Oklahoma Future Farmers of America.

There are three sections in the farm shop contest which are as follows: (1) electricity, (2) arc welding, and (3) cold metal work.

The mean number of schools participating in the farm shop contest per year for eight of the last ten years is 34 schools ranging from a low of 27 in 1957 to a high of 43 in 1959.[1]

Many of the same schools are represented year after year; whereas, other schools are never represented in the contest.

Statement of the Problem

The purpose of this study was to compare the mechani-

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[1]The State Interscholastic Farm Shop Contest results for 1958 and 1963 were not available.

cal abilities of students participating in the 1967 State Interscholastic Farm Shop Contest with non-participating students in an attempt:

(1) to determine the effect of participating in the contest on the student's mechanical ability.

(2) to determine the overall effect of preparing and participating in the farm shop contest on the student's mechanical ability.

(3) to determine the effect of preparing for the farm shop contest on the student's mechanical ability.

(4) to determine if a relationship exists between mechanical ability of the students participating in the contest and their achievement in the farm shop contest.

Importance of the Study

The necessity of continued evaluation of any type of an educational endeavor is rarely questioned. Educators constantly seek better methods of evaluating their curriculum so improvements can be made.

This study, by comparing the mechanical abilities of students participating in the farm shop contest with non-participating students, seeks to determine if contest preparation and participation have any significant effect on the development of the student's mechanical aptitude.

Limitations of the Study

While the population of this study is all Oklahoma Vocational Agriculture students, who are members of the Future Farmers of America, the sample is small.

Out of twenty-six schools which had participated in the State Interscholastic Farm Shop Contest two of the last three years, only nine of these schools participated this year in the contest.

The investigator assumed that the criterion measurement was fine enough to detect differences among the different groups. Also, the criterion measurement selected was assumed to measure abilities which are needed for employment in agriculture mechanic's jobs.

Definition of Terms

Ability. Present skill. Contrasted to aptitude in that it refers to actual accomplishment rather than potential or capacity.

Aptitude. A condition or set of characteristics regarded as symptomatic of an individual's ability to acquire with training some (usually specified) knowledge, skill, or set of responses.

Mechanical Ability. Present skill in mechanics.

Mechanical Ability Test. A test designed to measure the skill in mechancis at a given point in time.

Non-Participating Students. Students used in the

study who did not compete in the 1967 State Interscholastic Farm Shop Contest.

Non-Represented Schools. Those Oklahoma schools with vocational agriculture departments which have not competed in the State Interscholastic Farm Shop Contest for at least the last three years.

Participating Students. Students used in the study who participated in the 1967 State Interscholastic Farm Shop Contest.

Represented Schools. Those Oklahoma schools with vocational agriculture departments which competed in the 1967 State Interscholastic Farm Shop Contest and have competed in at least two of the last three years in the contest prior to this year.

CHAPTER II

REVIEW OF LITERATURE

In the last few years greater emphases is being placed on the agriculture mechanics area of instruction in vocational agriculture.

Much of the curriculum in agriculture mechanics is designed so the students can develop levels of proficiencies in activities which are essential for success in agriculture. Phipps (7) states:

> Agriculture mechanics involves the development of the mechanical abilities of students in performing agriculture shop activities; in operating, maintaining, repairing, and adjusting farm machinery; in constructing and maintaining farm buildings; in installing and maintaining farm electrical systems; and in performing the mechanical activities in soil and water management programs.

In vocational agriculture, there are differences of opinion expressed about the value of contests.

Warren (9) pointed out that contests have been a subject of discussion among workers in the field of vocational agriculture since their inception. Furthermore, he states that their value has often been questioned from the educational point of view.

It has been suggested that vocational agriculture do away with the FFA contests. Wilson (10) in referring to contests said, "My view is that we should cease trying to

improve something that when improved is still not good and should not be a part of an educational program in a democratic society". In Wilson's article, he lists some of the things wrong with contests, such as the following:

> (1) Contests are causing many teachers to try to teach, and students to try to learn something that should not and perhaps cannot be learned.
>
> (2) Contests give undue recognition to one special ability a person may have. A student who is skilled at winning contests gets most of the trips and the attention of a teacher who is out to win contests.
>
> (3) Contests often take so much time of teachers and students that they necessarily have little time for other important things.
>
> (4) Winning contests has become the objective in many cases rather than a means of evaluation.
>
> (5) Awards lower the level of aspiration rather than raise it.....This eliminates the possibility of learning anything except, maybe, how to win other contests.

On the other hand, many feel that there are values and purposes of contests.

Gray (3) lists several purposes of contests which are important. He states that perhaps one of the most important ones is that contests are valuable means of providing opportunities for the development of individual abilities. He further emphasizes that regardless of the ability of the student, there is probably a contest in which he can develop his abilities.

The State Interscholastic Farm Shop Contest provides a form of checking the student's level of proficiency in activities related to the instruction of farm shop. This

study compared the mechanical abilities of the participating students with the mechanical abilities of the non-participants and determined the effect of preparing for and participating in the contest on the development of the student's mechanical abilities.

Another phase of the study was to compare the participating students with each other to determine differences among these students in mechanical ability: Carr (2) in speaking of a welding contest, states that the degree of proficiency within a group of students varies considerably. The investigator compared the participating student's mechanical ability with their score on the farm shop contest. The purpose of this comparison was to determine if there was a correlation between the mechanical ability of the student and the student's achievment on the contest.

Wilson mentioned that maybe the only thing learned from contest participation was how to win a contest. Jones (5) states that whether or not the FFA chapter enters judging contests depends upon the instructional program. Jones said, "Judging teams are selected in these areas only because the essential skills, knowledges, and abilities are developed as a result of the instructional program to meet educational objectives, not for the purpose of winning a contest".

The mechanical abilities of the participating and non-participating students from the same high schools were compared to determine the effect of actually participating

in the contest. Binkley (1) in referring to the psychology of recognition states that learning results from self-activity. Binkley stated, "It is possible to increase the kind, amount, and quality of activity-to cause students to be more conscious of the activity they engage in, through providing some forms of recognition". Binkley said that recognition should motivate the development of abilities, the securing of knowledge, and the acquiring of attitudes as set up in the course of study.

Another common objection to contests is that contest preparation is for only those who compete in them; however, Hirshey (4) emphasizes that as teachers we should meet the educational objectives by including all of our students in the preparation of our teams.

The investigator compared the mechanical abilities of the non-participating students who were from represented schools with the non-participating students who were from schools not represented in the contest. The purpose of this comparison was to determine the effect of preparation for the contest on the student's mechanical ability who did not participate in the contest.

This study also examined the overall effect of the farm shop contest on development of mechanical ability. Warren (9) concluded in his study that contests should be given continuous examination in order that they (contests) can be kept abreast with the rapidly changing agriculture technology and corresponding needs of the

student.

The mechanical abilities of the participating students and the non-participating students, who were from schools not represented in the 1967 contest, were compared to determine the overall effect of the contest on the development of mechanical abilities.

The purpose of this study was not to determine the value of the farm shop contest, but rather, to examine the effect of preparation and participation in the contest on developing potential mechanical capacities of the students.

CHAPTER III

METHOD AND PROCEDURE

Instrument Selection

The "Prognostic Test of Mechanical Abilities" by Wrightstone and O'Toole was selected for measurement of the mechanical abilities of the individuals in the study. This test was selected largely on the basis of reviews in Buros's "The Fourth Mental Measurement Yearbook".

This test is composed of five sections which are: (1) Arithmetic Computation; (2) Reading Drawings and Blueprints; (3) Identification and Use of Tools; (4) Spatial Relationships; and (5) Checking Measurements. In his review of this test Willard A. Kerr states that each section seems to contribute some unique value to the test, and certainly the five sectional scores as labeled have quick and easy meaning in both educational and industrial training programs, as well as, in student or worker counseling.

Kerr (6) further states:

> Because it (the test) recognizes the demand that a good prediction instrument should isolate to some extent the principal talents which it measures, this test represents a distinct technological advance over such competing tests as the Bennett-Fry "Test of Mechanical Comprehension", which measures but does not separate the functional

interests factor and the spatial factor.

Research Hypotheses

The null hypotheses formulated for this study are the following:

Ho_1 There is no significant difference in mechanical abilities between participants in the 1967 State Interscholastic Farm Shop Contest and non-participants from the same vocational agriculture department.

Ho_2 There is no significant difference in mechanical abilities between participants in the 1967 State Interscholastic Farm Shop Contest and non-participants from Oklahoma vocational agriculture departments that were not represented in the contest.

Ho_3 There is no significant difference in mechanical abilities between non-participants from vocational agriculture departments represented in the 1967 State Interscholastic Farm Shop Contest and non-participants from Oklahoma vocational agriculture departments that were not represented in the contest.

Ho_4 There is no correlation between the mechanical abilities of the participating students and their achievement in the farm shop contest.

Population of the Study

The population of this study consisted of the following samples of Oklahoma vocational agriculture students:

(1) Participants in the 1967 State Interscholastic Farm Shop Contest, who are from vocational agriculture departments which have competed in the farm shop contest at least two of the last three years prior to this year.

(2) A stratified random sample of vocational agriculture students who did not participate in the 1967 State Interscholastic Farm Shop Contest, taken from vocational agriculture departments which participated this year in the farm shop contest and have competed in the contest at least two of the last three years prior to 1967.

(3) A stratified random sample of vocational agriculture students who did not participate in the 1967 State Insterscholastic Farm Shop Contest, taken from Oklahoma vocational agriculture departments which have not competed in the farm shop contest for at least the last three years.

A list of vocational agriculture departments which had competed in the State Interscholastic Farm Shop Contest for two of the last three years, prior to 1967 was compiled. There were a total of twenty-six departments which met this qualification.

From these twenty-six departments only those which competed in the 1967 farm shop contest were used in the study. There were nine departments from this group of twenty-six that competed, and this determined the departments from which the participants and non-participants from the represented vocational agriculture department

were taken.

Four non-participating students were randomly selected from juniors and seniors who did not participate in the 1967 farm shop contest for each of the nine represented departments by means of a table of random digits (8). One of the students was designated as an alternate in case one of the other students had moved or was absent when the test was administered.

Sixteen other vocational agriculture departments, stratified according to districts, were selected by means of a table of random digits (8) from all Oklahoma vocational agriculture departments which had not competed in the State Interscholastic Farm Shop Contest for at least the last three years. These departments comprised the group of non-represented vocational agriculture departments.

Seven non-participating junior and senior students were randomly selected for each of the sixteen non-represented departments by means of a table of random digits (8).

Methods of Collecting Data

During the last week in March, packets were sent out to all of the non-represented vocational agriculture departments used in the study. Included in the packets were: (1) cover letter to the teacher;[1] (2) directions

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[1]See cover letter in Appendix A.

for administration of test;[2] (3) answer sheets; (4) copies of the test; (5) scratch paper; and self-addressed stamped envelope.

The cover letter was checked by Dr. W. Hull, Agricultural Education staff and Olen Joyner, State Agricultural Mechanics specialist.

Within a week responses started to come back. The investigator contacted several of the teachers who had not returned their tests at the State FFA Convention. A follow up card was sent out the first week in May.

After the 1967 farm shop contest had been conducted, and the results were processed, the packets containing the same information were sent out to the nine represented departments. Also, a follow up card was sent out the second week in May.

The total number of responses in the study were: (1) twenty-three contest participating students, represented 85.19 percent of the selected students; (2) twenty-four non-participating students from the same department as the participants representing 88.89 percent of the selected

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[2]See directions for administration of test in Appendix B.

students; and (3) thirty-three non-participating students from schools not represented in the farm shop contest represented 68.75 percent of the selected students.

Processing the Data

All of the answer sheets were graded by hand with an overlay scoring key. The students were given one point for each answer marked correctly.

The points were added up for each of the five sections as well as the total score on all sections of the test.

The school means of the scores on the five sections, as well as the total score on the test of mechanical abilities, were determined for each of the following groups of students:

(1) Participating students used in the study.[1]

(2) Non-participating students used in the study from the same schools as the participants.[2]

(3) Non-participating students used in the study from non-represented schools.[3]

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[1]Hereafter the participating students are referred to as Group A.

[2]Hereafter the non-participating students from represented schools are referred to as Group B.

[3]Hereafter the non-participating students from non-represented schools are referred to as Group C.

From the school means for each section of the test, the mean of the sample was determined. These means of each sample for each section of the test were statistically compared by the use of the *t* test.

Correlation coefficients were determined to measure the relationship between the participant's scores on each section of the mechanical ability test and their contest score achievement.

CHAPTER IV

PRESENTATION AND ANALYSIS OF DATA

Data presented in this chapter represents the scores of eighty vocational agriculture students on the "Prognostic Test of Mechanical Abilities". These students were selected from nineteen Oklahoma schools.[1] Eight of these nineteen schools were represented in the contest at least two of the three years from 1964-1966 and were represented in the 1967 State Farm Shop Contest. The other eleven schools have not been represented in the farm shop contest since 1964.

The students were divided into three groups as follows:

(1) Group A - Those students who participated in the 1967 State Interscholastic Farm Shop Contest.

(2) Group B - Those students who did not participate in the 1967 State Interscholastic Farm Shop Contest from schools that were represented in the contest.

(3) Group C - Those students who did not participate in the 1967 State Interscholastic Farm Shop Contest from

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[1]List of the schools which participated in this study are found in Appendix C.

schools that were not represented in the contest.

The students answer sheets were scored and tabulated for each section of the test.[1] The school means on each section of the test were determined for each of the three groups of students.[2] From these school means, the group means were determined and compared among the three groups.

Table I shows the comparison of group means for all of the mechanical ability tests used in the study between participating and non-participating students who were from schools which were represented in the contest. The difference in the means between Group A and Group B is indicated for each section of the mechanical ability test. The significance of the difference is checked by the use of the t test, with the values indicated in Table I.

The data in Table I indicated that for all sections of the test, the means of Group B were higher than the means of Group A; however, these differences were not significant at the .05 level. The greatest difference between Group A and Group B was on test four, Spatial Relationships. It is interesting to note that the means of Group A and Group B for the Identification and Use of Tools test, number three, were practically the same.

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[1]Scores on each section of the test are presented as follows: Group A - Appendix D; Group B - Appendix E; and Group C - Appendix F.

[2]School means on each section of the test are presented as follows: Group A - Appendix G; Group B - Appendix H; and Group C - Appendix I.

TABLE I

COMPARISON OF GROUP MEANS FOR ALL TESTS BETWEEN GROUP A AND GROUP B[a]

Group	Group Means					
	Test 1[b]	Test 2[c]	Test 3[d]	Test 4[e]	Test 5[f]	Total[g]
A	9.48	9.52	17.39	7.58	10.33	53.86
B	9.87	10.42	17.42	8.58	11.29	57.58
Difference	-.39	-.90	-.03	-1.00	-.96	-3.72
t value	.3095	.7087	.0347	1.266	.6115	.7576

[a]Students in Groups A and B are defined on page 17.
[b]Test 1 - Arithmetic Computations
[c]Test 2 - Reading Drawings and Blueprints
[d]Test 3 - Identification and use of Tools
[e]Test 4 - Spatial Relationships
[f]Test 5 - Checking measurements
[g]Total - All five tests together

The distributions of scores on each of the tests for Group A students are compared in Table II with the distribution of scores for the students in Group B. The distributions for both groups have been divided into three divisions as follows: low, medium and high.

On test one, a larger percentage of students in Group A scored higher than the Group B students; however, 13 percent of the Group A students compared to 8.3 percent of Group B students scored low on test one.

There were more differences in the means of Group A

TABLE II

COMPARISON OF DISTRIBUTION OF SCORES BY PERCENT BETWEEN GROUP A AND GROUP B FOR EACH OF THE TESTS[a]

Test[b]	Groups	Range of Scores in Percent		
		Low	Medium	High
One	A	13.0	39.0	48.0
	B	8.3	50.0	41.7
Two	A	13.0	34.8	52.5
	B	4.2	45.8	50.0
Three	A	0	21.7	78.3
	B	4.2	12.5	83.3
Four	A	17.4	78.3	4.3
	B	8.3	70.9	20.8
Five	A	13.0	39.1	47.9
	B	12.5	16.7	70.8
Total	A	13.0	47.9	39.1
	B	8.3	54.2	37.5

[a]For definition of the groups and tests see page 17,19.
[b]The range of the three categories (low, medium,high) for test one, two, four, and five, are as follows: Low, 0-5; Medium, 6-10; and High, 11-15 raw score points. For test three the range for each category is as follows: low, below 10; medium, 11-15; and high, 16-20. The range for the total of all five tests is as follows: low, below 40; medium, 41-60; and high, 61-80.

and Group B on test two than test one. Table II indicates that only 4.2 percent of the Group B students scored low on

test two, Reading and Drawings and Blueprints; whereas, 13.0 percent of the Group A students scored low on test two.

For test three, Identification and Use of Tools, it is interesting to note that all of the students in Group A scored 11 or above; however, there were 83.3 percent of the Group B students compared with 78.3 percent of the students in Group A who scored 16 or above on test three.

The means of the scores differed the greatest on the Spatial Relationship test, number four, between Group A and Group B; however, the difference was not significant at the .05 level. Only 4.3 percent of the Group A students compared to 20.8 percent of the Group B students scored high on the Spatial Relationships test. 17.4 percent of the students in Group A scored below 5 on the test; whereas, only 8.3 percent of Group B students scored that low.

It is interesting to note that on test five about the same percentage of students in both Group A and Group B scored low; however, a higher percentage of the Group B students scored high. From the students in Group B, 70.8 percent scored 11 or above, while only 47.9 percent of the Group A students scored 11 or above.

The percentage of students which scored over 61 points on the total of all five tests for both groups was about the same. A higher percentage of Group B students, 54.2 percent, scored between 41-60 points on the total of all five tests, whereas only 47.9 percent of the students in

Group A scored between 41-60.

The differences in the group means between Group A students and Group C students for all of the tests were determined and presented in Table III.

Table III indicates that for all of the tests, the differences between the means of the students of Group A and Group C are not significant at the .05 level. In this table, it is interesting to note that the means of the scores for the students in Group C are greater than the means of the scores for Group A students for four of the five tests.

TABLE III

COMPARISON OF GROUP MEANS FOR ALL TESTS[a] BETWEEN GROUP A[b] AND GROUP C[b]

	Group Means					
Group	Test 1	Test 2	Test 3	Test 4	Test 5	Total
A	9.48	9.52	17.39	7.58	10.33	53.86
C	8.82	10.67	18.03	8.24	10.18	57.09
Difference	-.34	-1.15	-.64	-.66	+.15	-3.23
t value	.333	1.1058	1.056	.8571	.1042	.7859

[a]For identification and classification of the tests refer back to page 19.
[b]Students in Groups A and C are defined on page 17.

In Table IV the distributions of the scores for the students in Group A and Group C are compared by the per-

centage of the scores in three categories as follows: low, medium, and high.

TABLE IV

COMPARISON OF DISTRIBUTION OF SCORES BY PERCENT BETWEEN GROUP A[a] AND GROUP C[a] FOR EACH OF THE TESTS[b]

Test	Groups	Range of Scores in Percent		
		Low	Medium	High
One	A	13.0	39.0	48.0
	C	6.1	51.5	42.4
Two	A	13.0	34.8	52.2
	C	0	42.4	57.6
Three	A	0	21.7	78.3
	C	0	9.1	90.9
Four	A	17.4	78.3	4.3
	C	6.1	81.8	12.1
Five	A	13.0	39.1	47.9
	C	15.2	27.3	57.5
Total	A	13.0	47.9	39.1
	C	6.1	51.5	42.4

[a]Students in Groups A and C are defined on page 17.
[b]For identification of tests refer back to page 19.

On test one, arithmetic computations, there was a small difference in the means of the scores between Group A and Group C students. As shown in Table IV, 87.0 percent of the students in Group A scored medium or high on test

one; whereas, 93.9 percent of the students in Group C scored within this range.

The difference between the means of the scores on test two, Reading Drawings and Blueprints, for the students in Group A and Group C was greater than the difference between these two groups on any other test. As indicated in Table IV, 100 percent of the Group C students were in the medium and high categories of scores; whereas, 13.0 percent of the students in Group A scored low on the test.

On test three, arithmetic computations, none of the students in Group A or Group C were in the low category; however, 90.9 percent of the Group C students scored in the high range compared to 78.3 percent of the students in Group A.

A higher percentage of the scores on test four for the students in Group A were in the low range than were scores of the Group C students. 93.9 percent of the Group C students scored in the medium and high range on test three compared with 82.6 percent of the Group A students.

Table III shows the mean of the scores on test five, Checking Measurements, for Group A students was higher than the mean of the scores of the students in Group C. The difference between Group A and Group C students on this test is quite small. In Table IV, the data shows that about the same percentage of the scores on test five for the students in Group A and Group C were in the low range; however, the percentage in the medium and high ranges

varied slightly between the two Groups.

In comparing the distributions of the scores on all tests together, there were 13.0 percent of Group A students who scored within the low range and only 6.1 percent of the Group C students who scored low.

Table V represents the comparison of group means between non-participating students for all of the tests used in this study. The differences between the group means are shown in Table V, as well as the *t* value for each of the tests.

The differences in the mean scores between Group B and Group C students were not significant at the .05 level for any of the five tests. The greatest difference in means between Groups B and C was on tests three and five. It is interesting to notice that the mean for Group C on test three was greater than the mean of Group B; however, on test five the mean score of Group B students was greater than the mean score of the Group C students.

The difference in the mean scores on test one between the students in Groups B and C was the smallest with only a .05 difference in the two means. It is interesting to note that the mean scores for all three groups were about the same for test one.

For the other two tests and the total of all five tests there were practically no differences between the means of the Group B and Group C students.

The comparison of the distribution of scores by per-

TABLE V

COMPARISON OF GROUP MEANS FOR ALL TESTS[a] BETWEEN GROUP B[b] AND GROUP C[b]

Group	Test 1	Test 2	Test 3	Test 4	Test 5	Total
B	9.87	10.42	17.42	8.58	11.29	57.58
C	9.82	10.67	18.03	8.24	10.18	57.09
Difference	+.05	-.25	-.61	+.34	+1.11	+.49
t value	.0494	.2854	.8144	.5338	.7582	.1293

[a]For identification and classification of tests refer to page 19.
[b]Students in Group B and C defined on page 17.

cent between the Group B and Group C students for each of the tests is shown in Table VI.

Table VI shows that the percent of both Group B and Group C students within each of the three categories was approximately the same for tests one, two, and four.

On test three, 90.9 percent of the students in Group C scored high compared with only 83.3 percent of the Group B students; however, a higher percentage of the students in Group B scored high on test five than the Group C students. 70.8 percent of the Group B students scored high on test five, Checking Measurements, while only 57.5 percent of the students in Group C scored high on this test.

TABLE VI

COMPARISON OF DISTRIBUTION OF SCORES BY PERCENT BETWEEN GROUP B[a] AND GROUP C[a] FOR EACH OF THE TESTS[b]

Test	Groups	Range of Scores in Percent		
		Low	Medium	High
One	B	8.3	50.0	41.7
	C	6.1	51.5	42.4
Two	B	4.2	45.8	50.0
	C	0	42.4	57.6
Three	B	4.2	12.5	83.3
	C	0	9.1	90.9
Four	B	8.3	70.9	20.8
	C	6.1	81.8	12.1
Five	B	12.5	16.7	70.8
	C	15.2	27.3	57.5
Total	B	8.3	54.2	37.5
	C	6.1	51.5	42.4

[a]Students in Groups B and C defined on page 17.
[b]For identification of tests refer back to page 19.

Table VII shows the mean score of each of the tests for the students participating in the 1967 State Interscholastic Farm Shop Contest. Also the correlations of the students' scores with their contest scores are presented in Table VII for each of the five tests.

TABLE VII

PARTICIPATING STUDENTS' MEAN SCORES AND CORRELATION WITH CONTEST SCORES FOR EACH TEST

Test[a]	Mean Score	Correlation with contest score[b]
One	9.52	.4906
Two	9.52	.5158
Three	17.35[c]	.0086
Four	7.52	.4730
Five	9.91	.4253

[a]For identification of tests see page 19.
[b]The required r for significance at the .05 level is .433 with 21 degrees of freedom.
[c]Test three has twenty questions compared with fifteen questions on the other four tests.

The participating students' mean score for test three, Identification and Use of Tools, was proportionally higher than their mean score on any of the other four tests. The mean on test three represented 86.75 percent of the possible points on the test; whereas, on test five the mean score, the second highest of the five tests, represented only 66.6 percent of the possible points. This means the Identification and Use of Tools test was less difficult for the participants than the other tests.

The participating students had a lower mean score on test four, Spatial Relationships, than on any of the other tests. The mean for test four was 7.52, which represents only 50.1 percent of the possible points. This indicates

the degree of difficulty with which the students had answering the questions was greater on test four than on the other tests.

The correlations of the participants' scores on test one, two, four, and five with their contest scores were all significant at the .05 level. There was practically no correlation between the scores on test three and the participants' contest scores.

The participants' scores on test two, Reading Drawings and Blueprints, had the highest relationship with their contest scores; however, the correlation coefficient for test one was also high.

CHAPTER V

SUMMARY AND CONCLUSIONS

Purpose of the Study

The purposes of this study can be stated in the following objectives:

(1) to compare the mechanical abilities of the 1967 State Interscholastic Farm Shop Contest participants with non-participants from the same vocational agriculture departments.

(2) to compare the mechanical abilities of the 1967 State Interscholastic Farm Shop Contest participants with non-participants from non-represented schools.

(3) to compare the mechanical abilities of non-participating students from represented schools with non-participating students from non-represented schools.

(4) to determine if a relationship exists between mechanical ability of the students participating in the farm shop contest and their contest scores.

Method and Procedure of the Study

A list of all schools who had been represented in the State Interscholastic Farm Shop Contest from 1964 through 1966 was compiled. Twenty-six of the schools on this list

had been represented at least two of the three years. From this group, nine of the schools were represented in the 1967 Farm Shop contest, which were selected as the represented schools in the study.

The non-represented schools used in the study were selected from a random sample of those vocational agriculture departments which had not been represented in the Farm Shop contest since 1964. These schools were stratified according to districts.

Three junior and senior students not participating in the farm shop contest were randomly selected from each of the represented and non-represented schools. Alternates were selected for all of the schools.

The non-participating students and the participating students from the nine represented schools comprised the sample used in the study.

The students were given the "Prognostic Test of Mechanical Abilities", which contained five sub-tests.

Selected students in eight of the nine represented schools and eleven of the sixteen non-represented schools completed the test.

Responses were recorded and classified into the three groups as follows:

(1) Group A - participating students;

(2) Group B - non-participating students from represented schools;

(3) Group C - non-participating students from non-

represented schools.

Group means were determined for the three groups on five sub-tests and the total of the five tests. The following comparison was made with the group means for each of the tests:

(1) Group A with Group B

(2) Group A with Group C

(3) Group B with Group C

The t test was used to determine the significance of the differences in the means.

Correlation coefficients between the participating students' mechanical ability scores and their contest scores were determined for each of the sub-tests and the total of all tests.

The .05 level of confidence was used as basis for rejecting the null hypotheses in the study.

Summary of Findings

The data was statistically examined after the responses were scored, grouped, and recorded in an attempt to answer the questions pertinent to this study. The null hypotheses were tested and the following is a summary of the findings.

The first null hypothesis is stated as follows: There is no significant difference in mechanical abilities between participants in the 1967 State Interscholastic Farm Shop Contest and non-participants from the same voca-

tional agriculture department. Although some differences between the mechanical abilities of the participants and non-participants from the same vocational agriculture department did exist, the differences were not significant at the .05 level; therefore, the null hypothesis was not rejected. It was interesting to note that on all of the tests the means of the non-participating students was larger than the mean of the participants. Some of the possible explanations for these differences are:

(1) Since these groups of students are from the same schools, all of the students in both groups might have been involved in the same instruction in mechanics; therefore, the students in both groups might have had the same opportunity to develop their mechanical aptitudes.

(2) The selection of the students participating in the contest was probably influenced by factors other than the ability to perform the specific skills required to win the contest. Such factors as availability, maturity, participation in other contests, and dependability could have eliminated some of the more capable students.

The second null hypothesis is stated as follows: There is no significant difference in mechanical abilities between participants in the 1967 State Interscholastic Farm Shop Contest and non-participants from Oklahoma vocational agriculture departments that were not represented in the contest. The data supports the null hypothesis that there were no significant differences at the .05 level be-

tween the mechanical abilities of the participants and the non-participants from non-represented schools; therefore, the null hypothesis can not be rejected. The non-participating students had a higher mean score on each of the tests except for test five, Checking Measurements. On test five there was a very small difference in the means of the two groups. Possible explanations of these results are:

(1) No attempt was made in the study to evaluate the type of agricultural mechanics program that exists in either of the two groups. The non-represented schools could have had equally as good a program, and for some reason did not participate in the contest. Such factors as distance from the site of the contest, teacher's preference, and other activities being conducted at competing times with the contest could all have an effect on the participation of the school in the contest.

(2) The non-represented schools by not specifically training for the contest might be offering a more general curriculum for the students in mechanics, which helps the development of particular mechanical abilities which were tested with this criterion measurement.

The third null hypothesis is stated as follows: <u>There is no significant difference in mechanical abilities between non-participants from vocational agriculture departments represented in the 1967 State Interscholastic Farm Shop Contest and non participants from Oklahoma vocational agriculture departments that were not represented in the</u>

contest. Differences did exist between the two groups of non-participants; however, none of the differences were significant at the .05 level, so the null hypothesis was not rejected. Possible explanations for these small differences are:

(1) The non-participants from the represented schools might have spent less time on those activities associated with the farm shop contest than the participants; therefore, had more time for the development of a wider range of mechanical abilities. Since, this was true for students in the non-represented schools, it is reasonable to expect few differences among non-participating students from both groups.

(2) Since both groups of non-participants were selected from a random sample of junior and senior students, their mechanical abilities might have varied more than the participating students; therefore, by using the means of the non-participanting students, the abilities were averaged out more uniformly than the participating students, who actually were competing because of specific abilities.

The fourth null hypothesis is stated as follows: There is no correlation between the mechanical abilities of the participating students and their achievement in the farm shop contest. This null hypothesis was rejected significantly in four of the five sub-tests at the .05 level. On test three, Identification and Use of Tools, the null hypothesis was not rejected. This was not surprising since

the scores on test three were all high. Test three did not separate or differentiate the students sufficiently for the correlation to be significant. This data supports the following statements:

(1) There was a significant relationship between the students' scores on four of the five sub-tests and their achievement in the farm shop contest. The four sub-tests were: Arithmetic Computation; Reading Drawings and Blueprints; Spatial Relationships; and Checking Measurements.

(2) The relationship was not only significant at the .05 level but was a positive relationship.

Recommendations

The opinion of the writer is expressed in the following recommendations based on the data presented in this study:

(1) Since there was a positive significant relationship between the students' scores on four of the five sub-tests and their contest scores, the writer feels the tests could be used in the final selection of the students who will participate in the contest as long as they can perform the specific activities needed in the contest.

(2) The students in all three groups exhibited a greater degree of attainment on sub-test three, Identification and Use of Tools; therefore, it is recommended that equal emphasis be given by vocational agriculture teachers to other areas of agriculture mechanics such as: (1) read-

ing simple drawings and blueprints; (2) solving arithmetic problems; (3) using measuring instruments; and (4) spatial relationships.

(3) The study reveals a need for further investigatigation of factors relating mechanical ability of the students to achievement in agriculture mechanics skills.

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APPENDIX A

March 28, 1967

Dear Vocational Agriculture Teachers:

Enclosed you will find copies of a test of mechanical abilities. This test is designed and standardized to measure or indicate differences in mechanical abilities among individuals.

From these test results, I hope to compare mechanical abilities of selected vocational agriculture students from across the state.

While planning this study, I have worked with the Department of Agricultural Education at Oklahoma State University as well as the State Department of Vocational Education.

Would you please administer these tests to your students whose names appear on the answer sheets and return them to me at the earliest possible date? I have enclosed all of the materials needed, which includes; test booklets, answer sheets, rulers, scratch paper, and directions for administering the test.

Also enclosed is a self-addressed envelope necessary for returning the materials.

Enclosed are answer sheets for specified students. Give the student who is marked as the alternate an answer sheet only if one of the other students is absent or has moved.

I know that your schedule is crowded, but your assistance with this study will be greatly appreciated. If you have any questions, call me collect at FR2-6211; Extension 7531 (mornings) or Extension 357 (afternoons).

Sincerely,

Richard I. Carter

Richard I. Carter

APPENDIX B

GENERAL DIRECTIONS

The California Test Bureau, publisher of this test, recommends the following directions for use of the administers:

1. Test booklets are not be marked on. Answer sheets and scratch paper are provided. Other schools are to use these same test booklets for their students.

2. There are five parts to the test and each are to be timed as follows:

   Test I, page 2----------9 Minutes
   Test II, page 3----------7 Minutes
   Test III, page 4 and 5----------8 Minutes
   Test IV, Page 6 and 7----------8 Minutes
   Test V, Page 8----------6 Minutes

   It is of utmost importance that all administers of the test allow only the specified time for each test.

3. Use a pencil to blacken the answer sheet letter which corresponds with the correct choice in the test booklet. Erase the first mark completely if an answer is changed.

4. Give the students time to read the directions for each part and go through the examples provided before time is started.

5. Do not let the students work ahead or return to an earlier part.

6. The enclosed ruler is to be used only for Test V. Do not use on Test II.

Please return the booklets, answer sheets, etc. promptly. They need to be redistributed to other teachers by May 1.

APPENDIX C

Sample of Oklahoma Schools in Study

Represented Schools	Non-Represented Schools
*Beggs	*Arnett
*Custer	Carney
*Davenport	*Cashion
*Maysville	*Cherokee
*Ninnekah	Colbert
*Perkins	*Colcord
*Perry	Dunjee
*Ponca City	*Frederick
Woodward	*Glencoe
	*Marland
	*McLoud
	Newkirk
	*Red Rock
	Roosevelt
	*Vanoss
	*Wyandotte

* -Those schools responding to the study.

APPENDIX D

SCORES FOR ALL SECTIONS OF THE MECHANICAL ABILITY TEST FOR GROUP A[a]

Student Number	Scores					
	Test 1[b]	Test 2[c]	Test 3[d]	Test 4[e]	Test 5[f]	Total[g]
1	11	12	20	7	10	60
2	8	12	19	11	13	63
3	11	11	20	4	11	57
4	12	14	19	9	10	64
5	14	12	18	8	9	61
6	14	11	19	7	14	65
7	9	11	17	10	12	59
8	12	9	14	10	13	58
9	12	13	20	9	14	68
10	7	7	15	7	7	43
11	9	11	14	6	7	47
12	14	12	19	10	11	66
13	10	7	17	9	9	52
14	6	9	15	8	10	62
15	12	12	17	7	14	62
16	5	10	17	10	8	50
17	12	9	20	8	12	61
18	5	4	14	4	5	32
19	6	2	16	4	3	31
20	2	3	18	2	1	26
21	6	9	17	8	8	48
22	9	7	17	6	13	51
23	13	12	17	9	14	65

[a]Group A - Those students who participated in the 1967 Interscholastic Farm Shop Content.
[b]Test 1 - Arithmetic Computations
[c]Test 2 - Reading Drawings and Blueprints
[d]Test 3 - Identification and Use of Tools
[e]Test 4 - Spatial Relationships
[f]Test 5 - Checking Measurements
[g]Total - All five tests together

APPENDIX E

SCORES FOR ALL SECTIONS OF THE MECHANICAL ABILITY TEST[a] FOR GROUP B[b]

Student Number	Scores					
	Test 1	Test 2	Test 3	Test 4	Test 5	Total
1	12	10	16	9	10	57
2	11	11	20	8	12	62
3	6	7	18	5	13	49
4	8	14	20	8	11	61
5	9	9	16	8	12	54
6	12	10	18	6	14	60
7	12	11	16	9	12	60
8	13	13	20	9	13	68
9	9	13	19	7	9	57
10	10	11	18	12	15	66
11	15	12	19	11	15	72
12	9	15	19	10	15	68
13	14	14	19	9	14	70
14	15	14	19	9	14	71
15	14	10	17	7	11	59
16	12	9	15	11	6	53
17	8	8	18	9	7	50
18	7	7	17	8	5	44
19	5	13	19	11	15	63
20	7	10	18	12	12	59
21	10	8	19	4	15	56
22	8	3	15	9	2	37
23	10	12	15	8	15	60
24	1	6	8	7	4	26

[a]Identification of tests in Appendix D.

[b]Group B - Those students who did not participate in the 1967 Interscholastic Farm Shop Contest from schools that were represented in the contest.

APPENDIX F

SCORES FOR ALL SECTIONS OF THE MECHANICAL ABILITY TEST[a] FOR GROUP C[b]

Student Number	Scores					
	Test 1	Test 2	Test 3	Test 4	Test 5	Total
1	8	9	19	7	6	49
2	8	9	20	10	9	56
3	9	11	19	9	7	55
4	12	8	18	9	11	59
5	10	10	20	7	11	58
6	10	12	20	12	15	69
7	12	13	18	6	14	63
8	8	12	16	9	9	54
9	13	13	19	8	15	68
10	11	12	20	8	11	62
11	12	11	16	7	15	61
12	9	9	15	5	6	44
13	9	7	19	8	5	48
14	9	8	16	9	6	48
15	4	6	16	12	8	46
16	12	10	18	13	14	67
17	9	12	19	9	13	62
18	14	13	20	9	15	71
19	13	11	19	7	15	65
20	11	15	19	10	15	70
21	13	13	20	9	10	65
22	11	13	18	11	14	67
23	11	10	20	6	12	59
24	10	10	20	6	12	58
25	6	9	16	0	0	31
26	7	12	18	9	12	58
27	12	14	18	6	5	55
28	10	7	17	8	7	49
29	10	11	15	9	14	59
30	12	13	19	9	15	68
31	8	11	11	9	2	41
32	7	11	18	10	15	61
33	4	7	19	6	2	38

[a]Identification of tests in Appendix D.

[b]Group C - Those students who did not participate in the 1967 Interscholastic Farm Shop Contest from schools that were not represented in the contest.

APPENDIX G

SCHOOL MEANS FOR ALL SECTIONS OF THE MECHANICAL ABILITY TEST[a] FOR GROUP A[b]

School	School Means					
	Test 1	Test 2	Test 3	Test 4	Test 5	Total
A	10.00	11.67	19.67	7.33	11.33	60.00
B	13.33	12.33	18.67	8.00	11.00	63.33
C	11.00	11.00	17.00	9.67	13.00	61.67
D	10.00	10.00	16.00	7.67	11.67	52.00
E	9.33	9.33	16.33	8.00	11.00	54.00
F	8.50	9.50	18.50	9.00	10.00	55.50
G	4.33	3.00	16.00	3.33	3.00	29.67
H	9.33	9.33	17.00	7.67	11.67	54.67
Total	75.82	76.16	133.00	60.67	82.67	430.84

[a]Identification of tests in Appendix D.
[b]Group A defined in Appendix D.

APPENDIX H

SCHOOL MEANS FOR ALL SECTIONS OF THE MECHANICAL ABILITY TEST[a] FOR GROUP B[b]

School	School Means					
	Test 1	Test 2	Test 3	Test 4	Test 5	Total
A	9.67	9.33	18.00	7.33	11.67	56.00
B	9.67	11.00	18.00	7.33	12.33	58.33
C	11.33	12.33	18.33	8.33	11.33	61.67
D	11.33	12.67	18.67	11.00	15.00	68.67
E	14.33	12.67	18.33	8.33	13.00	66.67
F	9.00	8.00	16.67	9.33	6.00	49.00
G	7.33	10.33	18.67	9.00	14.00	59.33
H	6.33	7.00	12.67	8.00	7.00	41.00
Total	78.99	83.33	139.34	68.65	90.33	460.67

[a]Identification of tests in Appendix D.
[b]Group B defined in Appendix E.

APPENDIX I

SCHOOL MEANS FOR ALL SECTIONS OF THE MECHANICAL ABILITY TEST[a] FOR GROUP C[b]

School	School Means					
	Test 1	Test 2	Test 3	Test 4	Test 5	Total
A	8.33	9.67	19.33	8.67	7.33	53.33
B	10.67	10.00	19.33	9.33	12.67	62.00
C	11.00	12.67	17.67	7.67	12.67	61.67
D	10.67	10.67	17.00	6.67	10.67	55.67
E	7.33	7.00	17.00	9.67	6.33	47.33
F	11.67	11.67	19.00	10.33	14.00	66.67
G	12.33	13.00	19.33	8.67	11.67	66.67
H	10.67	11.00	19.33	7.67	12.67	61.33
I	8.33	11.67	17.33	5.00	5.67	48.00
J	10.67	10.33	17.00	8.67	12.00	58.67
K	6.33	9.67	16.00	8.33	6.33	46.67
Total	108.00	117.35	197.66	90.68	112.01	628.01

[a]Identification of tests in Appendix D.
[b]Group C defined in Appendix F.

VITA

Richard Ira Carter

Candidate for the Degree of

Master of Science

Thesis: A COMPARISON OF MECHANICAL ABILITIES BETWEEN STATE F.F.A. INTERSCHOLASTIC FARM SHOP CONTEST PARTICIPANTS AND NON-PARTICIPATING OKLAHOMA VOCATIONAL AGRICULTURE STUDENTS

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