AN EVALUATION OF THE MOBILE SHOP PROGRAM OF KERN COUNTY

by

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A THESIS

submitted to

OREGON STATE COLLEGE

in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

June 1955
Sincere appreciation is extended to Mr. Bruce J. Hahn for his helpful suggestions and critical reading of this manuscript.
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AN EVALUATION OF THE MOBILE SHOP PROGRAM OF KERN COUNTY

CHAPTER I

INTRODUCTION

The mobile shop program of the Kern County Schools is one that is unique in its method of operation and in its administration. It is classified as one of the co-operative services extended to the rural elementary schools districts of Kern County by the office of the Kern County Superintendent of Schools, Bakersfield, California; who offers co-operative programs in commerce, music, speech therapy, and home economics as well as in industrial arts. Each district participating in the program signs a contract with the co-operative teacher for the school year and transfers the money for that teacher's salary to the County Schools Service Fund. The co-operative teacher's monthly warrant is paid from this fund by the superintendent's office.

The mobile shop program is designed to offer industrial arts to those rural elementary schools, on a junior high school level, who cannot afford or cannot justify the expense of establishing an industrial arts department of their own.
Purpose of the Study

The mobile shop program has been in operation in Kern County since 1944 and is considered, by the administrators of the county, to be successful in its objective of extending industrial arts to the smaller, rural elementary schools. This study is an attempt to evaluate the educational benefits of the program to the students who participate in the program. This is the first effort to evaluate the program by the application of statistics to data that has been compiled in the research project.

Need for the Study

This study is the outgrowth of the author's curiosity as to what knowledges and skills the students had obtained that were of benefit to them upon their enrollment in industrial arts classes of the high school curriculum. Inasmuch as the students enroll in several different high schools, it did not seem feasible nor practical for a follow-up type of study to be made because of the many inherent difficulties of administering and co-ordinating such a study.

The author felt that a more practical study would be that of evaluating the learnings and knowledges of the students while still in the elementary school program and
that this could be done by a carefully planned testing program.

Method Employed

The method that was employed for this study was that of administering a carefully and co-operatively prepared industrial arts test, by a tests and measurements class at Oregon State College and the Kern County Schools Psychologist and the author of this thesis, at the first session of the class as a pre-test and then again administering the same test late in the school year as a follow-up test. The data tabulated from these tests were then subjected to statistical measures to obtain the "student scores" and the "correlations" pertinent to this study.

Definition of Terms

Mobile Shop - The mobile shop is a traveling unit built into a truck equipped with machines and hand tools and is driven from school to school by the instructor. The co-operating schools usually supply a work room with work benches and some hand tools.

Co-operative Program - A co-operative program is one that is designed to serve two or more school
districts by offering them an addition to their curriculum which could not be financed or justified on a full time basis. The office of the county superintendent employs a fully qualified instructor and co-ordinates the instructor's teaching schedule with the needs of the co-operating school districts.

Rural Education - It is that part of education that serves people who live in a rural environment - farmers and their village neighbors who are closely related to agriculture, petroleum, mining, and other local allied industries.

Industrial Arts - Industrial arts, as a school subject, is the broad study of materials, organization, tools processes, products, jobs and the human problems of industry. The learnings come through the pupil's experiences with tools and materials and through his study of resultant conditions of life. It is a curriculum area rather than a subject or course, being comparable in this respect to the language arts.

Elementary School District - For the purpose of this study an elementary school district shall be
interpreted to include grades one through eight and to be located in a rural area or in an unincorporated community of no more than 2,500 population.

County Schools Service Fund - The County Schools Service Fund is one that is made available to the county superintendents by the State of California, Department of Education, for the purpose of providing curricular and special services to the smaller school districts of the county.
CHAPTER II

BACKGROUND

Rural Education

The United States has become to be considered one of the leading industrial nations of the world and, as such, people tend to forget that the historical background of this nation is one primarily of agriculture and rural life.

In those early days the home and family were largely self-sufficient. Most of what was learned by the young people needed for making their own living was learned in the home, on the farm, and in the family shop from parents, older brothers and sisters, and their neighbors.

The scope of rural education in the United States today is indicated in an article written by Harold Dawson (4, p.407):

The education of rural children and youths is still a major part of the task of our public schools. Almost half the children of school ages, or about 14.6 million, still live in rural areas; over 7.7 million of these children live on farms.

Thus we see that almost one-half of the students of the United States are of a rural population and are entitled to an adequate education. In speaking of rural
education, Kate Woffard (22, p.26) says:

The fight then, as now, was essentially an effort to bring quality of educational opportunity to rural children, not merely for the sake of justice to them, but from the expedience of service to America. If the quality of American life is to be improved, increasing attention should be given to the care and education of rural children.

Many plans have been advocated to improve the lot of rural children - enlargement of the taxable, administrative, and attendance unit; provisions for opportunities for vocational education; development of a more functional curriculum closer to rural people; and other programs beyond the scope of this article.

In 1953 Mr. Dawson (5, pp.441-2) wrote:

Many changes have also taken place in rural life during the past decade. Farms have been increasingly mechanized. Modern methods of agriculture now enable fewer people to produce a larger volume of agricultural goods. Rural farm population has actually decreased while rural non-farm population has increased at an astounding rate. More farm and village people are engaging in service and small-industry occupations. Remarkable changes have come about in neighborhood and community relationships.

Many changes have also taken place in rural schools. In less than ten years, reorganization has reduced the number of districts from 108,000 to about 67,000. Schools have been consolidated. In the past decade one-teacher schools have decreased from about 108,000 to less than 60,000. Schools have become larger; yet the average school serving rural people remains small: three teachers for the elementary schools, six teachers for high schools. The number of students transported daily has grown from four million to over seven million.

There have been many changes in the objectives of the rural schools, just as there have been many changes in
economic and social conditions in rural life, during the past several decades. In regard to the emphasis given subject matter and methods, Butterworth and Dawson (2, p.6) say:

With each advancing decade additions to the curriculum or changes in emphasis on subject matter and methods of teaching have occurred. The curriculum of the elementary school now contains at least four times as many studies and activities as it did in the early 1800's. In short, a new concept of the function of the school is now held, and the modern rural school, as well as the urban school, is expected to offer opportunities to practice life, to develop useful skills and habits, to create desirable appreciations and attitudes, and to train in reflective thinking and analysis.

Butterworth goes on to point out that the problems of the schools, especially the elementary schools, includes that of an increasing population. The Bureau of Census (18, p.16) predicts that the increase in elementary school enrollment in the period from 1948 to 1960 will be 43.2 per cent.

With this growth in population that is causing the schools of the United States to experience expansion and teaching personnel problems, is the problem of a changing need in curriculum to better meet the requirements of our modern society. In regard to rural education and in pointing up the contrast of the newer methods to those of our forebears of just a few decades ago, Effie Bathurst (1, p.1) has written:
As you would expect, rural family life has changed. Farmers have opportunities for richer living and new problems and new responsibilities. Dangerous machinery and exacting scientific procedures mean that children cannot take part in many farm activities. As a result, rural boys and girls get less education through working at home with their parents than they formerly did. More education through experience is given over to the schools.

The goals that modern society expects education to attain are as varied as they are great in number. One, however, that occurs in a large percentage of the various vocations for which students prepare themselves in educational institutions is the ability and skill in the use of their hands. This is to be highly desirable of those who will work and make their homes in rural society.

In speaking of the farmer, Samuel Ogden (15, p.108) has said:

An important part of the basic equipment of any farmer is the ability to use his hands. He should be able to cope with minor repairs from plumbing to blacksmithing, and he should have the tools and equipment to work with. Further, he should be able to lay out and plan the carpentry and he should be able to carry on, except in the case of major jobs, without outside help. In spite of this, however, there is need for skilled men in the building trades in the country, and anyone who has talents and experience along these lines will find himself in a position to make an income and live profitably in the country.

It would seem, then, that rural education expects outcomes in terms of vocational, social, and cultural goals. This is little different, it would seem, from those of
general education except in emphasis and degree, which is
determined by factors that are characteristic of the part-
ticular community.

In 1944, the First White Conference on Rural Educa-
tion (12, pp.14-5) formulated an educational bill of
rights for the rural child which sets forth ten rights
to which rural population is entitled. Because they con-
stitute a profound set of principles, nearly all of which
have a direct bearing on this study, they are reproduced
here in full.

A Charter of Education for Rural Children

I. Every rural child has the right to a satis-
factory, modern elementary education. This
education should be such as to guarantee the
child an opportunity to develop and maintain
a healthy body and a balanced personality,
to acquire the skills needed as tools of
learning, to get a good start in understand-
ing and appreciating the natural and social
world, to participate happily and helpfully
in home and community life, to work and
play with others, and to enjoy and use
music, art, literature, and handicrafts.

II. Every rural child has the right to a satis-
factory, modern secondary education. This
education should assure the youth continued
progress in his general physical, social,
civic, and cultural development begun in
the elementary school, and provide initial
training for farming or other occupations
and an open door to college and the pro-
fessions.

III. Every rural child has the right to an educa-
tional program that bridges the gap between
home and school, and between school and
adult life. This program requires, on the
one hand, cooperation with parents for the home education of children too young for school and for the joint educational guidance by home and school of all other children; and, on the other hand, the cooperative development of cultural and vocational adult education suited to the needs and desires of the people of the community.

IV. Every rural child has the right thru his school to health services, educational and vocational guidance, library facilities, recreational activities, and, where needed, school lunches and pupil transportation facilities at public expense. Such special services, because they require the employment of specially qualified personnel, can be supplied most easily thru enlarged units of school administration and the cooperation of several small districts.

V. Every rural child has the right to teachers, supervisors, and administrators who know rural life and who are educated to deal effectively with the problems peculiar to rural schools. Persons so educated should hold state certificates that set forth their special qualifications, should be paid adequate salaries, and should be given by law and fair practices security in their positions as a reward for good and faithful services. The accomplishment of these objectives is the responsibility of local leadership, state departments of education, the teacher education institutions, and national leaders in rural education.

VI. Every rural child has the right to educational service and guidance during the entire year and full-time attendance in a school that is open for not less than nine months in each year for at least twelve years. The educational development of children during vacation time is also a responsibility of the community school. In many communities the period of schooling has
already become fourteen years and should become such in all communities as rapidly as possible.

VII. Every rural child has the right to attend school in a satisfactory, modern building. The building should be attractive, clean, sanitary, safe, conducive to good health, equipped with materials and apparatus essential to the best teaching, planned as a community center, and surrounded by ample space for playgrounds, gardens, landscaping, and beautification.

VIII. Every rural child has the right thru the school to participate in community life and culture. For effective service the school plant must be planned and recognized as a center of community activity; the closest possible interrelationships should be maintained between the school and other community agencies; and children and youth should be recognized as active participants in community affairs.

IX. Every rural child has the right to a local school system sufficiently strong to provide all the services required for a modern education. Obtaining such a school system depends upon organizing amply large units of school administration. Such units do not necessarily result in large schools. Large schools can provide broad educational opportunities more economically, but with special efforts small schools can well serve rural children and communities.

X. Every rural child has the right to have the tax resources of his community, state, and nation used to guarantee him an American standard of educational opportunity. This right must include equality of opportunity for minority and low economy groups. Since many rural youth become urban producers and consumers, it is necessary for the development of the democratic way of life that the wealth and productivity of the entire
nation should aid in the support of the
right of every child to a good education.

These are the Rights of the Rural Child
Because They are the Rights of Every Child
Regardless of Race, or Color, or Situation,
Wherever He May Live Under the Flag of the
United States of America.

**Industrial Arts in Rural Education**

Most of the books, articles, and conferences on
rural education and its problems agree that these
problems involve the lack of teachers, buildings,
and a functional curriculum that would prepare
rural people for living. As a solution all have
emphasized the "three R's" as being able to
satisfy the needs in one form or another. All
have overlooked the importance of the "three M's",
machines, materials, and manipulative processes
in our present industrial world. They have also
overlooked that phase of general education that
deals with the three M's - industrial arts.

(10, p.276)

It is the primary duty of the schools to provide edu-
cational training for citizenship in our democracy.
Democracy is not a birthright but is a responsibility
which demands intelligent and critical participation, both
at the local level and at the national level. We are
living in essentially an industrial age; modern civiliza-
tion is dependent largely upon science, invention, and
skill. The manufacturing industries are important among
the activities which make for the material well-being of
the people. The interrelations are very important and
cannot be eliminated. The interrelation of farm and city;
agriculture, industry, and labor; the dependence of any group in American life upon the prosperity and well-being of all is an important ingredient of democratic education as well as of a democratic society.

It is of interest to note that John Dewey (6, pp.11, 17) advocated activities of a nature very similar to those of industrial arts in the year of 1899. In his "School and Society" he said:

We must conceive of work in wood and metal, of weaving, sewing, and cooking, as methods of life; not as distinct studies, ... but as instrumentalities through which the school itself shall be made a genuine form of active community life, instead of a place set apart in which to learn lessons.

In another paragraph he says:

In educational terms, this means that these occupations in the school shall not be merely practical devices or modes of routine employment, the gaining of better technical skills as cooks, seamstresses, or carpenters, but active centers of insight into natural materials and processes, points of departure whence children shall be led out into a realization of the historical development of man.

Industrial arts as a phase of general education has general values that apply to all levels, and in a continuous program these values are progressively intensive and are cumulative in their effect as the student advances in maturity. In this type of program the pupil:

(1) Gains knowledge of the changes made in materials to meet the needs of society, of tools
and industrial processes used to effect these changes, of the constant adaptation of materials, tools, and processes to meet changing needs and conditions, and of industrial workers and working conditions.

(2) Grows in appreciation of the value of information regarding occupations as a background for a wise choice of career, of the importance in modern life of tools and industrial processes, of the artistry of the designer and the skill of the artisan, and of the dignity of productive labor.

(3) Increases in ability to plan constructive projects, to select and use sources of industrial and related information, to handle tools and materials, to express with material things his individual interests, to use effectively his recreational time, to work and share as a member of the group, and to evaluate work and its products.

(4) Develops attitudes of concern for safety practices, of consideration for workers in all fields, of regard for cooperation among the members of a group, and of respect for property.

A bulletin published by the University of New York (14, p.10) sets forth the following objectives of industrial arts for the junior high school:
The following objectives of industrial arts are set forth to clarify the meaning of the exploratory and general objectives so commonly accepted for junior and senior high school education. They define specifically the goals toward which teachers should point their work and guide their pupils. The industrial arts aims and objectives are as follows:

1. To develop an interest in avocational activities of a constructive nature.

2. To increase knowledge about and understanding of the uses and values of products and processes of industry, both past and present.

3. To develop an understanding of the problems of industry and its workers.

4. To provide an opportunity for creative expression and problem solving through the use of tools and materials.

5. To motivate interest in and increase knowledge about the principal fields of industry and the educational and occupational opportunities therein.

6. To develop manual ability in the use of common tools and materials which would be of service in and around the home.

7. To provide the pupil with exploratory industrial experiences which will aid him in the discovery of his own interests, abilities and attitudes toward industrial occupations.

8. To provide experience and information which will aid the pupil as a consumer, in the selection, use, repair and care of the products of industry, with which he is intimately associated.

9. To establish close relationships between industrial arts work and the other school subjects.

The very nature of industrial arts gives it a universal appeal, not limited by race, age, sex, or aptitude. The values of this phase of education is not limited to
any one occupational interest. No matter what the occupation, it invariably touches on many material, social, and economic factors. Wholesome stability in these respects may be promoted and developed in young people through honest work experiences. More important, however, is the opportunity for exploratory experiences that may determine in what broad fields of human and industrial activities their interests may lie.

The subject matter and experiences of industrial arts are derived from the type of society in which people find themselves. The curriculum applications are gaged by the resulting criteria. The idea of "exploration", for example, means not only contacts with a wide variety of tools, materials, and techniques, but a study of occupational opportunities, demands, and interests which extend even to actual tryouts in occupations on the part of the advanced adolescents.

The Mobile Shop as Industrial Arts

Industrial arts programs are very common in junior high school, but are not so common in grades seven and eight in the rural elementary schools. It is, then, with concern that we consider those boys and girls that are enrolled in those rural schools. One of our urgent problems
is to organize our industrial arts teaching so that these elementary schools may have opportunities that at least approximate those of the junior high school. An organization known as "general shop" has made considerable progress in this direction where several activities are in progress at one time under the direction of one teacher.

In 1925, Clinton Van Deusen (19, pp.150-2) advocated that the rural schools should have "Manual Training" with several types of activities in operation simultaneously and cited some of the Ohio schools that had introduced this type of program.

In 1938, he again wrote concerning the rural school industrial arts (20, pp.26-9). He discusses the idea of the itinerant teacher for special subjects in relation to the service that can be extended to the children in small rural schools.

"Industrial Arts on Wheels" is the title of an article written in 1945 by Dale Easter (7, p.17) in which he tells about the rolling workshop of Kern County. This is a program of an itinerant teacher working with ten rural elementary schools.

In the "Guide for Industrial Arts Education in California" (3, pp.4-7), a total industrial arts program is suggested and it is further suggested that the public school system in each community provide a similar program
designed to serve their local needs. Since it constitutes a basic expression of state policy it is reproduced in considerable detail.

Kindergarten Through the Sixth Grade:

Industrial arts experiences should be integrated with the social studies program. If the instruction is to be effective, elementary school teachers should have training in the industrial arts processes appropriate to this level, and elementary schools should have facilities and equipment needed to carry on the activities which are recommended.

Grades Seven, Eight, and Nine:

Level I. An exploratory program of two to four semesters that provides industrial arts experiences in a variety of industrial arts subject fields under qualified instructors is suggested. This program may be carried on in a general shop with a number of industrial arts subject areas or by rotating students through a number of unit shops.

Level II. Basic courses, one or two semesters in length, provide an opportunity for a student to take further work in a single industrial arts subject field. These basic courses are usually carried on in unit shops. In small communities these experiences can be provided by assigning learners to a definite industrial arts subject field area with appropriate experiences within the general shop. For schools too small to provide any shop or shop instructor, a mobile shop serving a number of schools may be established. After two semesters in a particular subject field, a student should be encouraged to enroll in some other basic industrial arts course rather than to take additional work in the same area.

Grades Ten, Eleven, and Twelve:

Level II. Basic courses similar to those provided in grades seven, eight, and nine are offered for those students who did not receive these
experiences, or who can profit from experiences in industrial arts subject fields other than those selected in grades seven, eight, and nine.

Level III. Intermediate courses, one or two semesters in length, provide further experiences in a single industrial arts subject field. These courses are offered to those who have completed the Level II course in the same field.

Level IV. Advanced courses, one or two semesters in length, are provided for students who have completed Level III courses and wish to specialize still further in a particular industrial arts subject field.

In a large school system with a number of shops, experiences described under the various levels in this section are usually offered in a unit shop for each industrial arts subject field. In the small school they may be provided through a general shop or limited general shop by assigning a student to a specific area with which he is concerned.

It is to be noted that the above program emphasizes the exploratory values of industrial arts, yet provides for the specialization by those students who may have found their special interests.

It is suggested, also, that schools too small to provide a shop or shop instructor, may take advantage of a mobile shop and an itinerant teacher to obtain an industrial arts program for their school.

In 1949, Dale Easter wrote a master's thesis at the University of Southern California entitled "A Guide for Mobile General Shop in Kern County Schools". A revision of this thesis is being used as a teacher's manual under
A paragraph telling of the beginnings of the mobile shop program of Kern County is as follows:

Early in the spring of 1944 a Dodge truck, with high paneled sides, bounced into a school yard for the first time in the history of Industrial Arts. Soon the truck was surrounded by curious children. The place was Mountain View School in Kern County, California. The driver was Ray Messinger, Supervisor of Industrial Arts and Agriculture. The panels of the truck were lowered on folding legs to reveal a wealth of machines and hand tools. Soon the boys were busy constructing practical, interesting projects planned to correlate with their particular school programs. This new service proved to be so popular that the following year an instructor was employed to spend his full time with the mobile shop program.

This method of expanding rural education to include industrial arts is of considerable advantage, as well as of educational service, to the smaller schools. It guarantees an optimum use of the equipment that is necessary to operate an effective program and is financially economical for the participating schools. Some of the participating schools become so interested in the cooperative or itinerant program that investments are made in tools and machines for their own schools. This is to be encouraged for ultimately many schools, because of increased enrollment and of physical plant expansions, will set up their own programs of industrial arts so that the young people of their schools will have even greater
opportunities.

Such a goal is expressed by John Satterstrom (17, pp. 262-3):

There is reason to believe that many schools will eliminate themselves from the group requiring the services of the mobile shop by acquiring adequate facilities of their own. By thus eliminating itself, the mobile unit will serve its highest purpose in the minds of its creators.
CHAPTER III

THE STUDY

The Method

The choice of the method to be used for this study was made by the author in consultation with the Kern County Schools Psychologist, Dr. Murray Tondow, who heads the testing program for the county schools. Dr. Tondow has made many excellent and helpful suggestions as to how the study was to be conducted and as to the treatment of the data collected in the study.

The method used for the testing program of this study is that of a pre-test given to the students at the initial class session and of a follow-up test at the end of the school year. The same test was administered as the pre-test and as the follow-up test. This was deemed to be the most expedient manner in which to get the most valid data on the students' achievement in terms of the learnings and knowledges gained during the school year.

The pre-test was administered in the month of September, 1953, to those students enrolled in the classes of the mobile shop program. The majority (67 per cent) of the students enrolled were in the seventh and eighth grades, but in some schools the fifth and sixth grade
students were also included in the program.

The follow-up test was administered early in the month of May, 1954, to those students enrolled in the grades from the fifth through the eighth. Not all of the students enrolled at this date had been in the classes throughout the school year nor were all of the students who were enrolled at the time of the pre-test still enrolled. This is accounted for in the migration that is constantly in progress throughout the United States. Of the students enrolled at the beginning of the school year, 84.8 per cent were still enrolled at the time of the May test. There were 71 students upon which complete data were obtained and it is to this data that the statistical measures have been applied.

The Test

There seemed to be no industrial arts test available that would suit the purpose of this study. It was deemed necessary to construct a suitable instrument that would measure the achievement of the students as accurately as possible.

The author did preliminary work by constructing a test and administering it to his students during the school year of 1952-53. It did not seem to be an adequate
instrument as it did not have comprehensiveness and certain of the items were proven to be very poor.

This test was introduced to a tests and measurements class at Oregon State College in which the author was enrolled during the Summer Session of 1953. The opinion that it was not a good instrument was soon verified by the class. It became one of the objectives of the author to construct the best possible instrument that would effectively test the students of the mobile shop program.

It became apparent, as the course progressed, that an adequate instrument would need to have validity, reliability, objectivity, discrimination, comprehensiveness, and ease of administration and of scoring.

The class, with these criteria in mind, set about constructing instruments that would measure achievement in the various subject fields of industrial arts. Each of these instruments was subjected to an evaluation of the class and the poor and weak items were eliminated. As a result of this co-operative work of the class, many excellent test items were constructed and compiled that included the various industrial arts subject fields. It was from this wealth of material that the author selected many, many items for his instrument, a copy of which has been included in the appendix of this study.

The measurement of individuals and objects may be of
various kinds, and may be taken to varying degrees of precision. Measurement of any kind is a matter of determining how much or how little, how great or how small, how much more than or how much less than. It can also be said that anything that exists at all exists in some quantity, and anything that exists in some quantity is capable of being measured. In a sense this statement is an expression of faith. It does not say that we are now able to measure all things. It does say that anything existing in quantity is capable of being measured.

Fifty years ago there was no such thing as a Geiger counter for measuring radioactivity. Seventy-five years ago we had no standardized tests for measuring intelligence. It was only one hundred years ago that the first measuring machine capable of detecting differences of one millionth of an inch was invented. In the sixteenth century the lawful length of the rod was determined by the length of the left feet of sixteen men lined up as they left church on Sunday morning. Other standards of measure just naturally originated from parts of the body. Fingernails, fingers, arms, all became units of measure.

The length of the forearm from elbow to the middle finger tip was the ancient Sumarian and Egyptian unit of measure called the "cubit". As one would expect, there were variations in this standard due to the variations in
stature of the people and this, of course, was true for all units of measurement that were based upon some member of the body. The same principle is present in the measuring standards used in achievement testing. There are variations in the accuracy of the results according to the accuracy of the instrument being used and the ability of the user to make proper use of that instrument.

Results and Interpretations

In the process of the statistical computations for this study, it was necessary to find the means of the various measurements. It may be of interest to discuss these at this point. The means calculated for the pre-test was progressively larger in the same order as the levels of experience increased in the number of years. The first year student group obtained the mean score of 33.25, the second year student group had a mean score of 37.97, and the highest mean score was that of the combined third and fourth year group at 49.0. The mean score of the entire group of students was 39.25.

The means calculated for the follow-up test followed the same general trend as that of the pre-test with the first year student group having made a mean score of 46.25, the second year group a mean score of 50.87, and the
combined third and fourth year group received the highest of 61.50. The mean score of the follow-up test was 52.21 for the entire group of students.

It became evident that there were distinct differences between the levels of experience and those differences were of a nature to suggest that the benefit to the student was cumulative. Also, it became evident that the student groups tended to make approximately the same gain in mean score from the pre-test to the follow-up test and that gain was approximately 12.8. This was significant in indicating improvement in the students' store of learnings and knowledges.

The statistical treatment of the data in this study has been for the purpose of evaluating the student achievement and has been divided into two groups; the Student's "t" distributions and the coefficients of correlation.

Student t Distributions

The Student's t distributions were calculated by the method of pairing observations. The distributions are the result of pairing the observations from the pre-test given at the beginning of the year with the observations from the follow-up test given at the end of the school year. The pairing of observations is: for all students, for first year students, for second year students, and for
the third and fourth year combined group of students.

The assumed hypothesis is that the paired observations for the entire group of students will show an equal amount of achievement when taken at the one per cent level of confidence. The hypothesis is to be rejected if the t distribution is less than -2.65 or more than 2.65 when the degrees of freedom are 70. The calculated value of t is 6.04, which is considerably larger than the 2.65 and thus the hypothesis is rejected. It can be said, then, there is achievement that is very significant and we can be confident well beyond the one per cent level of confidence.

The assumed hypothesis is that the paired observations for the first year group of students will show an equal amount of achievement when taken at the one per cent level of confidence. The hypothesis is to be rejected if the t distribution is less than -2.81 or greater than 2.81 when the degrees of freedom are 23. The calculated value of t is 3.29, which is somewhat larger than 2.81 and thus the hypothesis is rejected. This indicates achievement of the group and we can be confident at the one per cent level of confidence.

The assumed hypothesis is that the paired observations for the second year group of students will show an equal amount of achievement when taken at the one per cent
level of confidence. The hypothesis is to be rejected if the t distribution is less than -2.75 or is greater than 2.75 when the degrees of freedom are 30. The calculated value of t is 4.57, which is considerably larger than 2.75 and thus the hypothesis is rejected. This indicates definite achievement of the group and it is very significant at the one per cent level of confidence.

The assumed hypothesis is that the paired observations for the combined third and fourth year group of students will show an equal amount of achievement when taken at the one per cent level of confidence. The hypothesis is to be rejected if the t distribution is less than -2.95 or is greater than 2.95 when the degrees of freedom are 15. The calculated value of t is 4.01, which is considerably larger than 2.95 and thus the hypothesis is rejected. This indicates significant achievement of the group at the one per cent level of confidence.

The calculations were made for the comparisons of the various levels of student experience. That is, the comparison of the first year students with those of the second year group, and those of the combined third and fourth year group. To complete the comparisons, the second year group of students is compared with those of the combined third and fourth year group. These comparisons are based upon the follow-up scores given at the end of the
school year. The objective is to determine if there is any significant advantage for those students participating in the mobile shop program for more than one year.

The hypothesis is that there is no advantage for the second year students as compared to the first year students at the ten per cent level. The hypothesis is to be rejected if t is less than -1.71 or greater than 1.71 when the degrees of freedom are 23. The calculated t score is 1.25, which is less than 1.71 and thus the hypothesis is accepted. There seems to be no significant advantage for these students, at least at the ten per cent level of confidence.

The hypothesis is that there is no advantage for the students in the combined third and fourth year group as compared to the first year students at the one per cent level of confidence. The hypothesis is to be rejected if t is less than -2.95 or greater than 2.95 when the degrees of freedom are 15. The calculated t score is 4.89, which is considerably greater than 2.95 and thus the hypothesis is rejected. The assumption is that there is an advantage in the longer period of participation that is very significant at the one per cent level of confidence.

The hypothesis is that there is no advantage for the combined third and fourth year group over the second year group at the one per cent level of confidence. The
hypothesis is to be rejected if the t score is less than -2.95 or is greater than 2.95 when the degrees of freedom are 15. The calculated t distribution is 3.76 and this is somewhat larger than 2.95, thus the hypothesis is rejected. This shows there is an advantage for those students in the third and fourth year group that is significant at the one per cent level of confidence.

In summary of the foregoing, it has been shown that all the students of this study have made achievement regardless of the level of experience to which they belong. As can be expected, the various levels of experience show slight variations of student achievement, with the second year group showing a slightly greater achievement than either the first year or the combined third and fourth year groups. Also, it has been shown that the greater the number of years that the student has been enrolled in the program, the greater is his store of learnings and knowledges.

In answer to the question, "Is there student achievement in the mobile shop program?" we can now say there is evidence that the answer is in the affirmative. The statistical measures that have been discussed in this section show that there is student achievement in the mobile shop program, as measured by the achievement test. The achievement is of a significance such as to recommend that
this type of program take its appropriate place in modern rural education.

Coefficients of Correlation

The coefficients of correlation were calculated to determine the relationship between certain of the variables that are present in this study.

The coefficient of correlation between the pre-test given at the start of the school year and the follow-up test given at the end of the year is $0.84 \pm 0.02$. This indicates a very high relationship and it is of a nature to indicate a considerable amount of reliability since the correlation coefficient is considerably more than three times its probable error.

The coefficient of correlation calculated between the difference of the two test scores and the intelligence quotient for all the students is $0.14 \pm 0.08$. This is a positive correlation but is so small that it is of little value in establishing any relationship between these two variables. It is of a nature that is little better than chance, although it had been hoped that there would be a larger coefficient in terms of student achievement and the student I.Q.

The correlation coefficients were calculated to determine the relationships between the students' term grade,
as taken from the class record book, and their follow-up test scores at their various levels of experience. The levels of experience are: all students grouped together \((N = 71)\), the first year group of students \((N = 24)\), the second year group \((N = 31)\), and the combined third and fourth year student group \((N = 16)\).

The calculated coefficient of correlation between the students' term grade and their follow-up test scores is \(0.57 \pm 0.08\). This denotes a marked relationship that is quite reliable, since the coefficient is about eight times larger than its probable error.

The calculated coefficient of correlation between the term grades of the first year student group and their follow-up test scores is \(0.73 \pm 0.06\). This denotes a high relationship between the two variables and is considered to be quite reliable since the coefficient is more than ten times the size of its probable error.

The calculated coefficient of correlation between the term grades of the second year group of students and their follow-up test scores is \(0.40 \pm 0.10\). This denotes a substantial relationship, but it is not so significant as that of the first year group.

The calculated coefficient of correlation between the term grades of the combined third and fourth year group and
their follow-up test scores is $0.49 \pm 0.13$. This denotes a substantial relationship that is somewhat higher than that of the second year group but is not of significance comparable to that of the first year student group.

In summary, the foregoing statistics show that the students tended to make a significant gain in test scores and that the students who obtained the higher scores on the pre-test tended to have the higher scores on the follow-up test. This is shown by the high value of the correlation coefficient of the two tests. There seemed to be little relationship, however, between the gain in test score and the intelligence quotient of the student.

Statistical measure was used to show the relationship between the student's score on the follow-up test and his final class grade. The first year student group shows the highest relationship. The second year group shows the lowest relationship, with the third and fourth-year student group showing a somewhat better relationship. It is of interest to note that the coefficient of correlation for the entire group of students seems to fall midway in the range of the coefficients for the various levels of experience.

Promotional Results

After having participated in the mobile shop program,
there are thirteen districts in the County of Kern that now have their own programs of industrial arts. Table I shows the elementary school districts of Kern County that are located in a rural area or in a community of less than 2,500 population.

**TABLE I**

THE STATUS AND USE OF THE MOBILE SHOP PROGRAM IN THE RURAL SCHOOL DISTRICTS OF KERN COUNTY, CALIFORNIA

<table>
<thead>
<tr>
<th>School District</th>
<th>A.D.A.</th>
<th>Years in Mobile Shop Program</th>
<th>Permanent Facilities, 1954</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aqueduct</td>
<td>40</td>
<td>1</td>
<td>no</td>
</tr>
<tr>
<td>Aztec</td>
<td>86</td>
<td>4</td>
<td>yes</td>
</tr>
<tr>
<td>Belridge</td>
<td>90</td>
<td>10</td>
<td>yes *</td>
</tr>
<tr>
<td>Blake</td>
<td>13</td>
<td>5</td>
<td>no *</td>
</tr>
<tr>
<td>Buena Vista</td>
<td>33</td>
<td>9</td>
<td>yes *</td>
</tr>
<tr>
<td>Buttonwillow</td>
<td>511</td>
<td>1</td>
<td>yes</td>
</tr>
<tr>
<td>Caliente</td>
<td>63</td>
<td>2</td>
<td>no</td>
</tr>
<tr>
<td>Di Giorgio</td>
<td>224</td>
<td>0</td>
<td>yes</td>
</tr>
<tr>
<td>Edison</td>
<td>255</td>
<td>2</td>
<td>yes</td>
</tr>
<tr>
<td>Elk Hills</td>
<td>165</td>
<td>10</td>
<td>yes *</td>
</tr>
<tr>
<td>El Tejon</td>
<td>244</td>
<td>8</td>
<td>no *</td>
</tr>
</tbody>
</table>

* Schools still participating in the program.
<table>
<thead>
<tr>
<th>School District</th>
<th>A.D.A.</th>
<th>Years in Mobile Shop Program</th>
<th>Permanent Facilities, 1954</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruitvale</td>
<td>367</td>
<td>3</td>
<td>yes</td>
</tr>
<tr>
<td>Greeley</td>
<td>88</td>
<td>6</td>
<td>yes</td>
</tr>
<tr>
<td>Greenfield</td>
<td>817</td>
<td>1</td>
<td>yes</td>
</tr>
<tr>
<td>Johannesburg</td>
<td>34</td>
<td>0</td>
<td>no</td>
</tr>
<tr>
<td>Keene</td>
<td>25</td>
<td>4</td>
<td>no *</td>
</tr>
<tr>
<td>Kernville</td>
<td>181</td>
<td>6</td>
<td>yes</td>
</tr>
<tr>
<td>Lakeside</td>
<td>354</td>
<td>0</td>
<td>yes</td>
</tr>
<tr>
<td>Lerdo</td>
<td>441</td>
<td>2</td>
<td>yes</td>
</tr>
<tr>
<td>Linns Valley</td>
<td>32</td>
<td>3</td>
<td>no</td>
</tr>
<tr>
<td>Lost Hills</td>
<td>109</td>
<td>0</td>
<td>yes</td>
</tr>
<tr>
<td>Maple</td>
<td>155</td>
<td>0</td>
<td>yes</td>
</tr>
<tr>
<td>Maricopa Unified</td>
<td>448</td>
<td>0</td>
<td>yes</td>
</tr>
<tr>
<td>McKittrick</td>
<td>63</td>
<td>10</td>
<td>no *</td>
</tr>
<tr>
<td>Midway</td>
<td>388</td>
<td>0</td>
<td>yes</td>
</tr>
<tr>
<td>Mojave</td>
<td>371</td>
<td>2</td>
<td>no</td>
</tr>
<tr>
<td>Mountain View</td>
<td>1289</td>
<td>0</td>
<td>yes</td>
</tr>
<tr>
<td>Muroc</td>
<td>137</td>
<td>6</td>
<td>yes</td>
</tr>
<tr>
<td>Norris</td>
<td>98</td>
<td>10</td>
<td>no *</td>
</tr>
<tr>
<td>Panama</td>
<td>500</td>
<td>0</td>
<td>yes</td>
</tr>
<tr>
<td>Pondham</td>
<td>250</td>
<td>5</td>
<td>yes</td>
</tr>
</tbody>
</table>

* Schools still participating in the program.
TABLE I (Continued)

<table>
<thead>
<tr>
<th>School District</th>
<th>A.D.A.</th>
<th>Years in Mobile Shop Program</th>
<th>Permanent Facilities, 1954</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poso Flats</td>
<td>9</td>
<td>0</td>
<td>no</td>
</tr>
<tr>
<td>Randsburg</td>
<td>58</td>
<td>4</td>
<td>no</td>
</tr>
<tr>
<td>Red Rock</td>
<td>37</td>
<td>3</td>
<td>no</td>
</tr>
<tr>
<td>Rio Bravo</td>
<td>161</td>
<td>4</td>
<td>yes</td>
</tr>
<tr>
<td>Rosedale</td>
<td>374</td>
<td>1</td>
<td>yes</td>
</tr>
<tr>
<td>Semitropic</td>
<td>97</td>
<td>5</td>
<td>no</td>
</tr>
<tr>
<td>Shafter</td>
<td>67</td>
<td>5</td>
<td>no</td>
</tr>
<tr>
<td>South Fork</td>
<td>25</td>
<td>5</td>
<td>no</td>
</tr>
<tr>
<td>Southern Kern</td>
<td>283</td>
<td>7</td>
<td>no</td>
</tr>
<tr>
<td>Tehachapi</td>
<td>557</td>
<td>0</td>
<td>yes</td>
</tr>
<tr>
<td>Twin Oaks</td>
<td>32</td>
<td>1</td>
<td>no</td>
</tr>
<tr>
<td>Vineland</td>
<td>712</td>
<td>0</td>
<td>yes</td>
</tr>
<tr>
<td>Wildwood</td>
<td>38</td>
<td>10</td>
<td>no *</td>
</tr>
</tbody>
</table>

* Schools still participating in the program.

Of the forty-five rural elementary school districts in Kern County there are thirty-three that have been associated with the mobile shop program for a period of at least one year. The period for which the various districts have participated in the program varies from a
single year to as many as ten years, the length of time in which the program has been in operation.

There are twelve districts that have never been associated with the mobile shop program and, of those twelve, ten have industrial arts programs of their own and the remaining two are small, isolated schools that have not had any program of industrial arts.

Of the thirty-three schools that have been associated with the mobile shop program, nine are still participating in the program, thirteen operate their own programs of industrial arts, and eleven do not now have an industrial arts program.

There are various factors that have influenced these eleven schools to suspend their participation in the mobile shop program. The reasons are unknown as to why four of the schools do not have a program, one school had a financial reason, and two schools were forced out of the program because they could not be fitted into the mobile shop schedule due to their remote location. Four schools dropped out of the mobile shop program with the purpose of instigating their own programs, which since have been discontinued for local reasons.
SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The mobile shop program of Kern County is one that is unique in its method of operation. It is designed to offer an industrial arts program to rural, elementary schools (grades 1-8) similar to the program of the junior high school.

This study was an attempt to evaluate the educational benefits for the students who have participated in the mobile shop program. A test was constructed for the purpose of measuring student achievement and was used as the pre-test as well as the follow-up test. The data compiled from these tests were subjected to statistical treatment.

There have been many changes in rural life in these United States and, in order to keep pace, rural education has had to make many changes. There are many improvements yet to be accomplished; among them are adequate buildings, proper administrative units, adequately and properly trained teaching personnel, and a curriculum that will be modern, functional and comprehensive.

A complete curriculum will include a program of industrial arts that will offer opportunities for the
students to have exploratory experiences that may determine in what broad fields of human and industrial activities their interests and abilities may lie.

The mobile shop is a method by which industrial arts can be offered to the smaller, rural elementary schools through a co-operative program. This program employs an itinerant teacher who serves several schools as a fully credentialled industrial arts instructor and the several school districts pay his salary jointly.

The results of the evaluation study show that students who participated in the mobile shop program of Kern County have made significant progress in achievement. The students made an average mean gain in score of approximately 12.8, an increase of 14.2 per cent. The t scores calculated for all the students was 6.04, which is considerably beyond the 2.65 value of the one per cent level of confidence. The coefficient of correlation between the pre-test given at the start of the school year and the follow-up test at the end of the year was calculated to be .84 ± .02. The achievement, then, is of a significance such as to recommend that this type of program should take an appropriate place in modern rural education.

There are nine school districts in Kern County that still participate in the mobile shop program and of those that have been associated with the program, thirteen
(54.1 per cent) have been stimulated to withdraw and to establish their own programs of industrial arts. It is of considerable interest to note that of the forty-five rural school districts in the county, thirty-two, or 71 per cent, now have programs of industrial arts.

**Conclusions**

The conclusions are based upon the study of the literature available on rural education and its problems of attendance, administration, and curriculum; also upon the measurements and statistical results of this study. The conclusions are:

1. Rural education should expand its curriculum and its facilities to meet the needs of modern society. These needs can be expressed in terms of vocational, social, and cultural goals.

2. Rural education should include industrial arts and home economics in its curriculum. These are the fields in which the young people gain their exploratory experiences, and in which laboratory facilities are often lacking.

3. The mobile shop program is a suitable method of providing programs of industrial arts for rural education.

4. Students enrolled in the mobile shop program of
Kern County have made significant progress in achievement for the school year of 1953-54.

5. The students' achievement can be evaluated effectively by the use of achievement tests and by subjecting the collected data to statistical measures.

6. The student achievement while enrolled in the mobile shop program of Kern County is cumulative for at least three years of experience.

7. The mobile shop program of Kern County has stimulated thirteen school districts of the county to establish programs of industrial arts of their own, thus better serving the needs of their young people.

8. The mobile shop program of Kern County is serving its function of extending service to rural education. The program has given or is giving service to thirty-three of the forty-five rural, elementary school districts of the county.

Recommendations

The recommendations set forth are based upon the findings of this study. They are:

1. There should be a continued effort to improve the local school unit. Some of the more prominent efforts are: the enlargement of the taxable, administrative and attendance unit; the provision of opportunities for
vocational exploration; an adequate supply of fully credentialled teaching personnel; and the development of a more functional curriculum closer to the rural people.

2. The Kern County Schools should continue to operate their mobile shop program until there is no longer a need for its service.

3. The mobile shop program is recommended to those rural areas in which the itinerant instructor can best serve the needs of rural education.

4. Evaluation studies should be made by counties or communities that operate similar programs to determine the status of their programs.

5. Continued evaluation studies should be made of the mobile shop program of Kern County to determine how the program can be made more effective and to measure that effectiveness. The subsequent evaluations should result in an improved program that would be of greater benefit to the rural youth.
Figure I. Mobile Shop Unit
Figure II. Mobile Shop Unit
BIBLIOGRAPHY

   This article stresses that the school and community can work together for the educational and social benefit of all.

   Rural education must be developed so that rural people have comparable vocational, social, and cultural opportunities.

   An outline of what industrial arts can do for education in California.

   Statistics show that of the school age children in the United States, nearly one-half are of a rural population.

   A summarization of the crucial issues in rural education in list form.

   A philosophical discussion of education as he sees it.
A short description of the Kern County mobile shop program and of the trailer used and its machines.

A handbook that is geared to the elementary level with suggestions for the classroom teacher.

A textbook on the uses of statistical measurements.

He advocates the need and application of industrial arts in rural schools.

A textbook written for the teacher to use in his teaching to evaluate his program and his pupils.

A summary of the proceedings, findings, and recommendations of the conference.

A textbook expanding the philosophy of multiple activities in a single shop under a single teacher.
   An outline of industrial arts in grades seven, eight, and nine.

   This book is addressed to those who are interested in the idea of making a living in the country.

   As an educational field, industrial arts makes its contribution to the pupil's development.

   This article describes the physical setup of the Santa Clara County mobile unit and its method of operation.

   A series of tables of the predicted population for the various segments of the population of the United States.

   He advocates that the rural schools also have manual training.
   He discusses the use of itinerant teachers for special subjects in the rural schools.

   A textbook expanding the philosophy of industrial arts in its relationship to the total education of the child.

   She stresses that there must be educational equality for the rural pupils of America.
MOBILE SHOP

NAME __________________ AGE ______

SCHOOL __________________ GRADE ______

TRUE - FALSE ITEMS

Some of the following statements are true and some are false. If the statement is true place a plus (+) in the blank space at the left. If the statement is false place a zero (0) in the space. The first item is answered as an example.

+ 1. A jack plane is longer than a block plane.

_ 2. The top view in an orthographic drawing is placed directly above the front view.

2. Hidden lines in a drawing are shown by broken lines.

3. A coping saw is used to cut curves in thin stock.

4. Plywood is made by gluing several layers of veneer into sheets which has wood running cross-wise in every other layer.

5. Eight (8) penny nails are larger than ten (10) penny nails.

6. There are two board-feet in a piece of lumber that is 1 inch x 6 inches x 24 inches.

7. One of the advantages of the electrostatic process of abrasive coating is that the abrasive will cut faster.

8. When the belt is on the smallest step of the motor pulley, the lathe will run at its highest speed.
9. The gouge should never be used when hollowing a bowl that is being turned on the wood lathe.

10. The face plate is used when doing spindle turning on the wood lathe.

11. The tin snips may be used to cut copper as well as other sheet metals.

12. Iron is taken from the mines as a pure metal.

13. The heat is applied to the back side of the joint being soldered.

14. The reason for using flux when soldering is to keep the metal clean.

15. When grinding on a small piece of metal, a rag may be used to keep the metal from burning your fingers.

16. Plastics can be cut with almost any type of saw that will cut wood or metal.

17. The buffing wheel should turn toward the operator.

18. Acrylic plastics cannot be reshaped by heating them.

19. A uniform heat is very important in heating plastic to be formed.

20. Since plastic cools rapidly, it must be formed quickly.

MULTIPLE CHOICE ITEMS

DIRECTIONS: Each of the questions or incomplete statements listed below is followed by several words, phrases, or a series of numbers. From these, you are to choose the one which answers the question or completes the statement correctly. Place the letter of that word,
number, or phrase (A, B, C, D, E) in the numbered blank space at the left of the item. The first item is answered as an example to follow.

D X An auger bit that bores a 1/2" hole is stamped with what number?

A. 2
B. 4
C. 6
D. 8
E. 10

21. In the process of planning a project, four of the five following procedures are necessary. Which one does not belong here?

A. Make a rough sketch.
B. Make a scale model.
C. Determine the use of the project.
D. Determine the overall dimensions.
E. Make a working drawing.

22. Orthographic drawings normally have ______.

A. One view
B. Two views
C. Three views
D. Four views
E. Five views

23. One board foot is a piece of lumber that measures ______.

A. 1 ft. x 1 ft. x 1 ft.
B. 12 inches x 12 inches.
C. 1 inch x 1 ft. x 1 ft.
D. 12 inches x 12 inches x 12 inches.

24. What tool should be used to lay out chamfers?

A. Steel tape
B. Framing square
C. Dividers
D. Marking gauge
25. The main use of the try square is to •
   A. Lay out 45° angles
   B. Lay out 90° angles
   C. Lay out 60° angles
   D. Drive nails
   E. Open paint cans

26. Which of the following saws is used to cut along the grain of the wood?
   A. Hack saw
   B. Back saw
   C. Rip Saw
   D. Crosscut saw
   E. Dovetail saw

27. The cutting action of the teeth of a crosscut saw may be likened to the cutting action of a •
   A. Knife blade
   B. Chisel
   C. Plane iron
   D. Scraper

28. The correct size of the screwdriver blade to be used is determined by •
   A. The width of the screw head
   B. The depth of the screw slot
   C. The shape of the screw head
   D. The length of the screw
   E. The kind of material

29. When cutting stock to dimension, the saw kerf must be •
   A. Directly on the line
   B. In the waste stock
   C. Inside the line
   D. None of these
30. An auger bit that has the number six (6) stamped on it bores a _____ hole.

A. 1/2"
B. 5/8"
C. 3/8"
D. 6/8"
E. 6/32"

31. To plane end grain of narrow pieces, which plane should be used?

A. Jack plane
B. Block plane
C. Router plane
D. Jointer plane
E. Edge plane

32. In making a carpenter's tool box, which plane should be used to plane the edges?

A. Block plane
B. Jointer plane
C. Circle plane
D. Router plane
E. Jack plane

33. The tool most commonly used for driving or pulling nails is the _____.

A. Ball peen hammer
B. Cross peen hammer
C. Claw hammer
D. Shop hammer
E. Mallet

34. A finishing nail is driven below the surface of a board with a _____.

A. Nail set
B. Awl
C. Nail punch
D. Center punch
E. Countersink
35. Where nails are set below the surface of the wood, the holes need to be filled with _____.

A. Stain
B. Paint
C. Varnish
D. Filler
E. Lacquer

36. Which of these grades of sandpaper should be used for the final sanding before applying a finish?

A. #2 grit
B. #1 grit
C. #1/2 grit
D. #1/0 grit
E. #2/0 grit

37. After a stain is applied, the dark scratches that are discovered running across the grain of the wood are probably the result of _____.

A. Too course a sandpaper
B. Too much stain
C. Failure to wipe off excess stain
D. Sanding across the grain
E. Sanding with the grain

38. Which of the following is not an important reason for applying a finish on wood?

A. Improving appearance
B. Protection against moisture
C. Emphasizing the grain
D. Strengthening the wood
E. Protection against scratching

39. A tool used by sheet metal workers in laying out work on the metal is called _____.

A. Scratch-awl
B. Pencil
C. Compass
D. Hack saw
40. A hand drill is usually used to turn _____.

A. An auger bit  
B. A twist drill  
C. An auger drill  
D. An expansive bit  
E. A drill bit

41. After locating accurately the centers where the holes are to be drilled in steel, it is next necessary to _____.

A. Sharpen the drill  
B. Use the center punch  
C. Use cutting oil  
D. Use pressure on the drill  
E. Use the prick punch

42. In using taps and dies to cut threads, four of the following processes are involved. Which one does not belong here?

A. Proper size  
B. Proper type of thread  
C. Use cutting oil  
D. Tap with a mallet to start  
E. Remove the chips.

43. When using a mill file it is important that the cutting be done on the _____.

A. Return stroke only  
B. Return and forward strokes  
C. Forward stroke only

44. The proper method to clean a file is to _____.

A. Hammer it against something  
B. Brush it with a file card  
C. Heat it in a fire  
D. Leave it for the tool foreman to clean.

45. When using the hack saw the downward pressure should be applied on the _____.

A. Forward stroke  
B. Return stroke  
C. Both the forward and the return strokes
46. The process of coating the soldering copper tip is known as ______.
   A. Oxidizing  
   B. Plating  
   C. Polishing  
   D. Tinning  
   E. Firing  

47. You are making a sheet metal tool tray. One method used to strengthen the edges is a ______.
   A. Soldered joint  
   B. Folded hem  
   C. Riveted joint  
   D. Crimped edge  

48. A method of fastening two pieces of metal together by using another kind of metal is called ______.
   A. Hemming  
   B. Grooved seam  
   C. Soldering  
   D. Wire bead  
   E. Welding  

49. Sheet metal is commonly cut with ______.
   A. Metal scissors  
   B. Tin snips  
   C. Hack saw  
   D. Metal cutters  
   E. Diagonal pliers

Measure each of the following lines and choose the correct answer from the list below.

50. ______
51. ______
52. ______

   A. 1-1/2"  
   B. 1-3/4"  
   C. 2-1/4"  
   D. 2-3/4"  
   E. 3-1/2"  
   F. 3-5/8"  
   G. 3-3/4"
53. Plastics are usually fastened together by means of ______.
   A. Rivets
   B. Cements
   C. Woodworking glue
   D. Nails or brads
   E. Solder

54. Which of the following is the best method of cutting the plastic when making a letter knife?
   A. Tin snips
   B. Hot knife
   C. Cold knife
   D. Saw
   E. Cold chisel

55. You are to make a beaten-down ash tray. Which one of the following list is the best metal to use?
   A. Galvanized iron
   B. Solder
   C. Stainless steel
   D. Copper
   E. Cast iron

56. You are to make a copper bowl. Four of the following processes are involved. Which process does not belong?
   A. Raising
   B. Laying out design and cutting blank
   C. Beating down
   D. Annealing
   E. Polishing

DIRECTIONS: Each of the following items has a picture of a tool. Choose the correct name of the tool from the list of names and place the letter of that name in the blank at the left. Then choose from the list of uses the proper use of that tool and place the identifying
numeral in the blank at the left. The first item is answered as an example.

**A** X. Name

A. Block plane  
B. Jack plane  
C. Rabbet plane  
D. Jointer plane

**III Y. Use**

I. Jointing boards  
II. Planing large table tops  
III. Planing end grain on narrow pieces  
IV. Driving nails

**57. Name**

A. Coping saw  
B. Back saw  
C. Crosscut saw  
D. Hack saw  
E. Rip saw

**58. Use**

I. Making wheels from wood  
II. Making wheels from metal  
III. Making a straight cut in wood  
IV. Making a straight cut in metal

**59. Name**

A. Auger bit  
B. Breast drill  
C. Hand drill  
D. Brace  
E. Hole borer

**60. Use**

I. Twist drill  
II. Fluted drill  
III. Auger bit  
IV. Drill bit

**61. Name**

A. Center punch  
B. Awl  
C. Nail punch  
D. Nail set  
E. Reamer
62. Use
   I. Drilling holes in metal
   II. Laying out metal designs
   III. Setting nails
   IV. Enlarging a hole

63. Name
   A. Try square
   B. T square
   C. T bevel
   D. Framing square

64. Use
   I. Marking the sides for a tapered box.
   II. Laying out for holes to be bored.
   III. Laying out mitered joints.
   IV. Finding rafter lengths.

65. Name
   A. Claw hammer
   B. Planishing hammer
   C. Ball peen hammer
   D. Sledge hammer

66. Use
   I. Wood
   II. Metal
   III. Concrete
   IV. Plastic
   V. Plaster

COMPLETION ITEMS

DIRECTIONS: Each of the following statements has a blank in it and you are to supply the missing word. Write your word in the large blank at the left of the item. The first item is correctly answered as an example.

Galvanized Z. Sheet steel coated with zinc is called _______ iron.

67. Write the dimensions of the piece of
68. Always lay the plane on its ___ when it is adjusted for use.

69. Lumber is cut by handsaw along the grain with a ___.

70. Small round wooden pins used in gluing boards edge to edge are called ___.

71. The drawing instrument that we use to draw circles and curves is called a ___.

Place the name of each of the following types of wood screws in the proper blank:

72. ___

73. ___

74. ___

75. When copper has been hammered, the metal has become ___.

76. When riveting two pieces of metal together the correct hammer to use is the ___.

77. After varnish and paint brushes have been used they should be cleaned in ___.

78. Shellac is thinned with ___.

79. The process of bending a piece of plastic over a die or form is called ___.
Before heating, all the paper should be removed from the plastic.

MATCHING ITEMS

DIRECTIONS: Listed in the two columns below are common tools and some of their uses. Place in the blank at the left the letter of the use that is most closely associated with the tool. The first item is answered as an example.

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<tbody>
<tr>
<td>C</td>
<td>W. Router plane</td>
<td>A. Large holes</td>
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<tr>
<td></td>
<td>81. Claw hammer</td>
<td>B. Auger bit</td>
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<td>82. Burnisher</td>
<td>C. Dadoes</td>
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<td></td>
<td>83. Brace</td>
<td>D. Nails</td>
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<td>84. Compass</td>
<td>E. Small holes</td>
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<td>85. Hand Drill</td>
<td>F. Wood chisel</td>
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<td>86. Expansive Bit</td>
<td>G. Flathead screws</td>
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<td></td>
<td>87. Try square</td>
<td>H. End grain</td>
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<td></td>
<td>88. Mallet</td>
<td>I. Sharpening hand scraper</td>
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<td>89. Block plane</td>
<td>J. 90° angle</td>
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<td>90. Countersink</td>
<td>K. Circles</td>
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<td></td>
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<td>L. Laying out chamfers</td>
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