AN ABSTRACT OF THE THESIS OF

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(Name) (Degree) (Major)

Date Thesis presented July 29, 1936

Title "Correlation of Farm Mechanics and Industrial Arts in California," with reference to teacher-training and application in the secondary schools.

Redacted for privacy

Abstract Approved: _____
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Purpose of Study

The "Correlation of Farm Mechanics and Industrial Arts in California", with reference to teacher-training and application in the secondary schools, was attempted in this study by the writer after teaching experience in both fields of work. There is a certain amount of friction between advocates of these two programs resulting in a loss of efficiency of the secondary school in 1) Inadequate teacher-training for farm mechanics teachers; 2) Failure to successfully integrate the vocational and non-vocational programs as a part of the educational system of the school.

Introduction of Subject

A. Purpose and Scope of Farm Mechanics

Farm mechanics is that phase of instruction in Vocational Agriculture which deals with the operation and maintenance of farm implements and machinery, together with such construction and repairs of appliances and buildings as can be done economically by the farmer. It is not the function of farm mechanics to train craftsmen, such as plumbers, carpenters, auto mechanics, etc., but rather to train boys in various kinds of mechanical work which they will need to use on the farm.

B. Characteristics of Farm Mechanics

1. It is a part of Vocational Agriculture.

2. It is usually taught by the agricultural science teacher, who has had little or no preparation for teaching a "shop" subject.

3. It is partially financed by Federal funds, under the Smith-Hughes act, and is designed to meet "The needs of boys over 14 years of age who have entered upon, or preparing to enter upon the work of the farm."

4. It is often taught in the "industrial arts" shop, and its first teachers were recruited from the ranks of that group.

5. The agricultural science teacher has the "philosophy" of the farm shop, but often lacks the skill and techniques necessary for successful shop teaching.

C. Purpose and Scope of Industrial Arts

Industrial arts is one of the "practical arts" a form of general, or non-vocational education, which provides learners with experiences, understandings, and appreciations of materials, tools, processes, products, and of the vocational conditions and requirements incident generally to the manufacturing and mechanical industries.

D. Characteristics of Industrial Arts Education

1. It is a part of general education.

2. It is taught by a "shop" trained teacher who has spent four years in college preparing specifically for shop teaching.

3. It is financed by local and state funds and local conditions have a great influence in determining its "course of study."

4. The industrial arts teacher possesses the shop skills and techniques, but often lacks the philosophy of vocational agriculture.

5. Industrial arts teachers with a "farm" background and a selected course of study in an industrial arts teacher training department, including courses in the

methods and philosophy of farm mechanics will make a farm mechanics instructor superior to one trained in the field of agricultural science alone.

Method of Procedure

In order to secure first-hand information of what was being taught in the farm mechanics classes, a questionnaire was prepared and sent to the one hundred forty farm mechanics departments in the state of California. Of this number there were 93 satisfactory returns. The voluntary letters accompanying the returned questionnaires indicated a very favorable reception reflecting the interest the teachers displayed in the problem.

The "guiding principles" in preparing the questionnaire, were to seek the following information:

1) Who teaches farm mechanics in California?

2) What is the college training of the farm mechanics teacher in regard to "major subjects"?

3) What are the current practices and policies in farm mechanics shops that indicate a similarity to industrial arts?

4) Is there any logical reason why an adequately trained industrial arts teacher, cannot also successfully teach farm mechanics, and vice versa?

5) Are not most farm mechanics shops a "general shop" with a rural adaptation?

Some Conclusions and Implications

1) Over half (54%) of the farm mechanics teachers in the state of California had presented college majors in agriculture and its related subjects.

2) Comparing the college major subjects of those teachers who presented industrial arts major in college (22.1%) with those who presented agricultural engineering majors (9.5%), the only "shop fields" mentioned, gives a total of (32.3%) or less than one-third of the teachers of farm mechanics. In other words less than one-third of the farm mechanics teachers presented majors that would adequately prepare them for farm mechanics teaching.

3) The farm mechanics teachers in the state devote most of their time (58%) to the teaching of shop subjects (farm mechanics and general shop courses) -- the field in which they have had the least preparation, as a group.

4) "General shop" courses are taught in 61 out of a possible 93 farm mechanics shops in California. This leads the writer to believe that complete correlation could be effected by requiring farm mechanics instructors to present professional training in the technique and methods of industrial arts, plus teacher-training courses in the methods and philosophy of farm mechanics.

5) The program of the agricultural science teacher has not, in the past, embraced sufficient experience in farm shop work to develop a well trained farm mechanics teacher; nor does it seem likely that it will in the future.

6) The increasing complexity of farm mechanics work, due to new inventions in farm equipment, increased use of power on the farm, specialized equipment and new methods in agriculture, indicates the farm boy of today needs a broader scope of training in his farm mechanics work than was necessary a few years ago.

7) There is a distinct shortage of trained farm mechanics teachers in California, brought about by curtailment of the training of industrial arts teachers and the substitution of teachers trained in agricultural science, with only a few electives in the farm shop.

8) The complete correlation of industrial arts and farm mechanics is dependent upon the certification of teachers trained in the methods, objectives, and techniques of <u>both</u> industrial arts and farm mechanics.

CORRELATION OF FARM MECHANICS AND INDUSTRIAL ARTS IN CALIFORNIA

with reference to teacher-training and application in the secondary schools

by

Clarence David Jensen

A THESIS

submitted to the

OREGON STATE AGRICULTURAL COLLEGE

in partial fulfillment of
the requirements for the
degree of

MASTER OF SCIENCE

July 1936

APPROVED:

Redacted for privacy

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ACKNOWLEDGEMENT

The writer wishes to express his sincere appreciation to the teachers of Farm Mechanics in the State of California, for their cooperation in furnishing data for this study, and to Professor George B. Cox, head of Industrial Arts Education Department, for his many helpful suggestions and critical reading of the manuscript.

C. D. J.

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PREFACE

This problem was conceived by the writer after having spent some time in the fields of study concerned -- Industrial Arts and Smith-Hughes Farm Mechanics. From experiences in the two fields of work, and from contacts with other teachers and supervisors of industrial arts and farm mechanics, the writer has observed a certain amount of friction between advocates of these two programs as they are conducted in the secondary schools of the State of California. Believing that friction should not exist between the two, this thesis is presented in an attempt to show that farm mechanics and industrial arts can be correlated in application, in the classroom or shop and in the teacher-training program.

The differences in principles involved between these two phases of work in the secondary schools are:

1) Industrial arts is a form of general or non-vocational education, which provides learners with experiences, understandings, and appreciations of materials, tools, processes, products, and of the vocational conditions and requirements

incident generally to the manufacturing and mechanical industries.

2) Farm mechanics is that phase of instruction in vocational agriculture which deals with the operation and maintenance of farm implements and machinery, together with such construction and repairs of appliances and buildings as can be done economically by the farmer.

This study traces the growth of these two phases of secondary education from very meager beginnings to places of prominence in the educational system. Bulletins of the Federal Board for Vocational Education furnished the background information in tracing the farm mechanics movement, while "Standards of Attainment in Industrial Arts Teaching" a publication of the American Vocational Association, was the authority in the case of the industrial arts program.

Delimitation of Subject and Definition of Terms

1. Delimitation of Subject

It is not the intention of the writer to infer that all industrial arts teachers as they are now prepared in colleges should be certificated to teach farm mechanics in approved Smith-Hughes farm shop classes. It is the belief of the author however that:

1) Students with more extended training programs in shop work and the professional subject-matter

related thereto will make stronger farm mechanics teachers than the students of a technical agriculture program whose science and agriculture requirements are so great as to allow only a very limited program of training in the technique and professional methods of shop work.

2) Certificates for farm mechanics instructors should be based upon

   a) Practical farm background (farm bred and reared) with experience in farm construction, machinery repair and maintenance.

   b) An adequate technical and professional training in shop work of the several types used in a farm shop.

3) Generally speaking a more adequate technical and professional training in shop work can be had through a well-organized course in industrial arts education than through a technical agriculture program with farm mechanics as a minor.

2. Farm Mechanics, Agricultural Mechanics and Farm Shop

These three terms are used interchangeably throughout various sections of the United States when referring to the mechanics of agriculture. In California the terms "Agricultural Mechanics" and "Farm Mechanics" are used synonomously throughout the state. Mr. Julian A. McPhee,

Chief, Bureau of Agricultural Education, had this to say on the subject: "At one time there was a Farm Mechanics Association in this state, but it existed only about two years. At that time the group asked to have the name changed from Farm Mechanics to Agricultural Mechanics. That is why this term is used by so many of the teachers. This office uses both terms, but on all the credentials we usually put Farm Mechanics rather than Agricultural Mechanics. I do not believe there is a great deal of difference."

The report of the Committee on the Preparation of Farm Shop Teachers, at the Louisville, Kentucky, meeting of the American Vocational Association (1926), made this recommendation in regard to terminology: "That in order to avoid confusion and misunderstanding the use of the term 'Farm Shop' as relating to vocational agriculture be discontinued, and the more inclusive term 'Farm Mechanics' be used instead."

In keeping with the American Vocational Association ruling, and the practice of certification in the state of California, the term "Farm Mechanics" will be used throughout this thesis. It is the belief of the writer that this term is the most widely used and understood in referring to the mechanics of vocational agriculture.

PART I

INTRODUCTION

1. Reasons for the Study of the Problem

The reasons for the study of this problem, "The Correlation of Industrial Arts and Smith-Hughes Farm Mechanics in the Secondary Schools of California," are both social and economic in scope. The efficiency of the vocational program in the smaller schools and in agricultural communities is dependent upon the successful solution of this problem. The benefits that would be derived from the harmonious settlement of this problem as they appear to the writer would be as follows:

1) To successfully integrate the vocational and non-vocational programs of work in the secondary school.
2) To prepare better farm mechanics teachers in the future than have been prepared in the past.
3) To improve instruction in agriculture in the secondary schools with a program that meets the needs of the students.

4) To remove duplication of teacher-training programs in the various colleges and universities of the state of California.

5) To provide a greater number of qualified teachers for farm mechanics positions in the state of California.

6) To evolve a teacher-training program acceptable to both farm mechanics and industrial arts supervisors and directors will remove friction and ultimately lead to a teacher better prepared to handle both fields of work.

2. Method of Procedure

In pursuing this study the author has attempted to trace the growth and development of these two programs in a scientific way. The aims, philosophy and outcomes of both programs have been traced to determine similarities and differences, in order that these differences may be analyzed in the light of probably correlation of the two fields of work. A wealth of material was obtainable in the field of industrial arts from books, magazines, conferences and recongized authorities on the subject. In the case of the farm mechanics program, except for a limited amount of bulletins from the Federal Board for Vocational Education and a few books on the subject, it was necessary to go

directly to the field in the form of a questionnaire to secure adequate material.

In surveying the farm mechanics shops in the state of California, a questionnaire and letter of transmittal was prepared and sent to each of the one-hundred-forty agricultural departments in the state. Questionnaires were sent only to those teachers and schools whose programs embraced farm mechanics, as indicated by the personnel list of the Department of Agricultural Education, San Luis Obispo.

Returns were received from one hundred of the one-hundred-forty questionnaires sent out. Of this number, seven were discarded, because, contrary to the personnel list, the teachers concerned were not teaching farm mechanics. The state-wide distribution of the schools responding to the questionnaire is shown on the map - Appendix I. The remaining ninety-three questionnaires returned by the farm mechanics teachers formed the basis of the study and the implications derived.

The tabulated results of the ninety-three questionnaires and the names of the schools participating in the survey appear in the form of a master chart in Appendix II.

The interest displayed by the various teachers through out the state was apparent by the number of personal letters commending the writer on the value of such a survey.

Such passages as the following give an indication of the interest displayed by the teachers of farm mechanics throughout the state.

> "I am more than glad to be of some help in making this survey and would appreciate receiving a copy of the results."

and

> "I would like to hear the questions that you have listed discussed some time by a group of people that teach farm mechanics and general shop."

In view of the results obtained and the cooperation extended by all interested parties, the author has outlined a suggested course of study for the preparation of farm mechanics teachers, which appears as a part of this study.

PART II

HISTORICAL BACKGROUND OF GROWTH OF PROGRAMS IN CALIFORNIA IN LIGHT OF PRESENT STATUS OF INDUSTRIAL ARTS AND FARM MECHANICS

1. Growth and Development of Industrial Arts and Farm Mechanics in the State of California

The growth of farm mechanics and industrial arts in the schools of California has been a steady one during the past ten years. This increased growth and development has been merited in no small part by the constant work and efforts of supervisors, principals and teachers to develop some type of shop activity which would appeal to the growing farm boy. The alarming rate at which boys in the agricultural regions of the state were leaving the schools and the farms was sufficient evidence that the schools were not giving the type of training necessary to interest and prepare farm boys for the vocation of farming.

That the type of school work in the rural areas should be of such nature as to benefit the farm boy is only logical, but it remained for agriculture and farm mechanics to really develop a program of work in the secondary schools which would reflect the agricultural interests of the rural communities and fit the future

farmers of tomorrow with those skills, habits and processes necessary to prepare them for the vocation of farming. The "farm shop" and farm mechanics became an integral part of this program, often giving vividness and expression to the agricultural science and other phases of the farm program.

Industrial arts teachers have had a prominent part in developing the farm mechanics program. They were the logical individuals to give instruction in farm shop work because they were already trained in shop technique when agriculture was added to the curriculum. The background for these early farm mechanics positions was, for the most part, a woodworking teacher who had had some experience in the carpentry trade, or who had studied in an industrial school or college.

Farm mechanics is, comparatively speaking, a new program and was not widely known until the enactment of the Smith-Hughes law in 1917. Industrial arts is a subject of much longer standing. But in the state of California "manual training," the predecessor of industrial arts, had not made the growth in the rural areas that it had in the towns and cities. This was due for the most part to the lack of funds available for such a program. Many administrators were still skeptical of "shop work" and regarded it with some skepticism as a course for high school graduation.

With the coming of qualified teachers through the growth of industrial arts departments in the teachers colleges of the state, industrial arts in the high schools became increasingly popular. The new teacher was qualified not alone in woodwork as the manual training teacher had been, but could offer sheet metal, forging, machine shop, mechanical drawing and related subjects. When this teacher could also teach farm mechanics and thereby qualify for the reimbursement of a part of his salary from Federal and State funds, this type of work came into the reach of the rural school.

To aid in this development several teachers colleges in the state inaugurated teacher-training courses in farm mechanics along with industrial arts. These were San Jose State College, Chico State College, and Santa Barbara State College. At any of these institutions a prospective teacher could qualify for a Farm Mechanics Credential along with his Industrial Arts Credential by taking additional courses in "farm shop" and perhaps a course in the rural education department.

A bulletin[1] from the Santa Barbara State Teachers College, for the year 1926-27, gives the following requirements for the Farm Mechanics Credential.

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[1] Santa Barbara State Teachers College. Announcement of Courses. Published by California State Printing Office, Sacramento, California. 1926-27. Page 22.

D. Work Leading to Special Credential for Teaching Farm Mechanics

By taking a course of 10 units in Farm Mechanics approved by the State Supervisor of Agricultural Education, students who have completed 40 units of required technical work will receive, in addition to Occupations and Home Mechanics, a special credential in Farm Mechanics entitling them to teach Farm Mechanics in classes in Vocational Agriculture organized under Federal and State Vocational acts.

San Jose State Teachers College[2] also gave work leading to a Farm Mechanics Credential. Examination of the Circular of Information from that college for the year 1927-28 revealed the following:

Farm Mechanics Credential

Students who wish to receive the Farm Mechanics Credential are required to complete the following courses:

138 Farm Marketing
139 Pumps and Irrigation
140 Tractors
141 Organization and Teaching of Farm Mechanics

Until 1930 the bulk of the teacher-training work in farm mechanics and industrial arts was done at the three aforesaid teachers colleges. San Jose pioneered the field and this statement may be noted regarding the subject in the circular of information of 1929-30.[3]

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[2] San Jose State Teachers College. Circular of Information. Published by California State Printing Office, Sacramento, Calif. 1928-29. Pages 98 and 101.

> The Department of Industrial Education has been training students for Industrial Teaching for 17 years, having been established in 1911 as a special Manual Arts Department and as a branch of the San Jose Normal School.
>
> Changes and advancement took place until 1925 the present organization was perfected. At that time the State Board of Education granted authority to grant the Degree in Industrial Education with Special Elementary and Secondary Certification.

Further growth of the industrial arts departments of the various teachers colleges, always with enriched opportunities for the training of farm mechanics teachers as well, is attested by the increased number of courses and the instructors employed. In 1924 there were offered in the Industrial Education Department of the San Jose Teachers College eighteen courses. By 1930 this number had grown to thirty-four courses. In the Chico State Teachers College in 1925 there were but two instructors. In 1930 there were four full-time instructors.

So it was that farm mechanics and industrial arts grew up side by side, with teacher-training given for both subjects in the same college and often by the same staff of instructors. Application in the field was often from the same shop by the same instructor.

2. Apparent Cause of the Differences in Opinions Which Led to the Breach between Farm Mechanics and Industrial Arts

Until the spring of 1930 things went along in much the same way as for the previous ten years, with farm mechanics taught in the industrial arts shops of the high schools by industrial arts instructors specially trained and certificated for that purpose. Then came the presentation of a new State Plan by the Director of Vocational Agriculture of the State of California. Very definite objectives were set up and incorporated in that Plan. The effect that it had on farm mechanics was to:

1) Require a technical agriculture graduate to teach farm mechanics.
2) Remove the teacher-training program for agriculture and farm mechanics from the College of Agriculture at Davis to the California Polytechnic School at San Luis Obispo.
3) Discontinue the former policy of certifying industrial arts teachers to teach farm mechanics.

The reasons set forth by the supervisors and the Director of Agriculture were as follows:

1) Farm Mechanics was a distinct part of agriculture, and was not in the future to be labeled a "shop" program.
2) Farm mechanics in the past was not successful

because industrial arts teachers failed to relate their program of work with the agricultural activities of the community.

3) Industrial arts teachers were not qualified to teach farm machinery repair, an important part of farm mechanics.

4) Industrial arts teachers taught too many time-consuming "exercises" which did not fit the boy to do those jobs on the farm that successful farmers were doing.

5) Industrial arts teachers completely overlooked the establishment of a "farm shop on every farm", a distinct part of farm mechanics.

6) Industrial arts teachers spent too much time teaching tool processes without consideration of the boy's agricultural project.

7) Industrial arts teachers in general completely overlooked the distinct vocational aspect of the farm shop, and taught it purely on an "appreciation basis."

The effect upon teacher-training of the inauguration of this new State Plan for Agricultural Education was soon felt throughout the state. College graduates with majors in industrial arts were no longer chosen to teach farm mechanics. If these graduates desired to teach farm mechanics, they must go to San Luis Obispo and take a

full year of advanced work, spending half a year at the Polytechnic School studying agriculture, and the other half of the year in the field as a cadet, under the Supervisor of Teacher-Training from the Polytechnic School at San Luis Obispo. New jobs pertaining to farm mechanics were immediately filled with agriculture teachers. Many schools throughout the state formerly staffed with a teacher of agricultural science and another in farm mechanics, found their new staffs included two agricultural science teachers, each teaching his own farm mechanics classes.

A new organization, the Future Farmers of America, immediately came into being with its headquarters at the Polytechnic School in San Luis Obispo. This movement was in conjunction with a national youth organization of Future Farmers, to interest the young boy of rural background in continuing his agricultural education from the 4-H club of the grade schools, to the Future Farmers of America in the high schools.

The new State Plan for Agricultural Education was also far-reaching in the field of agricultural science. New teachers graduating from the College of Agriculture at Davis, or coming from recognized institutions out-of-state, were sent to San Luis Obispo for a one-year period of training. Here their knowledge of technical agriculture was increased by studying under specialists in the

branches of agriculture. Theory courses on Farm Marketing and the California Plan for Vocational Agriculture were also stressed. When the student became a cadet during his last half year he was sent to a high school in the state to do his practice teaching under a full-time agriculture instructor.

The institution at San Luis Obispo had originally been set-up as a Polytechnic School for boys and girls to prepare for entering agriculture, home making, or mechanics. In describing the institution at its founding, Dr. True said:[4]

> The California Polytechnic School, located in San Luis Obispo was opened October 1, 1903. It is a state institution established under an act of the legislature of March 8, 1901, to take effect January 1, 1903 to "Furnish young people of both sexes, mental and manual training in the arts and sciences, including Agriculture, Mechanics, Engineering, Business Methods, Domestic Economy and such branches as will fit the student for the non-professional walks of life.

The attendance at this school had fallen off very badly until by 1930 the building had fallen into ruin through lack of a state appropriation to adequately maintain the Polytechnic School. There were some people in the State Department of Education who were in favor of

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[4] True, A. C., and Crosby, Dick J. The American System of Agricultural Education. U. S. Department of Agriculture Office of Experiment Station, Washington, D. C. 1904. Page 17.

closing the school entirely, and such would have happened had not the Department of Agricultural Education, through its Chief, Mr. Julian A. McPhee, offered to take over the whole plant and make it into a graduate school for Future Farmers of America, boys who were taking courses in vocational agriculture in the high schools of the state of California.

The offer of the Department of Agricultural Education was accepted, a new appropriation came into being and California Polytechnic School began on a new basis. This time however its use was reserved for boys. The mechanic arts were continued and aeronautics received the most attention. It has continued to function as a ground school for boys interested in aviation.

New buildings were erected to house the influx of new students to California Polytechnic. New barns and corrals were built to take care of additional livestock. Experimental plots were laid out and a corps of new instructors were hired on their ability to teach vocational agriculture. Practical men were here given choice -- men specialized in various fields of agriculture who could teach these boys, the high school members of the Future Farmers of America, to go out on the farms in their respective communities as accomplished farmers. The whole outlook was "practical vocational agriculture" rather than college training for degrees or teaching requirements.

PART III

AN EVALUATION OF OBJECTIVES, PHILOSOPHY AND OUTCOMES OF FARM MECHANICS AND INDUSTRIAL ARTS EDUCATION

1. Objectives, Philosophy and Outcomes of Industrial Arts Education

The term "industrial arts" has in the last few years come to replace the older term "manual training" by which term it was generally known in the United States since its introduction from Russia in 1876. The term "manual training" signified manual or "hand" training, and was believed beneficial for training the mind through the training of the hand. It was used principally as a disciplinary form of education and originated in Russia and Sweden, known in the latter country as the "sloyd" system of training.

Industrial arts as the subject is now called has come to mean a great deal more than "hand" training. No longer does the making of a piece of furniture, or a series of exercises in wood jointery constitute the course of study. It is defined by the Western Arts Association in the Terminological Investigation[5] as follows:

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[5] Western Arts Association Bulletin, Vol. 17, No. 2. Published by Western Arts Association, Indianapolis, Ind. March 20, 1933. Page 27.

> Industrial arts is one of the Practical Arts, a form of general or non-vocational education, which provides learners with experiences, understandings, and appreciations of materials, tools, processes, products and of the vocational conditions and requirements incident generally to the manufacturing and mechanical industries.

This signifies that industrial arts has kept pace with the progress of time and developed accordingly in keeping with the needs of the boys in the school systems of the United States. Elementary, junior high and senior high schools find valuable training and recreation for boys of these ages who spend school time under supervision of a competent teacher in the pursuit of industrial arts work.

In the senior high school, wherein this discussion will be limited, industrial arts finds a broad place in workshop activities of many kinds. The materials of industry -- wood, metals, leather, clay, ceramics, and fabrics -- are used to acquaint and instruct the boy in the processes of industry. The objectives of industrial arts in the senior high school have been listed by Warner[6] as follows:

1. General Guidance.
2. Further exploration and avocational opportunities.
3. Vocational preparation for a specific industrial vocation.

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6 Warner, William E. Policies in Industrial Arts Education. Ohio State University Press, Columbus, Ohio. 1928. Page 44.

4. Consumers' or utilizers' knowledges and appreciation of the products of industry.
5. Formation of desirable personal and social habits.
6. Development of a degree of skill with tools and in tool or machine processes commensurate with the ability of the pupil and incidental to the completion of a project or activity which seems to have educational value.

These objectives are in agreement with the objectives of general education. Industrial arts is a part of general education. As such it makes some contributions to general knowledge and through the medium of shopwork, more effectively than can be made through any other subjects of the curriculum.

The above list of objectives is by no means an exhaustive list but it will suffice for this study to show the place of the industrial arts in the secondary schools. And it should be noted that all of these objectives, with the possible exception of numbers 1 and 2, apply equally well to both the farm and the city boy.

The emphasis placed on the several objectives listed by Warner for the high school will vary in accordance with 1) The knowledge of these objectives possessed by the teachers of industrial arts; 2) The efforts made by teachers to attain these objectives. Varying emphasis will warp the objectives to some extent.

The final results will be determined by

a) Locality

b) Interests of students

c) Type of community

d) Available equipment

e) Local application of instruction

The teacher of industrial arts in a rural community should necessarily attempt to teach those skills, habits and desirable outcomes which tend to be reflected in his community and which give the training necessary for the efficient application of the skills and occupations of the community.

The concept that education should be something more than attention given to the mental side of the individual has been voiced since earliest times. That the physical and emotional side of the individual should also be stressed, and outlets provided for these natural energies, is the philosophy of practical education. That these faculties should be developed in man from childhood is advocated by Jacks[7], the English psychologist, in these words:

> Education is a preparation which fits the whole man for his grand vocation as a member of society and as a

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[7] Jacks, L. P. Education of the Whole Man. Harper Bros. New York and London. 1931. Pages 24 - 27.

> citizen of the world -- plans must be laid for vigorous coeducation of mind and body as an inseparable unity in every stage.

This conception of education implies something more than bookwork for the development of the faculties of men. If the hand and the mind are to be educated in unison there must be a distinct place for the subject of industrial arts education in the secondary school.

The purpose of industrial arts is to give direction and guidance to those impulses of youth in a constructive, supervised program that is common to all types of individuals regardless of age, sex, race and intelligence. Those impulses that are common to all people and upon which a part of the philosophy of industrial arts is built have been stated by Bonser[8] as:

1. The Manipulative Impulse
2. The Investigative Impulse
3. The Art Impulse
4. The Social Impulse

The industrial arts program is the place where real life activities are experienced. The boy is able to satisfy the above-named impulses in a way that is mentally stimulating and satisfying. He is not engaged in busybody or make-believe courses, but participating in the activities of the adult in so far as that is practicable.

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[8] Bonser, F. G. Industrial Arts for Public School Administrators. New York Bureau of Publications, Teachers College, Columbia University. 1930. Page 33.

Bawden[9] states the desirable outcomes of the industrial arts program as follows:

> Appreciation of things bought, of good design, of good workmanship, of ability to do useful things, of self-reliance, of orderly method of procedure - these are specific and identifiable adult-life social values which are contributed directly through the industrial arts experiences.

In summing up the philosophy and objectives of industrial arts there are found some desirable contributing factors to the scheme of general education wherein industrial arts contributes some worthwhile knowledge, skills and attitudes not common to other phases of education. These have been listed by the writer as follows:

Specific Contributions of Industrial Arts to Education

1) Gives the boy a man for an instructor.
2) Provides a basis for the appreciation of industrial experiences.
3) Furnishes actual contact with materials, and processes used in industry.
4) Provides opportunity to do the things boys like to do.
5) Gives a sense of achievement in practical things.

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9 Bawden, William T., and Others. Industrial Arts in Modern Education. The Manual Arts Press, Peoria, Ill. 1934. Page 21.

6) Gives an opportunity for creative ability.

7) Offers supervised instruction in the care and use of tools.

8) Makes adjustment for individual differences.

As a final analysis let us examine what requirements are set up by teacher-training institutions for a credential to teach industrial arts in secondary schools. Since this is a study of California conditions, reference will be made to California requirements.[10]

Special Credential in Industrial Arts Education
(Requirements effective July 1, 1935)

An applicant for a special credential in industrial arts must submit:

I. A certificate from a physician licensed to practice medicine and surgery that the applicant is physically and mentally fit to engage in teaching service.

II. A recommendation from the school or department of education of the institution approved by the California State Board of Education for training teachers of industrial arts education, with verification of:

A. The completion of a four-year college course with a bachelor's degree.

B. A minimum of sixteen semester hours of work in the fields of English, science, social studies, and physical education.

C. Fifteen semester hours of professional work in education including:

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10 California State Department of Education Bulletin No. 12 Regulations Governing Granting of Credentials and Certificates for Public School Service in California. California State Printing Office, Sacramento, Calif. 1935. Pages 30 and 31.

1. A course dealing with the aims, scope, and desirable outcomes of the elementary and secondary school.
2. Directed teaching in industrial arts, six semester hours.
3. Methods courses in industrial arts.
4. Other courses in education organized for the training of public school teachers.

D. Forty semester hours of special technical training suited to the needs of teachers of junior and senior high school students distributed approximately as follows:

Basic Technical Requirements	Semester hours
1. Automobile and transportation	3
2. Woodwork	3
3. Drawing	3
4. Electricity and Radio	3
5. Metal Work	3
Total	15
Additional requirements	25

Twenty-five semester hours of shop electives made up of additional courses in the subjects listed in the required group above, or selected from the following or similar subjects:

1. Battery construction and repair
2. Vulcanizing and tire repair
3. Home Mechanics and general shop
4. Forging and Welding
5. Wood finishing and painting
6. Leather work
7. Upholstery and caning
8. Construction work for elementary grades
9. Art metal work
10. Pattern Making and foundry work
11. Pumps and irrigation equipment
12. General shop
13. Printing

Authorization for service. This credential authorizes the holder to teach industrial arts subjects as indicated upon the credential in the public schools of the state.

2. Objectives, Philosophy and Outcomes of Smith-Hughes Farm Mechanics

Farm mechanics is that phase of instruction in vocational agriculture which deals with the operation and maintenance of farm implements and machinery, together with such construction and repairs of appliances and building as can be done economically by the farmer. It is not the function of farm mechanics teachers to train craftsmen such as plumbers, carpenters, auto mechanics, welders, blacksmiths, etc., but to train boys to use those skills, habits and attitudes which they will use in their farm mechanical activities.

To fully understand the objectives of instruction in farm mechanics one must first have an understanding of the objectives of vocational agriculture. Without agriculture, farm mechanics would not exist. Farm mechanics is then the part of agriculture which deals with the appliances of the farm homestead and necessary to the production of agricultural commodities. The farmer's interest in tools, machinery and appliances is first as a necessary means of producing the goods which he raises. The avocational aspect is for the most part secondary. The Federal Board for Vocational Education[11] lists the following objectives for the vocational agricultural program:

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11 Federal Board for Vocational Education, Bulletin No. 153 Training Objectives in Vocational Agriculture. Federal Board for Vocational Education, Washington, D. C. 1923 Page 3.

1. To produce agricultural products efficiently.

2. To market agricultural products economically.

3. To select and purchase suitable farm equipment and supplies.

4. To cooperate intelligently in economic activities.

5. To manage the farm business effectively.

6. To establish and maintain a satisfactory farm home.

7. To perform appropriate economical farm-mechanics activities.

8. To participate in worthy rural civic-social activities.

9. To use scientific knowledge and proceed in a farming occupation.

10. To exercise constructive leadership and to recognize and follow worthy leadership.

11. To grow vocationally.

12. To become successfully established in farming.

These are the general objectives and guiding principles of all vocational agriculture. They will affect the farm mechanics program as they apply to the specific activities of the farm shop. Objectives numbered 3 and 7 apply particularly well in view of the rapidly increasing investments in farm equipment and supplies necessary to operate a modern farm business.

The Federal Board[12] lists these specific objectives as follows:

3. To select and purchase suitable farm equipment and supplies.

   a. Ability to determine farm equipment needs.

   b. Ability to select appropriate farm equipment.

   c. Ability to determine what materials to purchase cooperatively.

   d. Ability to secure necessary supplies economically.

4. To perform appropriate economical farm mechanics activities.

   a. Ability to construct and repair farm appliances.

   b. Ability to order repair parts for farm appliances and machines.

   c. Ability to interpret blue prints and construction drawings.

   d. Ability to operate farm machinery and motors.

   e. Ability to plan farm buildings and select and adapt ready-made plans.

   f. Ability to care for farm machinery and motors.

   g. Ability to assembly farm machinery and motors.

   h. Ability to overhaul and repair farm machinery and motors.

   i. Ability to build and remodel small farm structures.

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[12] Ibid. Page 4.

j. Ability to plan and construct drainage systems.

k. Ability to plan and construct irrigation systems.

l. Ability to plan and construct terracing systems.

m. Ability to care for and repair farm tools.

n. Ability to plan, install, use and maintain an adequate farm shop.

o. Ability to install small electrical systems and devices.

p. Ability to plan and install farm home water and sewage systems.

The abilities listed under this head include many activities which are often overlooked and omitted from the training program. On the other hand, it is not assumed that any individual teacher will attempt to teach all of these abilities. He will be limited in his choice by his training and experience, by the importance of a given job in his locality, and by the pressure of other work.

These learning or teaching units are the ones which are dependent on the farm mechanics department of the agricultural program for fulfillment. Let us now examine the specific objectives of farm mechanics, which are stated by Schmidt[13] as follows:

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[13] Schmidt, G. A., Ross, W. A., and Sharp, M. A. Teaching Farm Shop Work and Farm Mechanics. The Century Co. New York. 1927. Pages 11 and 12.

1. To develop the ability of farm boys to think so that they may be able to solve intelligently the problems which they will encounter in conducting their farm mechanical activities, which ability may be termed mechanical resourcefulness.

2. To develop habits and skills which farm boys will need in order to perform efficiently those farm mechanical activities which they may be called upon to perform.

3. To have farm boys acquire the knowledge, and to develop their ability to use that knowledge, (facts, theory, and principles) which will be useful to them in conducting their farm mechanical activities.

4. To develop in farm boys the right attitude toward all phases of farm mechanics work.

5. To develop the appreciations of farm boys in regard to all farm mechanical activities which a trained farm boy should possess.

6. To stimulate in farm boys the proper ideals in all their farm mechanical activities.

These objectives should govern all farm mechanics work in the secondary school. They will be varied in their application to specific jobs by varying agricultural conditions found in each community, by the background and training of the instructor and finally by the students themselves. Roehl[14] lists the aim of farm mechanics shop as follows:

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[14] Roehl, L. M. A One-Year Course in Farm Shop Work. Industrial Arts Magazine, Vol. XIV, No. 1, Bruce Publishing Co., Milwaukee, Wisc. January, 1925. Page 9.

> The ultimate aim of the farm shop is to have every boy in the course have a shop of some kind at home; to have in that shop the necessary tools to do farm construction and repair work; to have the tools conveniently placed and arranged in the shop; to have each boy know how to get and keep tools in good working order; to see the boys master the tool operations; to have all boys know how to make and read plans of buildings and appliances; to develop sufficient general judgment and skill in the use of tools to do ordinary construction and repair work on the farm.

The philosophy of vocational education must be considered in order to understand the philosophy of farm mechanics. Farm mechanics with its vocational trends, must necessarily be considered as a part of vocational education.

There was a belief on the part of certain interests, namely labor, industry, and agriculture, during the drafting of the Smith-Hughes act that certain types of training for students in the secondary field should be encouraged by providing Federal funds. There was accordingly passed the Smith-Hughes Vocational Educational Act, approved and signed by President Wilson on February 24, 1917. It is permanent legislation and carries annually large amounts of Federal funds for instruction in agriculture, home economics, and trades and industries. Among other things the act states that Vocational Education in Agriculture must:[15]

[15] Federal Board for Vocational Education, Washington, D.C. Policies of Federal Board. Bulletin No. 1, Page 60.

1. Fit for useful employment.

2. Be of less than college grade.

3. Be designed to meet the needs of persons over 14 years of age, who have entered upon or are preparing to enter upon the work of the farm or farm home.

Certain guiding principles of vocational education in the application of fundamental principles are listed below. They are selected from Prosser and Allen, "Vocational Education in a Democracy"[16] and are chosen with special reference to farm mechanics in the vocational agriculture program. They are cited here because they are indispensable in understanding the philosophy of vocational education.

Guiding Principles in Vocational Education

1. Vocational education will be efficient in proportion as the environment in which the learner is trained is a replica of the environment in which he must subsequently work.

2. Effective vocational training can only be given where the training jobs are carried on in the same way with the same operations, the same tools, and the same machines as in the occupation itself.

3. Vocational education will be effective in proportion as it trains the individual directly and specifically in the thinking habits and the manipulative habits required in the occupation itself.

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[16] Prosser, C. A., and Allen, C. R. Vocational Education in a Democracy. The Century Co., New York. 1935. Page 370.

4. Vocational education will be effective in proportion as the instructor has had successful experience in the application of skills and knowledge to the operations and processes he undertakes to teach.

5. The effective establishment of process habits in any learner will be secured in proportion as the training is given on actual jobs and not exercises or pseudo jobs.

As a final analysis it may be well to trace the teacher-training programs as they have been prepared, and to examine the requirements as outlined by the states for certification. As this is a California study, the Department of Education Bulletin No. 12[17] of that state has been used to obtain that information. Copy of the requirements follows:

Special Secondary Credential in Agricultural Education
(Requirements effective July 1, 1935)

An applicant for a vocational credential in agricultural education must submit:

I. A certificate from a physician licensed to practice surgery and medicine, that the applicant is physically and mentally fit to engage in teaching service.

II. Verification of:

A. Graduation from an approved institution with a bachelor of science degree in agriculture.

B. Two years of practical farm experience.

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[17] Op.Cit. 22-23.

C. Fifteen semester hours of approved work in education, including eight semester hours in directed teaching and methods in vocational agriculture.

D. Completion of ten months of cadet teacher training to meet the requirements of the California State Plan for Vocational Education.

Authorization for Service:

This credential authorizes the holder to teach the subjects listed thereon in the public schools of the state.

3. Comparison of Similarities and Differences of the two Programs

I. Industrial arts and farm mechanics are similar in the following respects:

1) They are both a distinct contribution to the secondary school field.

2) They both appeal to the same impulses in the adolescent youth.

3) They are taught in many schools by the same instructor and with the same tools and appliances.

4) They both seek to increase the consumer's or utilizer's knowledge and appreciation of the products of industry.

5) They give the boy an opportunity to participate in adult-life activities, under supervised conditions.

6) They give the boy an opportunity to use his native ability in creation and design.

7) They give a sense of achievement in practical things.

8) They recognize individual differences and do something about them, to adapt the boy to his environment.

9) They stimulate such worth while habits as industry, methodical procedure, care in the use of tools, appreciation of work activities and contribute to the training for better citizenship.

10) They both increase the civic and vocational intelligence of the young worker.

11) They are both a direct contribution to the "seven cardinal principles of education."

II. Industrial arts and farm mechanics are different in the following respects:

1) The purposes of industrial arts are "educationally social" rather than "vocationally economic."

2) Farm mechanics is a part of vocational education, and has a distinct "vocational aspect" not common to industrial arts.

3) The objectives of farm mechanics tend to be

"specific"; the objectives of industrial arts tend to be "general."

4) Farm mechanics is partially financed through Federal funds which leads to Federal regulation of what may be taught and who may teach it.

5) Industrial arts is financed by local and state funds. The course of study is often determined by local policies and certification also covered by "general credentials."

6) Industrial arts teachers are trained in that subject by a four-year college course that leads to professional shop teaching. Forty semester hours of technical shop work is required for an industrial arts credential.

7) Farm mechanics teachers are trained in agricultural science, with but such courses in shop work that is recommended by the teacher-trainer of vocational agriculture, which in the past has not exceeded six semester hours in farm mechanics, to meet California requirements.[18]

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[18] California State Department of Education Bulletin No. H-2 Published by the California State Printing Office, Revised Edition, 1930. Page 31.

Further evidence that the agricultural science teacher has little or no training for farm mechanics work was found in a study made of the vocational high schools in Kansas[19] and is significant to show what is being done in other states.

> A survey of the college transcripts of 66 teachers of Vocational Agriculture in a half-dozen mid-western states indicates that upon graduation, each teacher had an average of less than 5 semester hours of the possible 26 in farm mechanics and farm engineering courses. Eight of the 66 had no credits in such subjects while 10 had three hours or less..... In view of the number and complexity of farm mechanics and engineering problems common to modern agriculture, it would not seem unreasonable for any agricultural curricula to require at least 18 semester hours of work in the field of farm mechanics.

This situation is parallel in practically every state in the union. Since the training in farm mechanics for agricultural teachers has been, and still is, inadequate, due to the necessity of majoring in agricultural science subjects, it seems advisable to leave that subject to a competent shop instructor. A selected course of study in an industrial arts department for selected students, plus training in methods of vocational agriculture, and philosophy of vocational education would in the opinion of the writer prepare better farm mechanics in the future than have been prepared in the past.

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[19] Pollom, Lester B. A Study of Farm Mechanics Courses in Vocational Agricultural High Schools in Kansas. Kansas State Board for Vocational Education. Bulletin A-3, Page 11.

PART IV

AN EVALUATION OF THE QUESTIONNAIRE SURVEY OF THE PROFESSIONAL PREPARATION OF TEACHERS, PHYSICAL PLANT, AND METHODS EMPLOYED IN FARM MECHANICS SHOPS

In preparing the questionnaire and letter of transmittal, a copy of which is included on the following pages, an attempt was made by the writer to:

1) Ask questions and make statements on the letter of transmittal that would tend to arouse a "participating interest" in the problem.
2) Refrain from asking for information that would tend to embarrass the teacher, who could then not respond favorably.
3) Set up the mechanics of the questionnaire so as to secure the maximum of information, from the minimum of writing.
4) Confine the questionnaire to relevant points.

The questionnaire was designed to gather information in the following major.

1) What is the college preparation of the farm mechanics teachers in the state of California?
2) What were the major subjects in the college training of the farm mechanics teachers?

3) What percentage of their time do the farm mechanics teachers devote to farm mechanics, general shop and agricultural science, in those cases where the program includes all three?

4) What percentage of the farm mechanics shops are used to teach "general shop" classes as well?

5) What equipment in the various farm mechanics shops belong particularly to the subject of farm mechanics? Which belong to the subject of "general shop", and which tools are common to both shops?

6) What objectives are considered important by the teachers in the state, in determining courses of study for farm mechanics students?

7) To what extent is industrial arts, through its "general shop" program, recognized by the teachers of the state as a prerequisite for farm mechanics?

8) What correlation now exists between farm mechanics and industrial arts, as determined by certain "key" questions relative to projects and policies in farm mechanics?

9) To what extent are power tools being used in farm mechanics shops, and how can such practice be justified?

HAWTHORNE
URAL SCIENCE

CLARENCE JENSEN
AGRICULTURAL MECHANICS

Agricultural Department
East Nicolaus High School
East Nicolaus, California

Mr. John Doe
Farm Mechanics Instructor
High School
-------, California

Dear Mr. Doe:

We in the field of Vocational Agriculture are often called upon to teach classes in "general shop" in addition to those in farm mechanics. I realize that there are in this state two distinct groups of teachers giving instruction in farm mechanics; one group consists of those trained in the field of Industrial Arts (or Trade Trained), and the other consists of those trained specifically in the field of Agricultural Science.

What do YOU think should be included in a good course in farm mechanics? Should we teach entirely by the project method, or should exercises sometimes be included in training various skills and shop fundamentals? Do YOU believe the school shop should contain only those tools and power equipment found on the average farm --or are we justified in teaching the use of power equipment with the idea that the farmer of tomorrow, realizing the possibilities for saving labor and money, will install such equipment on his farm? Do you believe that a certain amount of uniformity of instruction in farm mechanics should exist similar to that now practiced in agricultural science?

We shall be anxious to learn YOUR reaction to these and other questions now uppermost in the minds of farm mechanics teachers. Naturally, the information will be treated in a confidential manner. No names will be used in the reports or summaries. In fact, you need not fill in your name, if you prefer to remain "anonymous".

Will you fill out the inclosed questionnaire and mail in the self-addressed envelope? The study will merit your co-operation in the interest of professional progress. A prompt response will be quite helpful. An extra copy of the questionnaire is inclosed for your files, and a summary of the findings will be made available to all who co-operate in the study.

Yours truly,

Clarence Jensen

AN INQUIRY CONCERNING FARM
MECHANICS AND GENERAL SHOP COURSES

(Please check or fill in required information)

Name of School _____

Location _____

Name of person reporting _____

How many periods are there in your school day? _____

How many periods a day do you teach Agriculture? _____

How many periods a day do you teach Farm Mechanics? _____

How many periods a day do you teach General Shop Classes? _____

How many students are enrolled in your Agricultural Department? _____

How many students are enrolled in Farm Mechanics classes? _____

The farm mechanics instructor is employed on the following basis:
10 months ( ) 11 months ( ) 12 months ( )

Are there separate shops in your school for the following:
Woodworking ( ) Auto Mechanics ( ) Trade and Industrial ( )

Are there any "General Shop" courses taught in the farm mechanics shop by the
farm mechanics instructor ( ) by a different instructor ( )

Please indicate the major items of equipment available in your shop by placing number in the approrpiate blank below. If you do not have a given item, place a zero in the blank.

Metal Working Equipment		Wood Working Equipment	
Forges	( )	Table Saw	( )
Gas Welding Outfits	( )	Band Saw	( )
Power Shears	( )	Wood Lathe	( )
Engine Lathe	( )	Portable Sander	( )
Drill Press, power	( )	Electric Glue Pot	( )
Electric Drill	( )	Paint Spray Outfit	( )
Acetylene Generator	( )		

Sheet Metal Equipment

Bar Folder	( )	Wiring Machine	( )	Elbow Edging Machine	( )
Forming Rolls	( )	Burring Machine	( )	Cornice Break	( )
Fire Pot	( )	Beading Machine	( )	Sheet Metal Stakes	( )

Our Farm Mechanics course of study is determined by:
(List 1, 2, 3, etc., in order of importance)

( ) Needs of community ( ) Projects boys like to build

( ) Boy's Agricultural project ( ) Project competition

( ) Instructor's evaluation ( ) Integrated program of school

Others

(Please place check in either yes or no column)

	Yes	No
Is farm mechanics required of all agricultural students?	( )	( )
Is the boy's agricultural project the basis of his farm mechanics program?	( )	( )
Is the same equipment used to teach both the general shop students and the farm mechanics students?	( )	( )
Are general shop and farm mechanics students taught identical shop fundamentals?	( )	( )
Are students who have had courses in "general shop," in your shop or elsewhere, better fitted to do farm mechanics?	( )	( )
Do you have required projects for all shop freshmen?	( )	( )
Do you use instruction sheets of any type for required projects in your freshmen classes?	( )	( )
Are your required projects for freshmen of such a nature that they require work in more than one activity, that is woodwork, sheetmetal, metal work, etc., to make one article?	( )	( )
Do you ever use "exercises" for teaching shop skills?	( )	( )
Do you teach forge welding?	( )	( )
Do you keep a shop progress chart, or permanent record system of all shop students?	( )	( )

	Yes	No
Would you find a book of projects, tested and approved for California conditions, an aid in teaching farm mechanics?	( )	( )
Do you use "field trips" for a part of your instruction in farm mechanics?	( )	( )
Do you receive "mileage" for field trips or for farm mechanics project work?	( )	( )
Do you accept work brought in by farmers or townspeople, who have no students in your department, to be done in your shop?	( )	( )
Do you allow advanced farm mechanics students to use power tools?	( )	( )
Do you teach a shop night school for farmers?	( )	( )
Is there an enrollment fee in your shop night school?	( )	( )
Do you "charge" for gas, coal, power or other supplies used in instruction in your farm mechanics night school?	( )	( )

Please give the following information as a means of comparing the responses from various teaching groups. No reflection is implied on any group, but the information will be helpful for comparative purposes.

From what college did you graduate? _____ Degree _____

What was your major subject? _____

How many years have you taught farm mechanics? _____

What type(s) of credential do you hold? Type "A" Agricultural ( ) Special Farm Mechanics ( ) Special Industrial Arts( )

1. A Survey of Farm Mechanics Teachers in California to Reveal College Preparation, and Time Devoted to Teaching Various Subjects in the Secondary School

A. What are the College Major Subjects of Farm Mechanics Teachers

A survey of the 93 farm mechanics teachers in the state of California revealed a variety of "major subjects" taken while they were in college. A study of the results (Table II) shows that there are represented on the list of college major subjects nineteen different fields. Almost the entire college curriculum is shown to have some influence in training the farm mechanics teacher. The first impressions from a study of the list leads one to believe that industrial arts with twenty-four teachers listing that subject, as a major field in college, is predominate in the farm mechanics field. A further analysis however shows that when the various branches of agriculture such as agronomy, animal husbandry, horticulture, and so forth are added together, a different picture is presented. The results of compiling the various college major subjects into logical groups are listed in Table I.

TABLE I

Summary of College Majors of 93 California Farm Mechanics Teachers

College Major Subject	Per cent in each field
1. Agriculture and Allied Subjects	54.0%
2. Industrial Arts	22.8%
3. No College Major	10.1%
4. Other Subjects*	13.1%
	100.0%

*Other subjects were mathematics, hygiene, education physical education, and so forth.

TABLE II

Showing College Majors of 93 California Farm Mechanics Teachers

Rating	(percentage listing given major)	Number
1 Industrial Arts	---------- (22.8)	24
2 Animal Husbandry	---------- (19.1)	20
3 No major subject	---------- (10.5)	11
4 Agricultural Engineering	--------- (9.5)	10
5 Education	------- (7.7)	8
6 Horticulture	----- (5.7)	6
7 Agricultural Education	---- (4.8)	5
8 Dairy Industry	--- (3.8)	4
9 Physical Education	--- (3.8)	4
10 Agronomy	-- (2.9)	3
11 Pomology	- (1.9)	2
12 Citrus and Deciduous	(0.9)	1
13 Entomology	(0.9)	1
14 Farm Management	(0.9)	1
15 Irrigation	(0.9)	1
16 Hygiene	(0.9)	1
17 Mathematics	(0.9)	1
18 Plant Sciences	(0.9)	1
19 Poultry Husbandry	(0.9)	1
Total number of majors listed by 93 teachers -		105

Note: Some instructors presented double majors, thus giving a higher total (105) than the number studied (93).

A further analysis of Table II shows that when industrial arts majors (22.8%) are added to agricultural engineering majors (9.5%), the only other "shop" majors in the field, the total is 32.3% or less than one-third of the farm mechanics teachers in California. In other words less than one-third of the farm mechanics teachers in California are professionally trained in the practical operation or application of shop work in any desirable degree. The remaining two thirds or 67.7% of the farm mechanics teachers are trained in some phase of technical agriculture and other subjects unrelated to shop work, except possibly for a minimum of six semester hours - an amount too scant for professional application.

What is the College Preparation of the Farm Mechanics Teachers?

A study of the farm mechanics teacher personnel shows a wide variety of colleges attended and degrees received. Table IV shows in detail the colleges attended and the degrees received by these teachers. Of the 93 teachers surveyed, seventeen did not graduate from college. These teachers were probably recruited from industry or agriculture and qualified for a farm mechanics credential by summer school work at various institutions. Following is a summary of the colleges attended and the degrees received by the various teachers.

TABLE III

Summary of Colleges Represented and
Degrees Received by Farm Mechanics Teachers

Colleges represented on survey	21 Colleges
Graduates having B. S. degrees	56 Teachers
Graduates with A. B. degrees	16 Teachers
Graduates with M. S. or M. A. degrees	5 Teachers
Other degrees	1 Teacher
Those having no degrees	17 Teachers

TABLE IV

Showing Colleges and Universities Represented on Survey

College or University	Total	No Degree	B.S. Degree	A.B. Degree	Others
University of California	33	2	29	2	0
Oregon State College	14	1	11	0	2 M.S. deg.
San Jose State College	9	3	0	6	0
Utah State Agr. College	5	0	5	0	0
Chico State College	4	0	0	4	0
Fresno State College	2	0	0	2	0
Washington State College	2	0	1	1	0
Montana State College	2	0	2	0	0
Iowa State College	2	0	1	0	1 M.S. deg.
Santa Barbara State College	1	0	0	1	0
Chattanooga University	1	0	0	0	1 LL.B. deg.
Claremont College	1	0	0	0	1 M.A. deg.
University of Idaho	1	0	1	0	0

TABLE IV (cont.)

College or University	Total	No Degree	B.S. Degree	A.B. Degree	Others
University of Illinois	1	0	1	0	0
University of Minnesota	1	0	1	0	0
Michigan State	1	1	0	0	0
University of South Dakota	1	0	1	0	0
Purdue University	1	0	1	0	0
Stanford University	1	0	0	0	1 M.A. deg.
Valparaiso Univ. Indiana	1	0	1	0	0
Virginia Poly.	1	0	1	0	0
No college listed	10	10	0	0	0
	95	17	55	16	6*

* Advanced degrees, represented as follows:

M.S. Degrees - 3

M.A. Degrees - 2

LL.B. Degree - 1

Time Devoted to Various Subjects by Farm Mechanics Teachers

Table V shows the distribution of the teaching time of the farm mechanics teachers in the secondary schools. As would be expected the greatest number of class periods is devoted to the subject of farm mechanics. Agricultural science ranks second in importance, with "other classes," third, and "general shop" classes, fourth.

When the shop classes of farm mechanics teachers are compiled as a unit, that is "farm mechanics (42.1%) and general shop (15.9%) classes," we find 58 per cent of the total time of these teachers is devoted to a field in which they, as a group, have spent but 32.3 per cent of their time adequately preparing for. The remaining two-thirds (67.7%) of the teachers are untrained or inadequately trained in the field in which they spend the majority of their teaching time.

TABLE V

Showing Distribution of Class Periods between Various Phases of Shop Work, Agricultural Science and Other Classes

(Percentage of total class time based upon a total of 649 periods devoted to all subjects)

1. Farm Mechanics	273 Periods	42.1%
2. Agricultural Science	138 Periods	21.2%
3. Other subjects*	135 Periods	20.8%
4. General Shop Classes	103 Periods	15.9%
	649 Periods	100.0%

*Includes project supervision

Table VI shows the teaching combinations common to farm mechanics teachers. The results indicate farm mechanics and "general shop" are the most popular combinations. Agricultural science ranks second in choice, while the remaining combinations are very definitely of lesser popularity as shown by the number of teachers listing those teaching combinations.

TABLE VI

Showing Teaching Combinations of 93 Farm Mechanics Teachers

	Teachers
1. Farm Mechanics and "General shop"	40
2. Farm Mechanics and Agricultural Science	35
3. Farm Mechanics, Agriculture and "General Shop"	9
4. Farm Mechanics and "other classes"*	6
5. Farm Mechanics only	3
	93

6. "General shop" taught in farm mechanics shop by other than the farm mechanics teacher - 14 shops

*"Other classes" refers to subjects other than farm mechanics and "general shop".

The conclusion drawn from this situation is that an industrial arts trained teacher with a farm mechanics credential is still the most popular teacher combination, and capable of giving the best results, even though few teachers have been certificated under this combination

since 1930. There is a distinct preference for a "shop teacher" to teach a shop subject.

2. A Survey of Farm Mechanics Shops in California to Reveal Tools and Equipment and the Utilization of that Equipment in Classes Other than Farm Mechanics

Farm mechanics, as shown earlier in this study, did not originate as a distinct subject within itself. It was added to the program with the coming of agriculture and often combined with existing industrial arts shops. This situation will necessarily influence the physical plants of the various shops today. The study proposed, therefore, to determine which shops are primarily industrial arts and which ones were equipped with reference to farm mechanics only.

A survey of equipment in farm mechanics shops (Table VII) shows of the 93 shops surveyed, 44 were strictly farm mechanics in nature. In these no "general shop" courses were offered by the farm mechanics teacher. General shop courses were offered in these shops however by a "different instructor", other than the farm mechanics teacher. Fourteen shops (Table VI) showed this situation. The remaining 49 farm mechanics shops offered "general shop" subjects in addition to farm mechanics classes, and both subjects were taught by the same instructor. Results show that "general shop" courses definitely affect the equipment in the farm mechanics shops, that subject being

offered in 63 out of a possible 93 farm mechanics shops in the state of California.

In analyzing the equipment of these shops, it was found that the shops which catered principally to farm mechanics (general shop classes taught by other instructor regarded as incidental) were 47.3 per cent of the entire shops surveyed, and that they contained but 21 per cent of the equipment in the field. The combination shops, farm mechanics and "general shop" set-ups, constituted 52.7 per cent of the total and contained 79 per cent of the total equipment in the field. The conclusion here is that those shops offering the broader scope of subjects, are better equipped, probably due to the necessity of a wider range of equipment to teach a wider range of shop activities.

TABLE VII

Tools in "Farm Mechanics" and "General" Shops
Listed in Order of Frequency

Name of Tool	Total	44 F.M. Shop	49 F.M. and Gen. Shop
1. Forges	198	71	127
2. Wood Lathes	74	19	55
3. Electric Drill	73	27	46
4. Fire Pot	69	26	43
5. Drill Press, Power	65	23	42
6. Sheet Metal Stakes	62	10	52
7. Table Saw	58	19	39
8. Engine Lathes	55	17	38
9. Gas Welding Outfit	45	14	31
10. Band Saw	41	11	30
11. Paint Spray Outfit	27	8	19
12. Portable Sander	23	6	17
13. Bar Folder	19	7	12
14. Wiring Machine	18	3	15
15. Forming Rolls	17	3	14
16. Burring Machine	17	2	15
17. Electric Glue Pot	16	5	11
18. Beading Machine	14	4	10
19. Elbow Edging Machine	8	0	8
20. Power Shears	6	2	4
21. Jig Saw	4	1	3
22. Planer	3	1	2
23. Jointer	3	1	2
24. Cornice Break	3	0	3
25. Acetylene Generator	2	0	2
26. Mortising Machine	2	0	2
27. Milling Machine	1	0	1
28. Shaper	1	0	1
29. Scroll Saw	1	0	1
30. Electric Arc Welder	1	0	1
	925	280	645

3. An Evaluation of Factors Determining Policies and Farm Mechanics Courses of Study as Determined by a Survey of the Farm Mechanics Shops of California

A. Determining Course of Study

As a basis of determining what factors were considered important when building and maintaining a farm mechanics course of study the following question was placed before the 93 farm mechanics teachers covered by this study.

Our Farm Mechanics Course of Study is determined by:
(List 1, 2, 3, etc., in order of importance)

( ) Needs of the community

( ) Boy's Agricultural project

( ) Instructor's Evaluation

( ) Projects boys like to build

( ) Project competition

( ) Integrated program of school

Others

The following tables indicate the relative importance assigned by the teachers to each of these factors. They have been analyzed in detail and are included in Tables VIII to XIII inclusive. They are of value in that certain factors such as "boy's agricultural project" and "needs of the community", as bases for the boy's agricultural program ranked consistently high with practically all of the farm mechanics teachers of the state. Other factors such as "project competition" and "integrated program of the school", ranked consistently lower as determining factors.

TABLE VIII

EVALUATION OF CERTAIN CRITERIA USED IN ORGANIZING COURSES OF STUDY

1. Boy's Agricultural Projects as the Basis of the Farm Mechanics Course

(Table indicates percentage)

Rank		Teachers
1	(47.3)	44
2	(39.8)	37
3	(7.6)	7
4	(3.3)	3
5	(1.0)	1
6		0
0*	(1.0)	1
		93

* Indicates no response.

TABLE IX

2. Needs of the Community as the Basis of the Farm Mechanics Course

(Table indicates percentage)

Rank		Teachers
1	(45.1)	42
2	(30.2)	28
3	(15)	14
4	(6.5)	6
5		0
6		0
0*	(3.2)	3
		93

* Indicates no response.

TABLE X

3. Projects Boys Like to Build as a Basis of the Farm Mechanics Course

(Table indicates percentage)

Rank		Teachers
1	----- (5.3)	5
2	---------- (19.3)	18
3	---------- (33.3)	31
4	---------- (16.2)	15
5	----- (5.3)	5
6	--- (3.3)	3
0*	---------- (17.3)	16
		93

* Indicates no response.

TABLE XI

4. Instructor's Evaluation as a Basis of the Farm Mechanics Course

(Table indicates percentage)

Rank		Teachers
1	------ (6.4)	6
2	------- (7.5)	7
3	---------- (31.1)	29
4	---------- (26.9)	25
5	---------- (11.9)	11
6	--- (3.2)	3
0*	---------- (13)	12
		93

* Indicates no response.

TABLE XII

5. Integrated Program of School as the Basis of the Farm Mechanics Course

(Table indicates percentage)

Rank		Teachers
1	- (1)	1
2	---- (4.4)	4
3	---------- (10.8)	10
4	---------- (14)	13
5	---------- (15)	14
6	---------- (19.4)	18
0*	---------- (35.4)	33
		93

* Indicates no response.

TABLE XIII

6. Project Competition as the Basis of the Farm Mechanics Course

(Table indicates percentage)

Rank		Teachers
1		0
2		0
3	---- (4.4)	4
4	---- (4.4)	4
5	---------- (22.5)	21
6	---------- (24.7)	23
0*	---------- (44)	41
		93

* Indicates no response.

The results of the evaluation of the factors: 1) needs of the community; 2) boy's agricultural project; 3) instructor's evaluation; 4) projects boys like to build; 5) project competition; 6) integrated program of the school, are shown in Table XIV, below.

The method of reaching this conclusion was as follows: Each chart that carried a factor was considered as a unit and scored accordingly. For a rating of 1 on the chart, 6 points were scored for each teacher listing it as such; for a 2 rating, 5 points were given; for a 3 rating, 4 points, etc., until 0 was reached in which case no points were allowed. The complete score of a chart was then recorded and scored as that factor of evaluation received first, second, etc. choice.

TABLE XIV

Results of Certain Criteria used in Organizing Courses of Study

	Score	Possible
1. Boy's Agricultural Projects	482	558
2. Needs of the Community	461	"
3. Projects boys like to build	298	"
4. Instructor's Evaluation	284	"
5. Integrated Program of School	149	"
6. Project Competition	92	"
Total points -	1766	

B. Evaluation of Current Policies in Farm Mechanics

On the second page of the questionnaire (page 39) is a list of policies and problems most frequently discussed at sectional, regional and state meetings of farm mechanics teachers. Farm mechanics is similar to other types of shop work in that there is a great variety of differences of opinions among teachers, depending upon the philosophies, training, practical experiences and practices which they have found to be successful in solving their particular teaching difficulties. It is the belief of the writer that these policies will be reflected when answering certain pertinent questions regarding the methods of shop procedure, and policies practiced in their farm mechanics work.

A summary of the policies now conducted in farm mechanics shops (Table XV) has led the writer to the following statements as being indicative of the practices now followed in the state of California.

Question 3)
Table XV

1) In sixty-eight out of a possible seventy-nine cases, farm mechanics and "general shop" students use the same equipment. This leads the writer to believe that the choice of equipment is dependent somewhat upon the needs of industrial arts subjects and that both farm mechanics and "general shop" can be taught successfully in the same shop by the same teacher.

(Question 4) Table XV	2) Farm mechanics teachers agree in thirty-three out of a possible* seventy-seven cases that farm mechanics and "general shop" students should be taught identical shop fundamentals.
(Question 5) Table XV	3) Fifty two teachers out of a possible seventy-six stated that students who had taken "general shop" in their shop or elsewhere were better fitted to do farm mechanics work.
(Question 8) Table XV	4) A decided majority of the teachers, fifty-seven out of a possible eighty-three, require projects for freshmen that are of a decidedly "general shop" nature.
(Question 12) Table XV	5) Seventy-nine out of a possible eighty-four teachers, would like to have a book, tested and approved for California conditions, as an aid in teaching farm mechanics. (The writer was undecided whether to interpret this fact to mean a "decided need" for reference material, or idle curiosity as to what the book would contain.)
(Question 16) Table XV	6) A great majority, seventy-nine out of a possible eighty-six teachers, allowed advanced farm mechanics students to use "power tools". This would indicate a need for teaching "power machinery" on the farm in greater quantities than ever before, and a greater utilization of tools normally a part of the industrial arts shop, or of the combination industrial arts and farm mechanics set-up.

* Possible is scope of survey.

TABLE XV

Results of Questionnaire on Present Policies in Farm Mechanics Shops

Question	Yes	No	Total
1. Is farm mechanics required of all agricultural students?	61	32	93
2. Is the boy's agricultural project the basis of his farm mechanics program?	54	37	91
3. Is the same equipment used to teach both the general shop students and the farm mechanics students?	68	11	79
4. Are general shop and farm mechanics students taught identical shop fundamentals?	33	44	77
5. Are students who have had courses in "general shop" in your shop or elsewhere better fitted to do F. M.?	52	24	76
6. Do you have required projects for all shop freshmen?	58	35	93
7. Do you use instruction sheets of any type for required projects in your freshmen classes?	35	56	91
8. Are your required projects for freshmen of such a nature that they require work in more than one activity; that is woodwork, sheetmetal, etc., for one article?	57	26	83
9. Do you ever use "exercises" for teaching shop skills?	53	40	93
10. Do you teach forge welding?	70	23	93
11. Do you keep a shop progress chart, or permanent record system of all shop students?	61	27	88

TABLE XV (cont.)

Question	Yes	No	Total
12. Would you find a book of projects, tested and approved for California conditions, an aid in teaching F. M.?	79	5	84
13. Do you use "Field Trips" as a part of your instruction in farm mechanics?	70	22	92
14. Do you receive "mileage" for field trips or for farm mechanics project work?	67	25	92
15. Do you accept work brought in by farmers or townspeople who have no students in your department, to be done in your shop?	72	19	91
16. Do you allow advanced farm mechanics students to use power tools?	79	7	86
17. Do you teach a shop night school for farmers?	16	76	92
18. Is there an enrollment fee in your night school?	3	13	16
19. Do you "charge" for gas, coal, power or other supplies used in instruction in your night school?	6	10	16

PART V

SUMMARY AND IMPLICATIONS

1. Interpretations of the Results as a Basis for Future Policies

From a study of the problem through a survey of the field, from publications listed in the bibliography, and from contact with workers in the field of farm mechanics, the writer has formulated the following summary and implications.

1) Over half (54%) of the farm mechanics teachers in the state of California had presented college majors in agriculture and its related subjects.
2) Comparing the college major subjects of those teachers who presented industrial arts majors in college (22.1%) with those who presented agricultural engineering majors (9.5%), the only "shop fields" mentioned, gives a total of 32.3% or less than one-third of the teachers of farm mechanics. In other words less than one-third of the farm mechanics teachers presented majors that would adequately prepare them for farm mechanics teaching.

3) The farm mechanics teachers in the state devote most of their time (58%) to the teaching of shop subjects (farm mechanics and general shop courses) -- the field in which they have had the least preparation, as a group.

4) "General shop" courses are taught in 61 out of a possible 93 farm mechanics shops in California. This leads the writer to believe that complete correlation could be effected by requiring farm mechanics instructors to present professional training in the technique and methods of industrial arts, plus teacher-training courses in the methods and philosophy of farm mechanics.

5) The program of the agricultural science teacher has not, in the past, embraced sufficient experience in farm shop work to develop a well trained farm mechanics teacher; nor does it seem likely that it will in the future.

6) The increased use of power tools in the farm mechanics shops that are <u>used</u> by farm mechanics students, give a clear indication that the farmer of tomorrow needs a broader scope of shop training in the future than he has needed in the past.

7) The increased use of power appliances on the farm increases the necessity for a teacher with a more intensive farm mechanics and general shop prepara-

tion, to properly give the desired instruction in farm mechanics to secondary school boys in the future.

8) The industrial-arts-trained teachers in the past have had the technical shop methods, skills and background to teach shop work, but have often lacked the philosophy of vocational agriculture.

9) The agricultural science teachers in the past have had the philosophy of the farm shop, but have most often lacked the training in skills, shop methods and training to make successful farm mechanics teachers.

10) There is a distinct shortage of trained farm mechanics teachers in California, brought about by curtailment of the training of industrial arts teachers and the substitution of teachers trained in agricultural science, with only a few electives in the farm shop.

11) The complete correlation of industrial arts and farm mechanics is dependent upon the certification of teachers trained in the methods, objectives, and techniques of <u>both</u> industrial arts and farm mechanics.

2. Suggested Course of Study for Farm Mechanics Teachers

As was stated in the Preface, it is not the intention of the writer to infer that all students who graduate from an industrial arts department of a teachers college should be certificated to teach farm mechanics. This would be impractical. It is however the contention of the writer that, other things being equal, (training in special methods, background, philosophy, etc.) a four-year course in industrial arts education is preferable to a like amount of time in agricultural science, for the training of successful farm mechanics teachers. The following conditions should determine the selection of candidates for farm mechanics training.

1) Select only those students who are farm bred and reared to prepare for farm mechanics teaching in the secondary schools.
2) Select only those students who have had work in vocational agriculture in a four-year high school, for at least two consecutive years.
3) Give those students four years of training in a selected course of study, in an industrial arts department of a degree-granting institution.
4) Require students preparing as farm mechanics teachers to complete 416 clock hours in actual operation and repair of farm machinery on the farm,

under supervised conditions, preferably during the college training period.

5) Students who wish to qualify for a Farm Mechanics Credential as part of their Industrial Arts program shall:

   1) Make preliminary registration with Supervisor of Vocational Agriculture to determine qualifications of candidate to pursue such a program.

   2) Outline program of study and secure approval of supervisor of vocational agriculture.

   3) Secure approval of director of industrial arts education.

A. Specific Requirements for Farm Mechanics Credential

In the major field (industrial arts) at least twenty of the forty semester hours required for the Special Credential in Industrial Arts shall be selected from the subjects listed below:

	Semester Hours
1. Forging	5
2. Acetylene Welding	2
3. Farm Carpentry	3
4. Pumps and Irrigation	2
5. Tractors and Gas Engines	3
6. Repair of Farm Machinery	3
7. Surveying and Land Leveling . . .	2
8. Farm Plumbing	2
9. Harness Repair	2
10. Farm Power and Lighting	2

B. The remaining twenty semester hours of technical subjects for the Industrial Arts Credential shall be chosen by the student with the approval of the Director of Industrial Education and the State Supervisor of Vocational Agriculture, according to selected groups for major emphasis in the shop teaching.

C. Major Related Field of Farm Mechanics

1) Not less than 10 semester hours shall be chosen from the following group.

	Semester Hours
1. Methods in Teaching Farm Mechanics	3 (req.)
2. The California Plan of Vocational Agriculture. . . .	2 (req.)
3. Vocational Guidance	
4. Trade Analysis	
5. The Conference Method	
6. Philosophy of Vocational Education	

D. Completion of ten months of cadet teacher-training to meet the requirements of the California State Plan for Vocational Education.

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Legend of Abbreviations on Master Chart

Colleges and Universities

1. U.C.	University of California
2. U-AG	Utah State Agricultural College
3. S.J.S.	San Jose State College
4. S.B.S.	Santa Barbara State College
5. N.D.I.N.	North Dakota Industrial Normal
6. Mon.St.	Montana State College
7. O.S.C.	Oregon State College
8. Va.Pol.	Virginia Polytechnic
9. Stanf'd	Stanford
10. S.D.S	South Dakota State College
11. Clrmt	Claremont College
12. Illin	University of Illinois
13. W.S.C.	Washington State College
14. Mo.U.	Missouri University
15. U.Minn	University of Minnesota
16. Iowa St.	Iowa State College
17. U.O.V.	University of Valparaiso
18. U.O.Cha.	University of Chattanooga

Separate Shops

W-W Wood Work	A-M Auto Mechanics

College Major Subjects

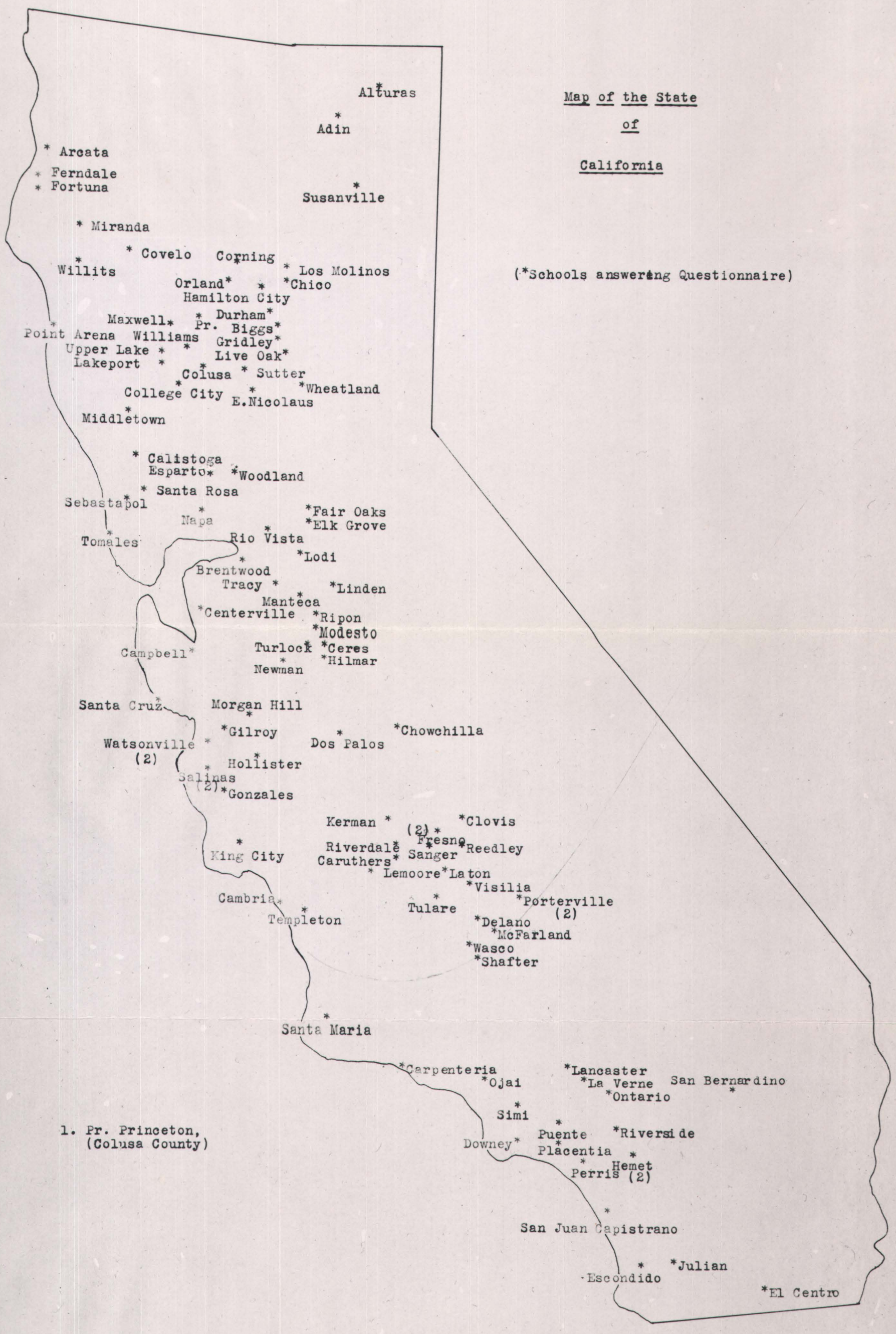
1. I-A	Industrial Arts
2. A-E	Agricultural Engineering
3. Agron	Agronomy
4. P-E	Physical Education
5. Hyg.	Hygiene
6. An-Sci	Animal Science
7. F-Mk	Farm Marketing
8. Educ	Education
9. D-Ind	Dairy Industry
10. Cit & Dec	Citrus and Deciduous Fruits
11. A-H	Animal Husbandry
12. Entom	Entomology
13. P-Hus	Poultry Husbandry
14. Pomol	Pomology
15. Ag-Ed	Agricultural Education
16. Hort	Horticulture
17. Math	Mathematics
18. Pl-S	Plant Science
19. Irri	Irrigation

Map of the State

of

California

(*Schools answering Questionnaire)



1. Pr. Princeton, (Colusa County)

Tabulated Results of Questionnaires to 93 Farm Mechanics Departments

	Periods in School day	Periods Teach Agr.	Periods Teach F.M.	Other Classes	Periods Teach Gen.S.	Students in Agr. D.	Students in F.M.	Months Employed	Seperate Shops	Gen. Shop Taught by Other Instructor	College Grad.	Degrees	Major Subject	Years taught F.M.	Type "A" Cred.	F.M. Cred	I.A. Credential	General Secondary	Needs of Com.	Boys Ag. Project	Instr's Evaluation	Projects Boys Like To Build	Project Competition	Integrated program
																		Course of Study						
Adin	9	2	2	5	0	20	20	11	No	No	U. C.	B-S	A-H	3	-	-	-	-	3	4	1	2	6	5
Alturas	6	2	2	2	0	27	27	12	No	Yes	U.A-G	B-S	Agro	9	Ys				1	2	3	4	-	5
Arcata	6	3	2	0	0	40	20	12	W-W A-M	No	U. C.	B-S	A-H	10	Ys				1	3	4	2	-	-
Biggs	8	2	2	2	2	25	24	12	No	No	U. C.	B-S	Hort	9	Ys				3	1	5	2	6	4
Brentwood	6	0	2	0	4	35	33	10	No	No	S.J.S	A-B	Educ	7		Ys	Ys		3	2	4	1	5	6
Calistoga	8	4	4	0	0	25	24	12	No	No	U. C.	B-S	A-H	3	Ys	-	-	Ys	1	3	2	-	-	-
Cambria	10	0	3	3	4	18	18	10	No	No	S.B.S.	A-B	I.A. P.E.	10		Ys	Ys		1	-	-	3	-	2
Campbell	6	0	4	0	2	60	60	10	No	No	S.J.S.	No	I-A	10		Ys	Ys		1	2	3	4	5	6
Carpenteria	7	5	2	0	0	24	24	12	No	Yes	U. C.	B-S	Pl-S	3	Ys				1	2	3	-	-	-
Caruthers	6	4	2	0	0	40	29	12	No	No	Purdue	B-S	A-H	4	Ys				-	1	-	2	-	-
Centerville	7	0	3	0	4	61	38	10	No	No	S.J.S.	A-B	I-A	1		Ys	Ys		1	3	2	6	5	4
Ceres	6	0	6	0	0	67	100	10	W-W A-M	No	No Given			7		Ys	Ys		2	1	3	6	5	4
Chico	6	4	2	0	0	50	38	12	A-M	Ys	U. C.	B-S	Irri	7	Ys			Ys	2	1	4	3	-	-
Chowchilla	6	2	2	2	0	34	34	12	No	Yes	U-AG.	B-S	A-H	3	Ys				-	-	-	-	-	-
College City	7	3	3	1	0	41	41	12	No	Yes	U-C	B-S	Hort	5	Ys				4	1	3	2	5	6
Colusa	7	3	2	2	0	36	36	10	No	Yes	U-C	B-S	Hort	3	Ys				2	1	3	4	5	6
Corning	7	0	2	3	2	46	46	10	No	No	N.D.I.N	No	I-A	14		Ys	Ys		2	1	4	3	5	6
Covelo	8	0	5	2	1	46	46	10	No	No	Mon.St.	B-S	A-Ed	5	Ys	Ys			1	2	5	3	4	6
Delano	8	4	4	0	0	60	60	10	Gen	No	Idaho	B-S	A-H	8	Ys				3	1	2	-	-	-
Dos Palos	8	0	7	0	1	62	50	12	W-W A-H	No	S.J.S.	A-B	I-A	7		Ys	Ys		1	2	3	5	6	4
Downey	6	0	2	0	4	50	43	10	W-W	No	None	0	None	1		Ys	Ys		3	1	4	2	5	6
Durham	6	2	2	1	1	34	34	12	No	No	U. C.	B-S	A-H	5	Ys			Ys	1	2	5	3	4	6
East Nicolaus	7	0	4	1	2	30	30	10	No	No	Chico	A-B	I-A	6		Ys	Ys	Ys	1	2	3	4	5	6
Elk Grove	6	0	3	1	2	60	58	10	No	No	None	0	-			Ys	Ys		2	1	-	-	-	3
Escondido	8	0	6	2	0	62	64	12	W-W	No	U. C.	0	M-E A-E	9	Ys				1	2	4	3	5	-
Esparto	9	0	4	2	3	19	23	10	No	No	O.S.C.	B-S	A-E	6		Ys	Ys		1	1	2	3	3	2
Fair Oaks	6	0	3	2	1	56	56	10	No	No	Va Pol	B-S	Math	8		Ys	Ys		2	1	4	6	5	3
Ferndale	6	0	4	0	2	50	50	10	No	No	U. C.	B-S	Eng	2		Ys			1	2	-	-	-	3
Fortuna	8	4	4	0	0	58	37	12	W-W A-M	No	O.S.C.	B-S	A-Ed	5	Ys				2	1	3	-	-	-
Fresno	8	0	4	0	4	45	35	10	No	No	Chico	A-B	I-A	6		Ys	Ys		2	1	4	3	6	5
Fresno	6	0	4	0	2	70	70	10	No	No	O.S.C.	B-S M-S	A-E	6	Ys				4	1	3	2	5	6
Gilroy	6	4	2	0	0	52	50	12	No	No	O.S.C.	B-S	Agro	15	Ys				1	2	3	-	-	4
Gonzales	7	0	3	1	3	35	35	12	W-W	No	O.S.C.	B-S	A-E	3		Ys	Ys		2	1	3	4	6	5
Gridley	6	0	1	0	4	40	27	10	No	No	Chico	A-B	I-A	4		Ys	Ys		3	1	4	2	5	6
Hamilton City	6	3	2	1	0	27	24	12	No	Yes	U. C.	B-S	Hort	6	Ys				1	2	4	3	-	-
Hemet	9	0	2	7	0	35	19	9	A-M	No	None	0	None	11		Ys	Ys		4	2	1	3	5	6
Hemet	9	0	2	2	5	35	19	9	A-M	No	O.S.C.	M-S	I-A	1		Ys	Ys		3	4	2	1	-	-
Hollister	8	0	6	2	0	65	60	12	No	No	Stan	M-A	Educ	13		Ys			1	2	3	4	5	6
Julian	6	2	2	2	0	19	19	12	No	No	U-C	B-S	Ag Ed	4	Ys				1	2	4	3	5	6
Kerman	6	0	2	2	2	39	33	10	No	No	Fresno	A-B	Educ	6		Ys	Ys		1	2	4	3	-	-
Kings City	6	0	2	2	2	50	31	12	W-W A-M	No	Several	0	I-A	10		Ys	Ys		3	1	4	2	6	5
Lakeport	9	0	6	2	1	23	23	10	No	No	S.J.S	0	I-A	5		Ys	Ys		1	2	3	4	-	-
Lancaster	6	0	5	0	1	84	84	9	No	No	S.J.S.	0	I-A	6		Ys	Ys		1	2	-	-	-	-
Laton	6	3	3	0	0	39	41	12	No	No	U-C	B-S	A-H	1	Ys				2	1	4	3	6	5
Leemore	8	0	2	5	1	25	17	10	W-W A-M	No	O.S.C.	B-S	I-A	12		Ys	Ys	Ys	1	1	1	2	3	3
Linden	7	3	2	1	1	24	24	12	No	No	S.D.S.	B-S	A-H	5	Ys			Ys	3	1	4	2	6	5
Live Oak	8	0	2	3	3	53	28	10	No	No	O.S.C.	B-S	I-A	7		Ys	Ys		2	1	5	3	6	4
Lodi	6	0	6	0	0	110	110	12	A-M W-W	No	None	0	None	10		Ys	Ys		2	1	-	4	-	3

Tabulated Results of Questionnaires to 93 Farm Mechanics Departments

	Periods School day	Periods Teach Ag	Periods Teach F.M.	Other Classes	Teach Gen. Shop	Students In Ag. Dep.	Students F.M. Dept.	Months Employed	Other Shops	Other Gen Shop Ins.	College Grad.	Degree	College Major	Years Taught F.M.	Type "A" Agr.	F.M. Credential	I.A. Credential	Gen Sec. Cred.	Needs of Com.	Boys Agr. Proj	Instr. Evaluation	Projects Does like	Project Comp. - Integrated program.
Los Molinos	7	0	3	3	1	28	28	10	No	No	W.S.C.	A-B	P-E I-A	12	-	Ys	Ys	-	2	1	3	3	-	2
Manteca	7	0	4	1	2	54	54	10	W-W	No	Mon.St.	B-S	A-E	7		Ys		Ys	2	1	5	3	6	4
Maxwell	6	3	3	0	0	30	30	12	No	No	U-Ag	B-S	Agro	8	Ys			Ys	1	2	3	4	6	5
McFarland	9	0	4	0	5	20	18	10	No	No	U-C.	A-B	P-E Hyg	2		Ys	Ys	Ys	1	4	3	2	5	6
Middletown	6	3	3	0	0	21	21	11	No	No	U.C.	B-S	A-H	1	Ys				1	2	5	3	6	4
Miranda	6	2	2	1	1	19	19	11	No	No	U.C	B-S	A-H	2	Ys				-	1	-	2	-	-
Modesto	6	0	5	1	0	135	115	12	W-W A-M	No	None	0	None	9		Ys	Ys		2	1	3	4	-	-
Morgan Hill	8	0	6	1	1	32	32	10	No	No	U.C.	A-B	Ed	6		Ys			3	1	-	2	-	-
Napa	6	0	3	3	0	64	57	12	W-W	No	None	0	None	14		Ys	Ys		2	1	3	4	5	6
Newman	6	0	1	3	2	37	38	10	No	No	S.J.S.	A-B	I-A	6		Ys	Ys		4	2	5	1	-	3
Ojai	8	5	1	2	0	18	10	12	No	Yes	U. C.	B-S	Agron F.Mk	6	ys				2	1	3	3	-	3
Ontario	6	0	2	3	1	30	30	10	W-W A-M	No	None	0	0	3		ys			1	3	2	-	-	-
Perris	7	3	1	3	0	23	13	12	No	No	U.C. Clar	B-S M-A	Hort. Educ.	8	Ys			Ys	3	2	-	1	-	-
Placentia	7	4	2	1	0	20	20	12	A-M	Yes	U.C.	B-S	D.Ind A-H.	1	Ys				2	1	3	-	-	-
Point Arena	6	3	2	1	0	20	20	12	No	No	O.S.C.	B-S	D.-Ind	3	Ys			Ys	1	3	2	1	-	-
Porterville	8	6	2	0	0	110	85	10	A-M W-W	Yes	U.C.	B-S	Cit & Dec Ft	6	Ys				1	2	1	-	-	-
Porterville	6	0	3	2	1	110	85	10	A-M W-W	Yes	Fresno	A-B	I-A	7		Ys	Ys		1	2	1	-	-	-
Princeton	7	3	1	3	0	28	28	12	No	Yes	U-C.	B-S	A-H	3	Ys				4	2	1	3	-	-
Puente	6	2	2	0	2	42	42	12	W-W A-M	No	U.C.	B-S	A-H	2	Ys			Ys	2	1	5	4	-	3
Reedley	6	2	4	0	0	37	37	12	W-W A-M	No	U.C.	B.S.	Etom	1		Ys	Ys	Ys	1	5	3	4	6	2
Rio Vista	6	0	3	1	2	40	36	10	No	No	S.J.S.	A-B	P-E I-A	7		Ys	Ys		2	1	3	-	-	-
Ripon	8	3	3	2	0	51	26	10	W-W	No	Illin	B-S	A-H	12	Ys				3	1	4	2	6	5
Riverdale	8	0	8	0	0	40	40	10	No	No	W.S.C.	B-S	A-E	8		Ys			1	2	6	3	5	4
Salinas	8	3	3	2	0	69	69	11	W-W A-M	No	U-Ag.	B-S	P.Hus	1	Ys			Ys	2	1	4	3	6	5
Salinas	8	6	2	0	0	69	69	12	W-W A-M	No	U.C.	B-S	Pomol	4	Ys			Ys	2	1	4	3	6	5
Sanger	6	1	1	2	2	18	18	10	w-w	No	O.S.C.	B-S	I-A	7		Ys	Ys		3	1	-	2	-	-
San Juan Capistrano)	7	3	1	3	0	30	30	12	No	Yes	Mo s U	B-S	D.Ind	1	Ys				4	3	5	2	6	1
Santa Cruz	6	0	2	2	2	22	22	10	W-W A-M	No	Mich.St	0	0	15		Ys			1	2	5	3	6	4
Santa Rosa	6	0	4	0	2	130	85	11	W-W A-M	No	S.J.S.	A-B	I-A			Ys	Ys		1	2	4	5	6	3
Sebastapol	6	4	2	0	0	56	46	11	W-W	No	U.O.Ch	LLB		9		Ys			1	2	3	-	--	-
Shafter	9	5	4	0	0	65	65	10	A.M. W-W.	No	None	0	None	13		Ys			1	3	2	-	-	4
Simi	6	2	1	3	0	21	21	10	No	No	U.O.Minn Iowa St.	B-S M-S	Ag.Ed	11	Ys				2	1	4	3	-	-
Sutter	7	2	2	3	0	34	34	11	W-W A-M	Yes	U.C.	B-S	A-H	1	Ys				1	2	3	5	6	4
Templeton	6	1	1	3	1	11	11	12	No	No	U.C.	B-S	Pomol	1		Ys			2	1	3	5	6	4
Tomales	6	2	2	0	2	21	29	10	No	No	Iowa St	B-S	A-H	8		Ys		Ys	3	2	4	1	-	-
Tracy	6	0	3	1	2	39	33	10	No	No	U.C.	0	0	10		Ys	Ys		1	2	4	3	5	6
Tulare	6	0	3	1	2	30	30	9	W-W A-M	No	U-Ag.	B-S	A-E	8		Ys	Ys		1	2	-	4	3	
Upperlake	7	2	2	2	1	18	18	11	No	No	U.C.	B-S	Educ Hort	1	Ys			Ys	2	1	6	3	4	5
Visalia	7	0	3	4	0	60	40	10	W-W A-M	No	U.C.	B-S	Ag.Ed	2		Ys		Ys	1	3	4	5	-	-
Watsonville	7	0	5	2	0	64	48	12	W-W	No	Chico	A-B	I-A	7		Ys	Ys		1	2	4	3	-	-
Watsonville	7	0	2	3	2	64	48	10	W-W	No.	U.O.V.	B.S.	Math I-A	16		Ys	Ys		1	2	-	3	-	-
Wheatland	8	2	2	3	1	20	20	12	No	No	U.C.	B-S	D-Ind	1	Ys	Ys			1	2	4	3	6	5
Williams	8	3	3	2	0	42	42	12	No	No	U.C.	B-S	A-H	2	Ys				2	1	6	4	5	3
Willits	6	0	3	2	1	40	40	10	No	No	O.S.C.	B-S	I-A A-E	9		Ys		Ys	2	1	5	3	4	6
Woodland	6	0	3	0	3	65	65	10	W-W	No	O.S.C.	B-S	I-A A-E	16	Ys	Ys			1	2	3	-	-	-