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Oregon has recently been introduced to the Careers Cluster Concept. This concept proposes to better acquaint students with the world of work. Students completing a Careers Cluster Program, should leave the secondary school with entry-level competencies, within the cluster of occupations studied.

Vocational Agriculture has recently been given new direction by the Occupational Cluster Guide for Agriculture. Agricultural Mechanics is a portion of that cluster. Normally 1/4 to 1/3 of the in-school instructional time of a vocational agriculture program is used in agricultural mechanics. The purpose of this study is to give an order or priority to the competencies studied in agricultural mechanics. Once priorities are established, instructional time can be more wisely used upon competencies of greater importance.

The study is organized around the needs of Jefferson County, a Central Oregon county. The findings of this study thus cannot be assumed to be fully valid in any other area.

A survey consisting of 83 agricultural mechanics competencies was distributed to ten percent of the full-time production farmers and full-time agribusinessmen in Jefferson County, Oregon. The survey requested an opinion of each competency as to whether it was "essential," "nice to know," or "unnecessary." The instrument used a simple four number opinion code to allow expression of any of the above opinions of each competency. The survey remained open ended as respondents were encouraged to add "other needed competencies," at the end of each of the six occupational specialty sections.

The surveys were tallied for each of the 83 competencies and each of the six occupational specialty courses. The mean score and rank order of each were determined. Forty-seven competencies were rated as "essential," 27 competencies rated "nice to know," and nine competencies rated "unnecessary."

The major findings of the study included:

1. That agricultural mechanics competencies can be identified and ranked.

2. That a pressing need exists to teach "essential" agricultural mechanics competencies, while some need exists to teach "nice to

know" competencies, and little or no need exists to teach "unnecessary" competencies.

3. That "unnecessary" competencies might be taught when individual student need exists.

4. That when instructional time is limited, priority be given to competencies with highest rank order.

5. That instructional priority should be given to the occupational specialty courses of agricultural mechanics in the following order:

1. Power Basic to Agriculture
2. Agricultural Machinery
3. Shop Work Basic to Agriculture
4. Soil and Water Management Basic to Agriculture
5. Electricity Basic to Agriculture
6. Buildings and Conveniences Basic to Agriculture.

Agricultural Mechanics Competencies Needed by Vocational Agriculture Graduates in Jefferson County

by

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TABLE OF CONTENTS

LIST OF TABLES

AGRICULTURAL MECHANICS COMPETENCIES NEEDED BY VOCATIONAL AGRICULTURE GRADUATES IN JEFFERSON COUNTY

I. INTRODUCTION

In recent years our secondary schools have become preparatory institutions primarily for the college bound student. Curricula, counseling services and course content have each been channeled in the direction of the college bound student. At the same time very little attention has been afforded the student who is not interested, or not academically inclined toward a four year college education. These students are often accused of having "no future" or, of being incapable of filling a "useful position in society." With such discouraging accusations, these students are further driven from serious study of participation within the school. Many such students remain in school only because of compulsory attendance laws, or because of a special interest in certain school programs such as vocational classes or athletics.

Too often the college preparatory curriculum has been theory oriented, stressing "The What" of a subject, while touching very little on "The How" and "The Why" aspects of study. Theory orientation is of little interest, and small value to that student who is not interested in the world of academics. This student is more often motivated by classes that stress physical involvement in the learning activities.

Hoyt (13, p. 29) reports that:

> At the heart of the problem is a false societal attitude that worships a college degree as the best and surest route to occupational success. . . . this attitude has resulted from the erroneous application of a generally sound educational principle: namely that more education can lead one to be better prepared to work. The principle is sound only if one recognizes that the optimal amount of education required as preparation for work will vary widely between occupations and between persons within an occupation. . . . the worth of an occupation, and hence its workers, is more properly judged by its societal contributions than by the amount of formal education required for entry into that occupation.

While these trends have been affecting our secondary schools, university graduating classes have encountered severe problems of unemployment. Time-Education (10, p. 49) reports:

> The actual job offers told an even grimmer story. A survey of 140 U. S. colleges and universities indicated that between March 1970 and March 1971, job bids for male B. A. s dropped 61%, and a staggering 75% for Ph. D. s.

Even though this problem is in part due to our national economic situation, many skilled and semiskilled occupations go wanting for qualified applicants (See Appendix I).

Despite tremendous drops in college degree job availability some college students continue on into graduate programs, either because employment is unavailable or they haven't determined what career area to pursue. Time-Education (10, p. 50) reports that:

> Normally, about half of the nation;s college graduates go into business, large and small. These days, almost as many go on to graduate study or to schools for law, medicine, and other professions.

Says New York University Chancellor Allan Cartter (10, p. 51):

> We have created a graduate-education and research establishment in American universities that is about 30% to 50% larger than we shall effectively use in the 1970's and early 1980's.

Thus two related problems become evident: First, the present educational system is providing very little for the non-college preparatory student. Second, the present educational system is directing far to many students toward four year college and graduate programs. Education must then begin to provide experiences to both above groups, which will allow entrance into personally satisfying, worthwhile work, with something less than a four year college education.

Oregon has undertaken steps to remedy this growing problem of over education. The method is entitled "The Oregon Way" and deals basically with the Careers Cluster Concept. Careers education is designed to better acquaint students with the "World of Work." This acquaintance will be accomplished by very broad exposure to what work is, and though what channels it may be accomplished, during the primary grades. Upon entrance to the secondary school, students will have an opportunity to enter the careers cluster program. This program will allow the student to throughly explore the variety of careers within the occupational cluster he has chosen. Through studies provided in this cluster, the student should graduate from high school with entry-level skills within a broad family or cluster of occupations.

Need for the Study

Vast technological change has placed careers education squarely between man and his work. If a student is to leave school hoping to find a worthwhile occupation, he must have entry-level skills in that occupational field. So the long overdue need for careers education in secondary schools, has been recognized.

A need exists then to establish Career education programs. But before this can be accomplished common families of occupations must be identified. Once accomplished, individual skills or competencies needed in each occupational family must be identified. After identifying individual skills a need exists to give priority to long lists of competencies and competency groups, known as specialty courses.

Within the Careers Cluster Concept program as developed by the Oregon Board of Education, there are currently 12 clusters developed to completion. Six additional clusters are expected to be developed in the future. Any secondary school may then incorporate any or all of the clusters into their vocational program.

The Agricultural Cluster is one of the 12 which has been fully developed and is being used in most schools where vocational agriculture is a part of the curriculum. The Agriculture cluster has six occupational specialty courses, they are: Animal Science, Soil Science, Plant Science, Agricultural Mechanics, Leadership Training and

Personal Development, and Agricultural Business Management (19, p. viii).

This study recognizes the need to place some order or priority to the study of agricultural mechanics, a specialty course of the agricultural occupational clusters. Some 83 specific competencies can be identified within this specialty. The best use can be made of the time alloted to agricultural mechanics if those competencies most needed by the student are given highest priority. The major portion of the alloted time can then be used in instruction of these "essential" competencies. Those competencies which are not essential, but would be "nice to know" may then be taught during the remaining time allotment. Those competencies classified as "unnecessary" can be totally eliminated from the instructional program. Further the same criteria may be applied to the occupational specialty courses within agricultural mechanics itself.

Statement of the Problem

Agricultural Mechanics uses a relatively large proportion of the total in-school time alloted to the Agriculture Cluster. Normally 1/4 to 1/3 of the total-in-school hours will be used in Agricultural Mechanics instruction. The subject matter involved can be treated through some eighty-three individual and specific competencies. This set of competencies will be varied somewhat from one school system to

another, as there are changes in the needs of the area being served.

A problem exists then in exploring these eighty agricultural mechanics competencies, to determine which competencies are commonly needed by graduates of Jefferson County Schools. Further, a problem exists in establishing which competencies are of greatest importance, and thus of highest priority for use of instructional time. By determining relative importance and thus a priority of instruction, valuable suggestions can be made concerning course content, scope and sequence of Agricultural Mechanics instruction.

Objectives of the Study

This investigation shall achieve the following:

1. To identify agricultural mechanics competencies commonly needed by Vocational Agriculture graduates in Jefferson County, Oregon.
2. To note the individual agricultural mechanics competencies as being "essential," "nice to know," or "unnecessary."
3. To place priority on individual agricultural mechanics competencies through establishment of a rank order of all identified competencies.
4. To note the six occupational specialty courses within agricultural mechanics as being "essential," "nice to know," or "unnecessary," and place them in a rank order.

Agriculture has undergone extraordinary change in America during the past twenty years. At the same time education is currently undergoing tremendous change within the state of Oregon. This combination of changing agricultural technology and advancement of the Careers Cluster Concept, have teamed-up making reevaluation of our current curricula content paramount. This investigation of agricultural mechanics competencies is but a small start in the area of competencies evaluation in the Agricultural Cluster.

Background - Jefferson County

A brief background of Jefferson County is helpful in understanding the importance of Vocational Agriculture and The Agriculture Cluster within the County's schools.

Jefferson County, a central Oregon county, has always been rather sparsely populated. The very nature of the county's location, climate, and topography has made its primary industry agriculture. When the white man first settled in Jefferson County he exploited the seemingly endless supply of bunchgrass by introduction of sheep into the area. Later came the cattle and the plow. By 1948 the production agriculture of Jefferson County was basically dryland grain farming and cow-calf ranching.

The development of the North Unit of the Deschutes Irrigation Project in 1948-1950 comprises 50,000 acres of highly productive

irrigable land. The primary crops of the area now include small grains, alfalfa hay, potatoes, peppermint, and grass seed crops. Table 1 shows the relative importance of the various kinds of agricultural crops and livestock in Jefferson County in 1970.

Table 1. Jefferson County Agricultural Industry Gross Income 1970.

Crop or Livestock	Gross Income
Crops Income:	
Peppermint	2,656,000
Grass and Legume Seed	2,353,000
Potatoes	1,907,000
Small Grains	1,031,000
All Hay	230,000
Miscellaneous	52,000
Livestock Income:	
Beef	5,482,000
Poultry and eggs	281,000
Dairy	114,000
Sheep	67,000
Hogs	38,000
Miscellaneous	25,000
Total Gross Income	$14,239,000

Agriculture related businesses are also of prime importance in Jefferson County, as they service every aspect of production agriculture. The number of people employed by these Agribusinesses has increased during the past ten years while the number of full-time production farmers has decreased.

Definition of Terms

1. The Oregon Way. The name Dr. Dale Parnell (19, p. i) has given Oregon's new approach to secondary education; namely the Careers Cluster Concept containing the following five requirements of participating school systems:

   1. High schools must make a definite commitment to move to career cluster tracks from the present tracking system which uses such terms as "Advanced-College Prep," terminal-general" or "remedial basic."

   2. It will be necessary to give "general education" a massive infusion of illustrations from the world of work.

   3. High school curriculums will need to be rebuilt around the Careers Cluster or family of occupations concept.

   4. Specific training for those thousands of occupations that do not require a bachelors degree for a job entry should be the responsibility of community colleges, apprenticeships programs, on-the-job training, or proprietory schools.

   5. Every school and community college must build highly integrated and greatly strengthened guidance programs.

2. Careers Cluster Concept

   An approach to teaching occupational preparation for a group or family of jobs requiring identical or similar skills and knowledges for workers to perform efficiently; holding that occupations may be classified into logically related groups on the basis of authentic identical or similar job characteristics; providing students with the basic entry level requirements for any job in the cluster or for a specialized post-high school occupational program (19, p. 5).

3. Agriculture Cluster

   Those related jobs grouped into a family of occupations

dealing with specifically agricultural occupational specialty courses: Animal Science, Soil Science, Plant Science, Agricultural Mechanics, Leadership Training and Personal Development, and Agriculture Business Management.

4. Occupational Specialty Courses

Those specific divisions or instructional areas that collectively make-up a Careers Cluster. Example: Agricultural Mechanics is one of six occupational specialty courses within the Agriculture Cluster.

5. Agricultural Mechanics

A term used to designate that segment of the agriculture cluster devoted to agricultural power, agricultural machinery, agricultural buildings and conveniences, agricultural electricity, agricultural shopwork and agricultural soil and water management.

6. Vocational Agriculture

A systematic program of instruction conducted under the Smith-Hughes and Goerge-Borden Acts of public school enrollees, out of school and post-high school youth, and established agriculturalists, organized for the purpose of improving agricultural methods and rural living.

7. Entry Level Skills

Those competencies which every student should acquire from a careers cluster in order to gain basic employment within that cluster's family of occupations.

8. Careers

Career deals with secondary school preparation for, or selection of a lifework, profession, occupation, or vocation.

9. World of Work

The world of work deals with acquainting the student with that which he must concern himself after completing school - that concerned with making a living.

10. Competencies

A competency is that knowledge, skill and ability that makes an employee more able to perform his duties while on the job.

11. Production Agriculture

The on-farm production of food and fiber, growing of plants, and the raising of animals is termed production agriculture. Persons employed in this field are generally referred to as farmers or ranchers.

12. Agribusiness

Businesses which are concerned with providing services

or products to farmers, or are concerned with the production, processing, transportation, storage, or distribution of farm products, are called agribusinesses. They are also commonly referred to as agriculture related business or Agriindustry.

13. Full-Time Production Agriculturalist (Farmer)

A person employed solely in the production of food and fiber, not employed in any off-farm job, is a full-time farmer.

14. Full-Time Agribusinessman

A full-time agribusinessman is a person employed solely in off-farm agriculture related jobs. He provides goods and or services to the farmer on a full-time basis.

15. Agriculturalist

Agriculturalist are those persons commonly referred to as either farmers or agribusinessmen. Employed either in production of food and fiber or in production of goods and services to the farmer.

Survey Terms Defined

1. Essential Competency

A competency which must be mastered by the student

in order to fulfill Agricultural Mechanics objectives.

2. Nice to Know Competency

   A competency which would be of some use to the student, but which is not essential in fulfilling Agricultural Mechanics objectives.

3. Unnecessary Competency

   A competency to which the student needs no exposure in order to fulfill Agricultural Mechanics objectives.

4. No opinion of this competency

   The observer is not familar with this competency, or has had no opportunity to observe this competency and thus does not care to express an opinion.

Limitations of the Study

This investigator assumes the following limitations of this study:

1. This investigation is limited specifically to the Agricultural Mechanics, occupational specialty course of the agriculture cluster.
2. Response from production farmers and agribusinessmen being surveyed in this study is limited to the actual surveys returned to the investigator. It must further be assumed that the survey used is a reliable and valid instrument.

3. The survey used in this study was limited in distribution to Jefferson County. Findings of this investigation may then be assumed valid only for Jefferson County Schools.
4. The survey used was limited to a ten percent, random sample, of fulltime production farmers and agribusinessmen in Jefferson County. It must be assumed that this sample is a valid representation of the agriculturalists in Jefferson County.
5. All survey instruments were organized in identical fashion. Varying the location of the six sections within the instrument may have produced a more reliable series of responses.

II. REVIEW OF RELATED LITERATURE

Technological change has, rather suddenly, thrown a dramatic challenge to this nations educational institutions. Though the full scope of this challenge may not be comprehended for years to come, its dimensions are now clear enough to call for a massive response on the part of American education. All levels of education, and particularly secondary and postsecondary education, must quickly move to assume greater responsibilities for preparing men and women for entry into the changing world of technological work. General education in the secondary school in America has been largely aimed at college preparatory. Too few people realize as Keller (16, p. 20) points out: "Ninety percent of American secondary education is traditional, and that tradition is frozen history." Helmick (11, p. 20) reports that:

> General Education has been weighed in the balance and found wanting. By no means can all the problems facing our great nation be attributed to the shortcomings of education, but without a doubt some of them can. It is suggested that education holds the key to the solution of many of the problems facing our nation today. In recent years there has been a great deal of study concerning the academic-vocational gap that has existed. Awakening the American public to the fact that culture and vocation are inseparable, is a difficult task.

Vocational education is special education for work as well as life. In America the most respected, and respectable single word is, work. "The dignity of work, and the virtue of a vocation may not be

in the operation itself but the personality of the worker in all the surrounding circumstances surrounding the work."

Kruger (17, p. 20) further supports the idea with these words:

> Environmental, technical, and social conditions change with the passage of time and the process of formal education must take these changes into consideration if it is to accomplish its purpose. The purpose of formal education then, is to endow the youth of a society with the skills, abilities, and competencies necessary to survive and participate in that society.

Exploring Agricultural Mechanics Competencies

Exploration of those competencies related to Agricultural Mechanics is essential before any priorities can be established. Once exploration is completed, priorities of individual competencies and instructional time may be formed.

Kahler (15, p. 13) reports that "specific agricultural skills, abilities, and understandings" are needed by both managers and employees in agriculturally related businesses, in order to carry out efficiently the functions of their jobs. Evaluations should be made of existing educational programs in public schools and in industry to determine what changes and or additions can be made to provide training for initial employment. These programs should provide practical farm experience and formal instruction in agriculture as well as instruction in the technical and business aspects.

Kahler (15, p. 13) further indicates that those "understandings, abilities, and skills taught in Agricultural Mechanics, management and in livestock and crops production are in the main those needed by males employed in distribution."

Robinson (21, p. 2-3) conducted an extensive study of competencies needed in farm machinery maintenance. The study included 87 competencies on 12 commonly used agricultural machines. It was felt that some instruction should be provided for all 87 competencies identified in the study, with more extensive training being provided for those competencies receiving higher need scores.

Maxwell (18, p. 1-14) investigated the agricultural competencies needed by males employed in wholesale farm machinery distribution. One hundred-fifty competencies were identified in two separate groups; those requiring an "understanding of," and those requiring an "ability to" perform. These competencies were then applied to the six primary employment sectors of the Farm Machinery business. Those sectors were:

1. Managers - General and Department
2. Product Education and Dealer Development
3. Sales
4. Parts and Services
5. Credit and Collections
6. Accounting and Clerical

Implications were then drawn as to the competencies needed by each employment sector.

A very comprehensive study is currently in progress concerning pedagogical requirements of vocational and technical teachers. Cotrell (4, p. ii-29) describes the study as containing ten different "categories" which are divided into 50 "clusters with 390 individual performance elements" or competencies listed in their respective cluster titles. The cluster titles, developed to facilitate communication, describe the general nature of a cluster of related elements.

Goldhammer (9, p. 32) indicates that "It would be deluding to think of the careers curriculum as a panacea for all our educational ills in this century." On the other hand, exploration of the careers cluster concept has the potential of providing a flexible curriculum, adaptable to the needs of individuals, directed toward realistic goals which conditions of our society require.

In order for a student to gain entry level competencies in Agricultural Mechanics he must first have a teacher who is intimately familiar with those same competencies. Johnson and Wacholz (14, p. 59-61) report that:

> With mechanization has come new responsibilities for vocational agriculture teachers in selecting understandings and abilities which should be taught in Agricultural Mechanics. Accompanying these new responsibilities is a higher degree of competence in Agricultural Mechanics needed by teachers.

The study lists 34 specific competencies, related to farm power and machinery, which teachers should be prepared to teach.

The state of Arizona (5, p. ii-158) has produced a basic guide for use in the first two years of the vocational Agriculture program. This guide contains competency oriented instructional units in 16 basic areas, and:

> is largely concerned with the development of basic shop skills, learning and proper use of tools and materials, and the development of good work habits. This guide will provide a broad base of mechanical knowledges, skills, and abilities upon which the student may base his advanced mechanics studies, whether pursuing Production Agriculture, or Agribusiness as an occupation.

The Occupational Cluster Guide for Agriculture in Oregon (19, p. 77-103) proposes a complete Vocational Agriculture program. The Agricultural Mechanics section of this guide is divided into seven basic sections; which in turn are divided into three sections each: "Required Knowledge and Skills," "The Student Can Do," and "Suggested Learning Activities."

> It is suggested that (19, p. 12) this guide is designed to provide qualified teachers with a compilation of recommended competencies and learning activities which will prepare students for entry-level employment or advanced training in an Agricultural occupation. The knowledge and skill items are grouped into logical subject matter or instructional areas. It will be the teachers responsibility to organize the material to assume that the needs of the individual will be met.

Priority of Agricultural Mechanics Competencies

Goldhammer (9, p. 32) reports that:

> Projection of sequences of occupational exploratory activities need to be carefully made. Conceptulization of the structure of occupations, including functions, fields, clusters, and specific occupations must be developed and made useful in terms of the vocational options available to youth.

Small schools often encounter problems in financing vocational programs. Agricultural Mechanics involves basically the same facilities and equipment in both large and small school programs. Copes (3, p. 142) points out that priorities in small school programs can be broadened considerably in combining instruction, equipment and facilities of such courses as Agricultural Mechanics, Small Engines, Power Mechanics and Auto Mechanics. Semester courses can be designed to teach related competencies in all mechanics courses, where there are overlapping learning activities.

In a Kansas study conducted by Eck (6, p. 280) it is pointed out that:

> There is an expanding need for instruction in farm power and machinery. The trend to larger farms coupled with the demand for bigger and more complicated machinery has brought about an increased volume of business for farm machinery dealers. The demand for immediate delivery of new machines and for quick repair and servicing of old machines has increased the need for more skilled workers in the area of farm power and machinery.

The study listed 59 competencies considered to be important, very important, or essential for employment in the farm machinery business.

The maintenance of quality vocational agricultural programs becomes increasingly more difficult as the priorities established in the past become obsolete or are superseded by new priorities. Thomas (23, p. 36-37) indicates that:

> Priorities are based on a variety of values or objectives. When an administrator looks at the priority of a program, he most likely asks:
> 1. How important is each aspect of this program in comparison to each of the other programs in the school?
> 2. How much time should be alloted to this program?
> 3. How much money should be alloted to this program?
> 4. How much space should be allocated for this program?

In order to have lasting credibility, a program planner's priorities must be based on objective educational goals. Data needed by the agricultural planner to establish objective educational goals on which his priorities should be based include:

- Local, state and national employment opportunities in the various areas of Agriculture.
- Measures of student interest in Agriculture, preferably obtained by use of an interest inventory.
- Measures of support in the form of advisory committee minutes.
- Indication that the Agricultural industry of the community will support the program, e.g., their willingness to accept and pay students for placement experience.

-- Information regarding the necessary skills that employees need for entry-level in the various Agricultural occupational areas.

-- Information regarding the funding patterns of the state department of vocational and technical education.

-- Information concerning the type of educational program that will be needed to meet the educational objective.

With this type of data at hand the program planner is prepared to give sound reasons why a program should exist rather than based on what he thinks.

Revision of Agricultural Mechanics Instruction

The Careers Cluster Concept requires revision of current curriculum practices. Goldhammer (9, p. 10) points out that:

> It is possible to build a functionally relevant curriculum for each learner, helping him acquire the depth of knowledge about culture, society, the physical world, and man within it, by centralizing the focus on man's vocational career. A central issue in a modern school curriculum is that of giving it a direction which indicates a point in time toward which the educational experience is heading. That point in time is the one at which the individual becomes fully engaged in a vocation of his choice. All realms of knowledge can be brought into the curriculum with respect to this unified theme and perspective. Specific curricular patterns on all grade levels need to be explored.

Shry (22, p. 265) reports that development or revision of "an educational program . . . should be developed on the basis of the competencies deemed important by businessmen in the industry." Applied to Agricultural Mechanics, this would include competencies deemed important by both production farmers and agribusinessmen.

A study conducted in Iowa by Hoerner and Bundy (12, p. 28) showed results concerning electricity competencies needed by farmers. A panel of specialists in farm electricity collaborated in the construction of a questionnaire which included 18 electrical understandings and 26 abilities, pertaining to electrical work on the farm. The questionnaire was presented to Iowa farmers who were requested to indicate the degree of competence they possessed for each item. From the study 12 "Understandings Most Needed" and 11 "Abilities Most Needed" were specified.

There are several factors which should be considered when determining the scope and sequence of Agricultural Mechanics programs. Fog and Bear (8, p. 290) list five factors of concern:

1. Availability of needed tools
2. Utilization of the shop
3. Amount of floor space available
4. Enrollment in the program
5. Credits available in multiple period classes

Recommendations are given concerning the minimal needs of each of these five factors.

With decreasing numbers of production farmers and increasing numbers of agricultural related businesses, emphasis in vocational agriculture instruction must be shifted in the same direction. Faulkner (7, p. 276-277) proposes a comprehensive curriculum which

would shift emphasis from farming to agribusiness. Recommendations are given in each primary area of vocational agriculture instruction for grades seven through twelve. Recommendations range from familiarization with "the world of work" at grade seven, to job entry-level skills at graduation.

Albracht (1, p. 304-305) states that: "To plan an effective instructional program three major dimensions must be considered: "The student; the teacher; and the instructional materials." The student dimension involves a consideration of all of the students who will be involved in the program. The teacher input involves not only competence in teaching and technical competence; it also includes a sincere and dedicated effort to provide the best instructional program which is possible. Instructional materials dimension is unfortunately dictated primarily by the elements of time and money. Other considerations for the evaluation of the program should include, "an analysis of the cultural and societal changes that occurred during the year which might affect the students and industry involved in the educational program." Relevant technological changes which have evolved should be incorporated into the instructional program.

Summary

Teachers of vocational Agriculture in the surging 70's have many of the greatest opportunities that have been given to educators.

It is up to them to decide if they will "hold the class," "give the lesson," or "inspire the pupils." The student is of paramount importance; they must be taught to seek facts, analyze situations, and be encouraged to THINK.

The literature reviewed and summarized in this chapter reveals the need for a comprehensive study of competencies in agricultural mechanics, in order to arrive at priorities for instructional programs.

III. PROCEDURES OF THIS STUDY

Locale

The instrument portion of this study was conducted entirely within the boundaries of Jefferson County. The primary source of income within Jefferson County is agriculture, as it relates to agribusiness, production agriculture and forestry. Production agriculture ranges from intensively cultivated, irrigated areas in the central portion of the county to dryland grain and livestock operations outside the irrigated areas. Forestry operations are located primarily along the western edge of the county, bordering the Cascade Mountains. Three centers of population are located in the county at Madras, Warm Springs, and Culver. Two High Schools, located at Madras and Culver, are operated in Jefferson County. A more detailed background of the County can be found in Chapter I of this study.

Background

This investigation was designed with the primary objective of bringing some degree of order and priority to those competencies related to Agricultural Mechanics. Through this primary objective, a comprehensive exploration of those Agricultural Mechanics competencies needed by graduates of Jefferson County schools is achieved. From this achievement it is then possible to suggest some revisions

to Agricultural Mechanics course content. Krueger (17, p. 70) in his study of mechanical technology in Agriculture, recommends that further studies be carried out.

Methods of Gathering Data

Data was gathered primarily in the following ways:

1. By reviewing similar graduate studies conducted at Oregon State University and other Universities having Agricultural Education Departments.
2. By review of professional journals within the field of Agricultural Education. The primary source concerned was the Agricultural Education magazine.
3. By review of recent national studies concerning Vocational teacher competencies and Career Cluster Concepts.
4. By review of texts written on the subject of Agricultural Mechanics.
5. By a survey entitled, "Agricultural Mechanics Competencies Survey." The primary source of information for this survey was the, Occupational Cluster Guide for Agriculture.

Development of the Study

Development of the original survey was accomplished primarily from an Agricultural Mechanics competency list compiled by Mr.

Leno V. Christensen of the Department of Agricultural Engineering, Oregon State University. Revision of the survey was made through careful study of the Agricultural Mechanics portion of the Occupation Cluster Guide for Agriculture, compiled by the Oregon Board of Education. The survey was then mimeographed and distributed to the two Research Procedures classes, (Ed. 512) under the direction of Dr. Jack V. Hall. Many helpful suggestions were given, which were then incorporated into the final draft of the survey.

When completed the survey (Appendix II) contained 83 specific competencies under the following six divisions:

I. Power Basic to Agriculture:

II. Agricultural Machinery:

III. Buildings and Conveniences Basic to Agriculture:

VI. Electricity Basic to Agriculture:

V. Shop-Work Basic to Agriculture:

VI. Soil and Water Management Basic to Agriculture.

The survey was organized for rapid expression by the respondent. A simple four number system was devised, whereby the respondent need only circle the number which most nearly expressed the opinion of each competency listed. The number code was explained as follows:

4 -- ESSENTIAL that this competency be mastered by the student.

3 -- NICE TO KNOW this competency, but not vital.

2 -- UNNECESSARY to include this competency in the program.

1 -- NO OPINION, not familiar with this competency.

The survey remained open ended through use of a section entitled "OTHER NEEDED COMPETENCIES" (Appendix III) which was placed at the end of each of the six divisions of the survey. Thus space was provided in six locations throughout the survey, where the respondent could add competencies of particular relevance to Jefferson County. The respondent was strongly encouraged to use this section to add local relevance to the study.

The sample to be surveyed was taken from the approximately 450 full time farmers and 90 full time agribusinessmen in Jefferson County. County Agricultural Agent, Julius F. Binder compiled the names from which a ten percent sample was systematically selected. Approximately every tenth name was taken from the compiled list. This selection spread the 56 surveyees geographically over the entire county.

Distribution of the survey was accomplished through personal delivery of one, numbered survey to each selected respondent. Personal delivery and explantion was used in the hope of obtaining a near perfect return of the surveys. Delivery of all surveys was accomplished between July 15, 1971 and August 1, 1971.

A pre-addressed, stamped envelope was provided with each survey, so that the survey could be mailed back to the surveyer. Each survey was numbered upon delivery, and a record was maintained on the return date of each. Respondents not returning their survey within one week of delivery, were called by phone and requested to complete and return the survey.

As individual surveys were returned a compilation sheet was used to record the response to each of the 83 competencies. From this compilation sheet findings were determined.

Mean Score Computation

Mean scores were computed for each of the 83 agricultural mechanics competencies listed on the survey instrument. All responses were recorded prior to computation of mean scores. The numerical opinion code on the survey instrument made quick tallying of responses possible. Several steps were involved in computing the mean scores for each individual competency. The steps involved were as follows:

1. Count the number of "essential" opinion code responses indicated by the numeral "4" on the instrument.
2. Count the number of "nice to know" opinion code responses indicated by the numeral "3" on the instrument.
3. Count the number of "unnecessary" opinion code responses indicated by the numeral "2" on the instrument.
4. Count the number of "no opinion," opinion code responses, indicated by the numeral "1" on the instrument.

5. Count the number of "no response," given by the respondents. (Indicated by the letter "X" on compilation sheet).
6. Count the total number of responses, given or failed, in steps one through five above. This number had to equal 52 or the procedure was repeated until the entire 52 survey responses were accounted for.
7. The opinion code numbers 4, 3, and 2 were then multiplied by the number of responses for each, yielding 3 separate products.
8. The three products computed in step 7 were added together and divided by the sum of the opinion code responses for the numerals 4, 3, and 2. The opinion code responses for the numeral 1 (No opinion) were not considered. The above division produced the mean score. This process was repeated for each of the 83 competencies involved.

Mean Score--Specialty Courses

Average mean scores were also computed for each of the six occupational specialty courses within agricultural mechanics. The steps involved were as follows:

1. Add the mean scores of all competencies within that specialty course.
2. Divide that sum by the number of competencies in that specialty course.

This process was repeated for each of the six courses, producing an average mean score for each.

Opinion Code Application

The opinion code (essential, nice to know, unnecessary) was applied to each of the 83 competencies and six occupational specialty

courses. Opinion code application was made by way of the mean score. Those competencies with highest mean scores were rated essential and those with lowest mean scores were rated unnecessary. The opinion code scale was arbitrarily determined prior to the beginning of the study, by a panel made-up of Dr. Philip B. Davis, Mr. Leno V. Christensen and Mr. John D. Oades. The opinion code scale follows:

Essential Competency	4.000 - 3.500	Mean Score
Nice to Know Competency	3.499 - 3.100	Mean Score
Unnecessary Competency	3.099 - 2.000	Mean Score

Determining Rank Order

The 83 individual competencies and six occupational specialty courses were placed in rank orders. Rank order was determined by the mean score. That competency with the highest mean score received the highest rank order number of one. That competency with the lowest mean score received the lowest rank order number of 63. Competencies with identical mean scores received identical rank order numbers. Occupational specialty courses were ranked 1 to 6 by average mean score.

Other Needed Competencies

Survey respondents were asked to write in any "other needed competencies" at the end of each of the six occupational specialty areas of the instrument. These agricultural mechanics competencies suggested were compiled by occupational specialty course, and may be found in Appendix III.

A brief follow-up letter (Appendix IV) was sent to all survey respondents. This letter informed them of high and low ranking competencies and contained a rank order listing of the six occupational specialty courses.

Summary

The instrument used in this study was applied only to full time production farmers and agribusinessmen in Jefferson County, Oregon. The primary purpose of this instrument was to establish a priority among 83 Agricultural Mechanics competencies. Data gathered in this study came primarily from five resource areas. Competencies listed in the survey instrument were listed under six divisions common to Agricultural Mechanics. The instrument used a four number, quick opinion response scale. Mean scores and rank orders were computed for the 83 competencies and six occupational specialty courses.

IV. PRESENTATION OF DATA

In modern careers education, instructors are striving to provide students with job entry-level skills. In order to provide these competencies, educators are forced to attach priorities to instructional units within their curriculum. Those units containing most needed competencies must be given some preference over other instructional units.

Educators have called upon related industry not only to help identify entry level skills, but to help rank these skills into some order of importance. Once skills are ranked instructors can make certain that "essential" competencies are learned, while less important competencies are taught as time allows. In so doing, some skills are normally found to be of little or no current value, and are thus excluded.

This study surveyed 83 selected agricultural mechanics competencies in Jefferson County, Oregon, in an attempt to place priority (rank) on each competency.

Explanation of Tables

The tables to follow show the Agricultural Mechanics competencies which fell into each of the three opinion areas: "Essential," "Nice to Know" and "Unnecessary." As explained in Chapter 3 (p. 32),

competencies were placed into these three categories according to their mean score. The mean score value code was arbitrarily determined prior to compilation of the mean scores. Competency mean score values were coded as follows:

Essential Competency	4.000 - 3.500	Mean Score
Nice to Know Competency	3.499 - 3.100	Mean Score
Unnecessary Competency	3.099 - 2.000	Mean Score

The competencies are listed in rank order, as determined by their mean score. The mean score is shown as a four digit number, in column two. The third column shows the individual competency number. This number reflects each competency's location among the 83 total competencies on the total survey instrument.

The last column shows the section of the survey instrument in which that competency was found. The survey was divided into the six numbered sections shown below. The abbreviations, shown in parenthesis, are identical to those in the last column of the tables.

Section (I. Power) - Power Basic to Agriculture

Section (II. Mach.) - Agricultural Machinery

Section (III. Bldg. - Conv.) - Buildings and Conveniences Basic to Agriculture

Section (IV. Elec.) - Electricity Basic to Agriculture

Section (V. Shop) - Shop Work Basic to Agriculture

Section (VI. Sls - Water) - Soils and Water Management Basic to Agriculture

The Essential Competencies

Table 2 (Essential Agricultural Mechanics Competencies) contains 47, or 56.6% of the total 83 competencies identified. All 47 competencies were listed within 33 rank order numbers. This was true due to identical mean scores on several competencies. Competencies with identical mean scores were given the same rank order number.

A very simple competency, "Servicing air cleaners," surprisingly earned the first rank order number. This being typical of industry requests to "teach the basics first." All arc and oxy-acetylene welding competencies ranked very high, between 10th and 16th place.

Eighty-three percent, or 15 of the 18 competencies listed in Section I of the survey (Power Basic to Agriculture) were ranked essential. At the same time nine of the first 14 competencies listed, were from the same section. In contrast 13 of the last 16 essential competencies came from Section V (Shop Work Basic to Agriculture). Section III (Buildings and Conveniences Basic to Agriculture) was the only section without any competencies ranked as essential.

Nut and bolt threading (Tap and die) ranked 33, last of the essential competencies.

Table 2. ESSENTIAL - Agricultural Mechanics Competencies. Listed in Rank Order.

Rank Order Number	Mean Score	Competency Number	Competency	Survey Section
1	3.923	4	Service air cleaners (Dry and oil bath)	I. Power
2	3.903	21	Maintain agricultural machinery (lubricate, minor repairs)	II. Mach
3	3.884	19	Use operators manual	II. Mach
3	3.884	5	Change oil and filter	I. Power
4	3.862	15	Operate tractor in field and on the road (shift, brake, maneuver, park)	I. Power
5	3.860	9	Maintain equipment service log (oil changes, antifreeze, filters grease)	I. Power
6	3.846	13	Couple PTO shaft	I. Power
6	3.846	12	Correctly hitch farm implements (3-point hitch, drawbar)	I. Power
6	3.846	10	Conduct daily pre-operational check and maintenance (oil, fuel, water, transmission, lubrication, air pre-cleaner)	I. Power
6	3.846	23	Calibrate agricultural machinery (grain drill, fertilizer spreader, sprayer)	II. Mach
7	3.826	14	Couple hydraulic lines	I. Power
7	3.826	22	Adjust agricultural machinery (plow, swather, planter)	II. Mach
8	3.803	63	General electric arc welding	V. Shop
9	3.769	11	Follow recommended machine starting procedures	I. Power
10	3.764	81	Operate irrigation pump	VI. Sls-Water
10	3.764	67	Arc weld in all positions well enough to repair ag machinery	V. Shop

Table 2. Continued.

Rank Order Number	Mean Score	Competency Number	Competency	Survey Section
11	3.750	70	Oxy-Acetylene cut, braze and weld mild-steel	V. Shop
11	3.750	64	Identify common metals	V. Shop
11	3.750	65	Prepare metal for welding	V. Shop
12	3.745	68	General oxygen-acetylene welding	V. Shop
12	3.745	50	Select and use general hand tools	V. Shop
13	3.734	83	Handle furrow irrigation system (shovel, siphons)	VI. Sls-Water
13	3.734	82	Change irrigation pipe (hand lines, wheel lines)	VI. Sls-Water
14	3.730	69	Set-up and operate oxy-acetylene equipment	V. Shop
15	3.723	66	Select proper arc welding electrode for job being done	V. Shop
16	3.705	18	Properly store and care for fuels and grease products	I. Power
16	3.705	3	Maintain and operate large gasoline or diesel engines	I. Power
17	3.686	57	Select and use general power tools	V. Shop
17	3.686	1	Identify engine components and systems (pistons, valves: electrical, cooling)	I. Power
18	3.673	25	Winterize agricultural machinery	II. Mach
19	3.666	44	Repair or replace electrical parts (fuse, switch, outlets, cords)	VI. Elec
20	3.660	76	Fit and sharpen various cutting tools (chisels, planes, drills)	V. Shop
21	3.653	56	Use measuring and marking tools (tapes, squares, awl, center punch, micrometer, feeler gauges)	V. Shop
22	3.620	58	Use power drills (portable, drill press)	V. Shop

Table 2. Continued.

Rank Order Number	Mean Score	Competency Number	Competency	Survey Section
23	3.615	8	Maintain and clean engine cooling system	I. Power
24	3.568	54	Use hand drills (wood auger and brace, expansion bits)	V. Shop
25	3.557	55	Use screwdrivers (slotted, phillips)	V. Shop
25	3.557	6	Adjust carburetor (idle and load needle valves, idle speed)	I. Power
26	3.549	51	Use handsaws (crosscut, rip, compass, coping, hacksaw)	V. Shop
27	3.538	52	Use hammers (claw, ball peen, sledge)	V. Shop
28	3.530	72	Repair and install water pipe	V. Shop
29	3.529	59	Use power saws (table, radial arm, chain, etc.)	V. Shop
30	3.525	62	Use power grinders (portable, pedestal)	V. Shop
31	3.520	71	Solder sheetmetal joints and electric wire	V. Shop
31	3.520	73	Measure, cut, ream and thread galvanized pipe	V. Shop
32	3.509	2	Maintain and operate small gas engines (2 and 4 cycle, lawnmower type)	I. Power
33	3.500	75	Use common tap and die equipment	V. Shop

Several additional agricultural mechanics competencies were suggested by the survey respondents. Many have merit for program inclusion. A list of these suggested competencies can be found in Appendix III.

The Nice to Know Competencies

Thirty-two percent, or 27 of the 83 agricultural mechanics competencies identified, were deemed "Nice to Know." All 27 competencies were contained in 20 rank order numbers, 34 through 54. Once again the number difference was due to identical mean score numbers being given the same rank order number.

Ten of the 14, or 71.5%, of the competencies in Section III (Buildings and Conveniences Basic to Agriculture) were rated as nice to know. Smallest contributions to the nice to know section were shared by Section I (Power Basic to Agriculture) and Section V (Shop Work Basic to Agriculture), each contributing 16.6% of their competencies. No evidence of any section concentration in any one area of the order could be found.

This observer found three "Nice to Know" competencies unexpectedly low in the rank order. They were: rank ordered 41--tune-up, 49--prepare a bill of materials, and 51--taking soil samples. Considering the common use of these competencies they had an unusually low rank.

Table 3. NICE TO KNOW - Agricultural Mechanics Competencies, Listed in Rank Order.

Rank Order Number	Mean Score	Competency Number	Competency	Survey Section
34	3.490	24	Operate ag machinery in the field (tractor, tillage, planting, harvesting equipment)	II. Mach
35	3.442	16	Operate and service hydraulic attachments (cylinders, power steering)	I. Power
36	3.437	35	Repair an agricultural building (replace siding and roofing)	III. Bldg-Conv
37	3.403	26	Recondition and return to proper condition one or more ag machines	II. Mach
38	3.400	53	Use planes (jack, block)	V. Shop
38	3.400	79	Survey contours and ditches	VI. Sls-Water
38	3.400	74	Cut and splice plastic pipe	V. Shop
39	3.387	27	Identify common building materials used in ag buildings	III. Bldg-Conv
40	3.374	36	Select fencing materials for specific purpose	III. Bldg-Conv
41	3.346	7	Adjust and replace engine ignition system parts (sparkplugs, points, condensor, timing)	I. Power
41	3.346	34	Compute storage volume of barns, silos, bins	III. Bldg-Conv
42	3.333	78	Differential leveling (survey difference in elevation between two points)	VI. Sls-Water
42	3.333	77	Use general surveying equipment	VI. Sls-Water
43	3.320	28	Interpret simple building plans (prepare bill of materials, compute costs)	III. Bldg-Conv

Table 3. Continued.

Rank Order Number	Mean Score	Competency Number	Competency	Survey Section
44	3.319	47	Interpret project plans and sketches	V. Shop
45	3.311	46	Maintain electric motors (clean, minor repairs, install switch)	IV. Elec
46	3.294	45	Select electric motors for various uses	IV. Elec
47	3.260	37	Treat posts and erect board and wire fences	III. Bldg-Conv
48	3.230	17	Figure belt and pulley sizes and their speeds	I. Power
49	3.220	49	Prepare a bill of materials on a proposed project	V. Shop
50	3.215	29	Use farm level to stake building corners	III. Bldg-Conv
51	3.187	80	Take soil samples and make soils map	VI. Sls-Water
52	3.160	33	Construct small frame building	III. Bldg-Conv
52	3.160	31	Construct forms for a concrete slab or footing	III. Bldg-Conv
52	3.160	43	Plan, purchase and install an electrical circuit containing switches, outlets, fixtures, and ground according to code	IV. Elec
53	3.154	61	Use power sanders (belt, orbital, disc)	V. Shop
54	3.122	38	Compute area for applying paint or preservatives	III. Bldg-Conv

The Unnecessary Competencies

Only nine competencies fell in the unnecessary category. This represents 10.8% of the total 83 competencies. All were included in nine rank order numbers, 55 through 63. Unlike the other opinion sections there was no overlap in rank order numbers, as there were no identical mean score numbers. The total 83 competencies were covered by 63 rank order numbers due to overlapping mean scores.

Section IV (Electricity Basic to Agriculture) was the largest percentage contributor to the unnecessary section, giving two of its six competencies or 33.3%. These were the last two competencies in the rank order numbers 62 and 63. Neither Section I (Power Basic to Agriculture) nor Section VI (Soil and Water Management Basic to Agriculture) yielded any competencies to this opinion section. Section III (Buildings and Conveniences Basic to Agriculture) gave four of the nine or 44.4% of the unnecessary competencies.

Three of the nine unnecessary competencies were surprises to this observer. They include rank order numbers: 56--draw-up a proposed project, 58--order, pour and finish concrete, and 63--use a rate schedule to figure an electric bill. Higher rankings were expected of these competencies.

Table 4. UNNECESSARY - Agricultural Mechanics Competencies, Listed in Rank Order.

Rank Order Number	Mean Score	Competency Number	Competency	Survey Section
55	3.085	40	Plan a waste disposal system for a farm home or livestock enterprise	III. Bldg-Conv
56	3.063	48	Draw up proposed building project, showing various views	V. Shop
57	3.061	39	Select paint, prepare surface and apply paint for a specific purpose	III. Bldg-Conv
58	3.060	32	Order, pour and finish concrete for a walk, slab, or footing	III. Bldg-Conv
59	3.040	60	Use jointer or thickness planer	V. Shop
60	3.000	20	Assemble new agricultural machinery	II. Mach
61	2.971	30	Install batter boards for a building	III. Bldg-Conv
62	2.963	42	Construct an electrical use diagram for a farm	IV. Elec
63	2.897	41	Use a rate schedule to figure an electric bill	IV. Elec

The Agricultural Mechanics Specialty Courses

Table 5 gives perspective to the six occupational specialty courses within agricultural mechanics. These six courses are listed in rank order. The rank order was determined by average mean score of each course section. Column 3 gives the opinion code of each of the six course sections. The opinion code was determined by the same scale used on the individual competencies (pg. 36). These course sections with average mean scores of 4.000 to 3.500 fall in the "essential" range of the opinion code (marked "E"). Those sections with average mean scores of 3.499 to 3.100 rank in the "nice to know" range (marked "NK").

The Roman numeral preceeding each course section indicates the location of that section in the survey instrument. The number following each course section indicates the number of individual competencies surveyed under that title, totaling 83.

The last three columns give the number of competencies in each opinion code, for each specialty course section. Corresponding percentages are found beneath in parenthesis.

There is a notable preponderance of competencies in the "essential" area in course Sections I, II and IV. Well over half of the competencies in each of these sections was found essential. Forty-three individual competencies are covered in these three areas alone.

Table 5. Agricultural Mechanics Specialty Courses, Listed in Rank Order.

Rank Order	Average Mean Score	Opinion Code		Agricultural Mechanics Specialty Courses		Number of Competencies in each opinion code (% in each) Essential	Nice to Know	Unnecessary
1	3.669	E	I.	Power Basic to Agriculture	(18)*	15 (83.2)	3 (16.6)	0 (0)
2	3.628	E	II.	Agricultural Machinery	(8)*	5 (62.2)	2 (25.0)	1 (12.4)
3	3.543	E	V.	Shop Work Basic to Agriculture	(30)*	23 (76.6)	5 (16.6)	2 (6.6)
4	3.497	NK	VI.	Soil and Water Management Basic to Agriculture	(7)*	3 (42.8)	4 (57.1)	0 (0)
5	3.215	NK	IV.	Electricity Basic to Agriculture	(6)*	1 (14.2)	3 (50.0)	2 (33.3)
6	3.212	NK	III.	Buildings and Conveniences Basic to Agriculture	(14)*	0 (0)	10 (71.5)	4 (28.5)
					83**	47**	27**	9**

* Number of competencies in that specialty course.
** Totals.

Equally notable is the preponderance of "nice to know" competencies in Sections VI, IV, and III. Again 50% or more of the individual competencies in each of the three course sections, are covered. A total of 17 individual skills are ranked in the above three sections.

No occupational specialty course sections ranked so low in average mean score, as to be rated as an unnecessary section.

Data Summary

Priorities are vital in curriculum planning, if essential job entry-level competencies are to be covered in crowded instructional time.

Eighty-three agricultural mechanics competencies were surveyed in Jefferson County, Oregon. Forty-seven of these competencies were found to be "essential," 27 were found to be "nice to know" and 9 competencies were found to be unnecessary. Thus priorities may be determined.

V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The Oregon Occupational Cluster Guide for Agriculture contains six occupational specialty courses, of which agricultural mechanics is one. In vocational agriculture classes, 1/4 to 1/3 of in-class time is used in the study of agriculture mechanics. Some 83 individual competencies can be identified from the above cluster guide, within the area of agricultural mechanics.

A problem exists then in knowing which competencies are commonly needed by vocational agriculture graduates of Jefferson County schools. Further a problem exists in knowing which competencies should have highest priority for use of instructional time.

The study procedure entailed massing information from a number of sources. These sources included review of: Similar graduate studies, related professional journals, national studies in career cluster teaching competencies, related written texts, the Oregon Occupational Cluster Guide for Agriculture, and a survey entitled "Agricultural Mechanics Competencies Survey."

The survey instrument identifies some 83 individual competencies, in six occupational specialty course areas of agricultural mechanics. It was distributed to 10 percent of all full-time production farmers and full-time agribusinessmen in Jefferson County.

Respondents were asked to classify each competency as being Essential, Nice to Know or Unnecessary. Respondents were encouraged to add local relevance to the survey by writing in additional competencies at the end of each specialty section. (A compiled listing of "Other Needed Competencies" may be found in Appendix III.) Fifty-six surveys were distributed, 52 were returned completed, for a 93% return.

The surveys were compiled and mean scores computed for each individual competency. The competencies were then classified as being Essential, Nice to Know, or Unnecessary, according to a predetermined mean score scale. Forty-seven competencies were classified as essential, 27 as nice to know and only 9 as unnecessary. The 83 competencies were then placed in rank order according to mean score. Finally the six occupational specialty courses within agricultural mechanics were placed in rank order according to average mean score for the group. The opinion code was applied to these same six groups, with three of the specialty courses being classified as essential and three being classified as nice to know.

Conclusions

Based on the study the following conclusions were developed:

1. That agricultural mechanics competencies needed by the

vocational agriculture graduates of Jefferson County schools can be identified and ranked.

2. That there is a pressing need for agricultural mechanics competencies rated "essential" to be taught in Jefferson County vocational agriculture programs.
3. That there is some need for agricultural mechanics competencies rated "nice to know" to be included in the vocational agriculture programs of Jefferson County, as instructional time is available.
4. That there is very little or no need for agricultural mechanics competencies rated "unnecessary" to be taught in Jefferson County school, vocational agriculture programs.
5. That competencies rated "unnecessary" may be taught when an individual student need exists.
6. That there is a need to give priority to agricultural mechanics competencies with highest rank order and greatest local importance, when agricultural mechanics instructional time is limited.
7. That there is a need to give instructional consideration to occupational specialty courses within agricultural mechanics, in the following rank order, in Jefferson County vocational agriculture programs:

1st - Section I - Power Basic to Agriculture

2nd - Section II - Agricultural Machinery

3rd - Section V - Shop Work Basic to Agriculture

4th - Section VI - Soil and Water Management Basic to Agriculture

5th - Section IV - Electricity Basic to Agriculture

6th - Section III - Buildings and Conveniences Basic to Agriculture

8. That the least amount of variability in opinion code response was shown on those competencies rated as "essential."

9. That there is a need to give priority to those competencies related to welding processes, being the only closely related group of competencies all in close proximity in the rank order.

Recommendations

Based upon the study, and the subsequent conclusions, the following recommendations are submitted:

1. That Jefferson County schools base the priority of the agricultural mechanics instruction upon coverage of "essential" competencies first, "nice to know" competencies as time and need allows, and "unnecessary" competencies only in cases of special need.

2. That Jefferson County schools give consideration to the rank order of both individual competencies and occupational specialty courses in planning agricultural mechanics instruction.
3. That all vocational agriculture programs be based around competency surveys, as related to the Oregon Occupational Cluster Guide for Agriculture.
4. That statewide competency surveys be conducted in each of the six occupational specialty course areas of the Oregon Occupational Cluster Guide for Agriculture.
5. That local or county agricultural competency surveys be conducted to give local emphasis and relevance to the vocational agriculture programs.
6. That due to the dynamic changing nature of the agricultural industry, that agricultural competencies be reviewed and updated every five years.

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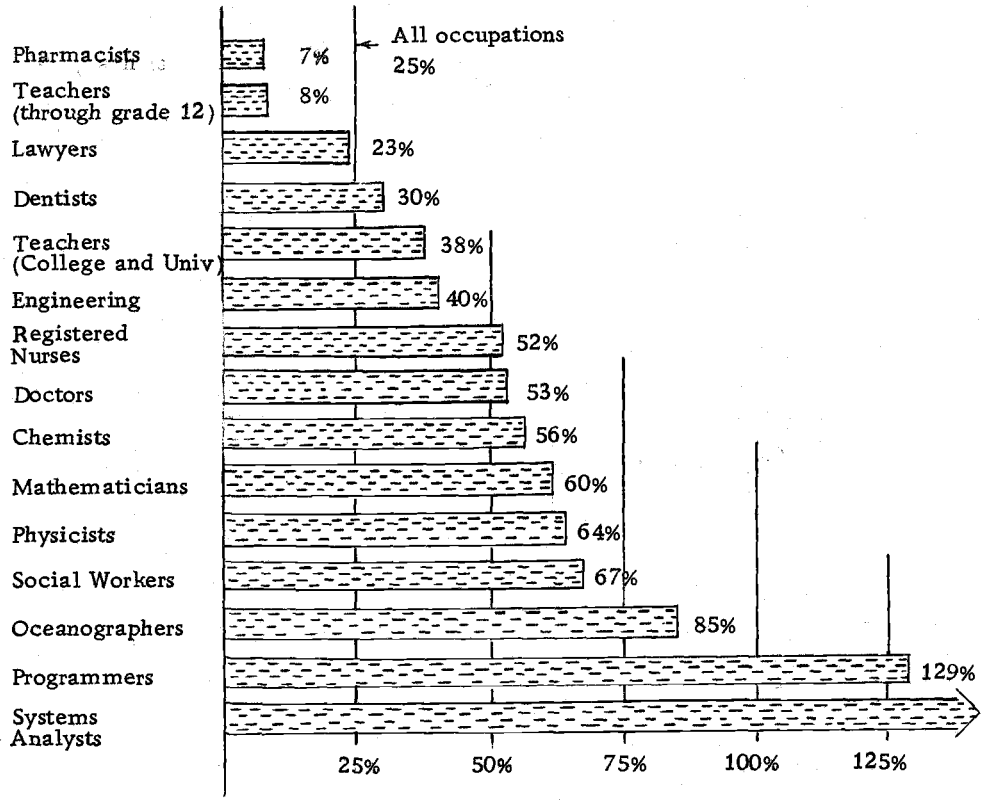
APPENDICES

APPENDIX I

JOB GROWTH FORECAST



Programmers and systems analysts are skilled occupations not requiring traditional four year college preparation.

Source: Time 97 (21):49-59. May 24, 1971.

APPENDIX II

AGRICULTURAL MECHANICS COMPETENCIES SURVEY

This survey is being conducted to assist teachers of Vocational Agriculture in making needed changes in the content of Vo Ag courses. The list below contains 82 competencies related to Agricultural Mechanics. Your opinion concerning the importance, or the lack of importance, of each competency, will be of great value in revising the Ag Mechanics portion of the Vo Ag curriculum.

To enable you to express your opinion rapidly, a simple number system has been devised. As you read through the survey, you need only circle the number which most nearly expresses your opinion of each competency. The numbered choices represent the following opinions:

4 -- ESSENTIAL that this competency be mastered by the student.

3 -- NICE TO KNOW this competency, but not vital.

2 -- UNNECESSARY to include this competency in the program.

1 -- NO OPINION, not familiar with this competency.

This survey is divided into the six major divisions of Ag Mechanics. At the end of each division you are given an opportunity to add competencies which you feel should be included in the program, but which are not listed in the survey. This section will be marked "OTHER NEEDED COMPETENCIES." You are encouraged to use this

section of the survey, so that competencies vital to our portion of the state may be added to the survey.

(1)

Please circle only one number following each competency.

	ESSENTIAL	NICE TO KNOW	UNNECESSARY	NO OPINION
I. POWER BASIC TO AGRICULTURE:				
1) Identify engine components and systems (pistons, valves: electrical, cooling)	4	3	2	1
2) Maintain and operate small gas engines (2 and 4 cycle, lawnmower type)	4	3	2	1
3) Maintain and operate large gasoline or diesel engines (tractor, truck)	4	3	2	1
A) Service air cleaners	4	3	2	1
B) Change oil and filter	4	3	2	1
C) Adjust carburetor idle and load needle valves, idle speed)	4	3	2	1
D) Adjust and replace ignition system parts (sparkplugs, points, condensor, timing)	4	3	2	1
E) Maintain and clean cooling system	4	3	2	1
F) Maintain equipment service log	4	3	2	1
4) Conduct daily pre-operational check and maintenance (oil, fuel, water, transmission, lubrication, air pre-cleaner)	4	3	2	1
5) Follow recommended starting procedures	4	3	2	1
6) Correctly hitch farm implements (3-point hitch, drawbar)	4	3	2	1
A) Couple PTO shaft	4	3	2	1
B) Couple hydraulic lines	4	3	2	1

(2)

	ESSENTIAL	NICE TO KNOW	UNNECESSARY	NO OPINION
7) Operate tractor in field and on the road (shift, brake, maneuver, park)	4	3	2	1
8) Operate and service hydraulic attachments (cylinders, power steering)	4	3	2	1
9) Figure belt and pulley sizes and their speeds	4	3	2	1
10) Properly store and care for fuels and grease products	4	3	2	1
11) <u>OTHER NEEDED COMPETENCIES</u> basic to ag power: (Please add rating numbers as needed)				
A)				
B)				
C)				
II. AGRICULTURAL MACHINERY:				
1) Use operators manual	4	3	2	1
2) Assemble new machinery	4	3	2	1
3) Maintain agricultural machinery (lubricate, minor repairs)	4	3	2	1
4) Adjust agricultural machinery (plow, swather, planter)	4	3	2	1
5) Calibrate agricultural machinery (grain drill, fertilizer spreader, sprayer)	4	3	2	1

(3)	ESSENTIAL	NICE TO KNOW	UNNECESSARY	NO OPINION
6) Operate ag machinery in the field (tractor, tillage, planting, harvesting equipment)	4	3	2	1
7) Winterize agricultural machinery	4	3	2	1
8) Recondition and return to proper condition one or more ag machines	4	3	2	1
9) OTHER NEEDED COMPETENCIES basic to ag machinery (please add rating numbers as needed)				
A)				
B)				
C)				
III. BUILDINGS AND CONVENIENCES BASIC TO AGRICULTURE:				
1) Identify common building materials used in ag buildings	4	3	2	1
2) Interpret simple building plans (prepare bill of materials, compute costs)	4	3	2	1
3) Use farm level to stake building corners	4	3	2	1
4) Install batter boards for a building	4	3	2	1
5) Construct forms for a concrete slab or footing	4	3	2	1

(4)	ESSENTIAL	NICE TO KNOW	UNNECESSARY	NO OPINION
6) Order, pour and finish concrete for a walk, slab, or footing	4	3	2	1
7) Construct small frame building	4	3	2	1
8) Compute storage volume of barns, silos, bins	4	3	2	1
9) Repair an agricultural building (replace siding and roofing)	4	3	2	1
10) Select fencing materials for specific purpose	4	3	2	1
11) Treat posts and erect board and wire fences	4	3	2	1
12) Compute area for applying paint or preservatives	4	3	2	1
13) Select paint, prepare surface and apply paint for a specific purpose	4	3	2	1
14) Plan a waste disposal system for a farm home or livestock enterprise	4	3	2	1

15) <u>OTHER NEEDED COMPETENCIES</u> basic to agricultural buildings and conveniences:
(please add rating numbers as needed)

A)

B)

C)

(5)

	ESSENTIAL	NICE TO KNOW	UNNECESSARY	NO OPINION
IV. ELECTRICITY BASIC TO AGRICULTURE:				
1) Use a rate schedule to figure an electric bill	4	3	2	1
2) Construct an electrical use diagram for a farm	4	3	2	1
3) Plan, purchase and install an electrical circuit containing switches, outlets, fixtures, and ground according to code	4	3	2	1
4) Repair or replace electrical parts	4	3	2	1
5) Select electric motors for various uses	4	3	2	1
6) Maintain electric motors	4	3	2	1
7) <u>OTHER NEEDED COMPETENCIES</u> basic to agricultural electricity: (please add rating numbers as needed)				
A)				
B)				
C)				
V. SHOP WORK BASIC TO AGRICULTURE:				
1) Interpret project plans and sketches	4	3	2	1
2) Draw up proposed project showing various views	4	3	2	1
3) Prepare a bill of materials on a proposed project	4	3	2	1

(6)	ESSENTIAL	NICE TO KNOW	UNNECESSARY	NO OPINION
4) Select and use hand tools	4	3	2	1
A) Handsaws (crosscut, rip, compass, coping, hacksaw)	4	3	2	1
B) Hammers (claw, ball peen, sledge)	4	3	2	1
C) Planes (jack, block)	4	3	2	1
D) Hand drills (wood auger and brace, expansion bits)	4	3	2	1
E) Screwdriver (slotted, phillips)	4	3	2	1
F) Measuring and marking tools (tapes, squares, awl, center punch, micrometer, feeler gauges)	4	3	2	1
5) Select and use power tools	4	3	2	1
A) Power drills (portable drill press)	4	3	2	1
B) Power saws (table, radial arm, chain, etc.)	4	3	2	1
C) Jointer or thickness planer	4	3	2	1
D) Power sanders (belt, orbital, disc)	4	3	2	1
E) Power grinders (portable, pedestal)	4	3	2	1

(7)

	ESSENTIAL	NICE TO KNOW	UNNEC ESSARY	NO OPINION
6) Electric arc welding	4	3	2	1
A) Identify common metals	4	3	2	1
B) Prepare metal for welding	4	3	2	1
C) Select proper welding electrode for job being done	4	3	2	1
D) Weld in all positions well enough to repair ag machinery	4	3	2	1
7) Oxygen-acetylene welding	4	3	2	1
A) Set-up and operate oxy-acetylene equipment	4	3	2	1
B) Cut, braze and weld mild-steel	4	3	2	1
8) Solder sheetmetal joints and electric wire	4	3	2	1
9) Repair and install water pipe	4	3	2	1
A) Measure, cut, ream and thread galvanized pipe	4	3	2	1
B) Cut and splice plastic pipe	4	3	2	1
10) Use common tap and die equipment	4	3	2	1
11) Fit and sharpen various cutting tools (chisels, planes, drills)	4	3	2	1

12) OTHER NEEDED COMPETENCIES basic to agricultural shop work: (please add rating numbers as needed)

(8)

	ESSENTIAL	NICE TO KNOW	UNNECESSARY	NO OPINION
A)				
B)				
C)				
VI. SOIL AND WATER MANAGEMENT BASIC TO AGRICULTURE:				
1) Use surveying equipment	4	3	2	1
A) Differential leveling (difference in elevation between two points)	4	3	2	1
B) Survey contours and ditches	4	3	2	1
2) Take soil samples and make soils map	4	3	2	1
3) Operate irrigation pump	4	3	2	1
A) Change irrigation pipe (hand lines, wheel lines)	4	3	2	1
B) Handle furrow irrigation system (shovel, siphons)	4	3	2	1
4) <u>OTHER NEEDED COMPETENCIES</u> basic to agricultural soil and water management: (please add rating numbers as needed)				
A)				
B)				
C)				

(9)

The opinions you have expressed in this survey are greatly appreciated. Your responses will help make possible worthwhile revisions in Vocational Agriculture programs.

Thank you for your assistance.

APPENDIX III

AGRICULTURAL MECHANICS COMPETENCIES SUGGESTED BY SURVEY RESPONDENTS

I. Power Basic to Agriculture:

1. Common tire pressures (car, truck, combine, tractor).
2. Use of starting fluid on diesel engines.
3. Battery service and maintenance.
4. Trouble shooting gasoline and diesel engines.
5. Headlight, marker light, turn signal repair.
6. Overhaul small gas engines.

II. Agricultural Machinery:

1. Use of common sense, to think before acting in the operation of farm machinery.
2. Parts identification for servicing or replacement.
3. Adjust combines to thrash various crops.

III. Buildings and Conveniences Basic to Agriculture:

1. Cut rafters and figure roof pitch.
2. Read and use instructions found on materials.
3. Knowledge of basic plumbing.
4. Draw farmstead plan---buildings, corrals, etc.
5. Knowledge and application of mathematics of building construction.

IV. Electricity Basic to Agriculture:

1. Trouble shoot electrical problems.
2. Convert motors from 110 volts to 220 volts, and reverse motor direction.
3. Common electrical danger signs--safety.
4. Motor wiring and rewiring.

V. Shop Work Basic to Agriculture:

1. Know grinding stones for various uses.
2. Sharpen and repair hand tools.
3. Knowledge of state requirements on equipment and electrical safety.

4. More advanced oxy-acetylene cutting skills.

VI. Soil and Water Management Basic to Agriculture:

1. Understand soil pH.
2. Complete crop water use chart.
3. Use of tenseometer, water demand meters.
4. Horsepower requirements for various capacity pumps.
5. Figure friction loss, pressure, etc.
6. Set-up irrigation system, make repairs.
7. Be familiar with various types of sprinkler equipment.
8. Optimum periods to irrigate, water requirements of local crops.
9. Water measurements in acre feet, second feet, etc.
10. Water conservation, relationships to environment and the ecology.

APPENDIX IV

CULVER HIGH SCHOOL
Culver, Oregon

January 10, 1972

Ag. Machanics Survey Respondents
Jefferson County
Oregon

Dear Respondent,

Last summer I asked you for your opinions on an agricultural mechanics skills survey. You were one of a ten percent sample of full-time farmers and ag-related business men in Jefferson County.

I recently finished tallying these surveys and I want to thank you for your time and opinions. The results of this survey will be very helpful in revising the agricultural mechanics portion of the Vo. Ag. Curriculum at Culver High School.

I thought you might be interested in a brief summary of the survey results. Your opinions ranked the six major sections of the survey as follows:

First ranked section - - - - - Power Basic to Agriculture
Second ranked section - - - - Agricultural Machinery
Third ranked section - - - - - Shop Work Basic to Agriculture
Fourth ranked section - - - - Soil and Water Management
Fifth ranked section - - - - - Electricity Basic to Agriculture
Sixth ranked section - - - - - Buildings and Conveniences

Eighty-three individual skills were ranked under the 6 sections above:

First placed skill - - - - - - Servicing air cleaners
Second placed skill - - - - - - Maintain ag machinery (lubricate, make minor repairs)
All welding skills placed 8th to 15th place.
Eighty-third placed skill - - - Using a rate schedule to figure an electric bill

If for any reason you would like a complete copy of the survey results, please give me a call. Again thank you very much for your help in making these results possible.

Sincerely,

(Redacted for privacy)

John Oades
Culver High School
Vo. Ag. Instructor