

AN ABSTRACT OF THE THESIS OF

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FOR VOCATIONAL AGRICULTURE IN OREGON

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The central purpose of this study was to formulate and test a model for securing information from the ornamental horticultural industry that would provide a basis for curriculum development in vocational agriculture. In order to develop the model, it was necessary to accomplish the following:

1. Determine typical occupations in ornamental horticulture from employment survey data.
2. Survey a randomly drawn sample of the total population to determine agricultural and business competencies needed for successful performance in the typical occupations.
3. Determine agricultural and business competencies common to most all the typical occupations.

An interview schedule was developed with the assistance of an advisory committee composed of representatives from seven occupational groups in the ornamental horticultural industry. The instrument contained 100 competencies which were identified as important

to the satisfactory performance of typical workers in each of the occupational areas.

Personal interviews were conducted with employers from 56 business firms and agencies located in nine Willamette Valley counties in Oregon. The interviewees were distributed equally among florists, landscapers, and workers employed in garden centers, greenhouses, nurseries, golf courses and parks. The employers rated each knowledge and skill item as to its relative importance for the typical worker in question.

The competencies were analyzed and ranked according to mean scores in relation both to their particular occupational groups and as a composite of all the occupational groups. Those items rated as "essential" or "important" by 50 percent or more of the respondents were identified for all seven occupational categories. Mean score comparisons were also made between the respondents and the panel of experts. There were a total of 45 competencies identified as being important and common to all seven occupational categories in the ornamental horticultural industry.

It was found that human relations and communications skills were rated in the top nine competencies considered important for all workers in ornamental horticultural occupations. Rated most important in the technical areas were knowledge and skills pertaining to basic plant growth and characteristics, soil composition and drainage, fertilizer materials, pest control, use of chemicals, and basic business

operation. The more specialized competencies, particularly those relating to floral and landscape design, were rated least important for horticultural occupations outside these specific areas.

Competencies rated important to each of the seven occupational groups were also identified. Landscaper and garden center groups identified the largest number, 64, of necessary competencies. The smallest number of necessary competencies, 27, was listed by the florist group. A range of 43 to 61 items of knowledge and skills were rated as important to the other four groups. There was general agreement between the respondents and the panel of experts in all the occupational areas.

This research demonstrated that occupational information for curriculum development in ornamental horticulture can be obtained through the systematic procedure employed in this study. The implications of this study are that the same procedure can be used with other off-farm agricultural industries. The major recommendation was to consider the competencies identified for typical ornamental horticulture workers in the development of the vocational agriculture curriculum.

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A Curricular Model in Ornamental Horticulture
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by

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A CURRICULAR MODEL IN ORNAMENTAL HORTICULTURE FOR VOCATIONAL AGRICULTURE IN OREGON

CHAPTER I

INTRODUCTION

Curriculum development for vocational education is a continuous process involving the combined resources of public agencies, school personnel, and representatives from the business community. As employment opportunities shift to new areas and as job performance requirements are altered it is essential that vocational curriculums be revised to correspond with these changes.

The Vocational Education Act of 1963 broadened the scope of vocational agriculture to provide training in "any occupation involving knowledge and skills in agricultural subjects, whether or not such occupation involves work on the farm." (74, p. 43) This expanded educational role for vocational agriculture has created a critical need to determine the nature and extent of the newly inherited occupations and to make appropriate adjustment in the instructional program. The National Outlook Seminar for Agricultural Occupations recommended that programs should be provided in various areas such as agriculture production, mechanics, supplies and services, products and processing, ornamental horticulture, forestry, and rural resource development and recreation. (52)

An important feature of the Vocational Education Act was the mandate for training and retraining which is "realistic in the light of employment opportunities" (17, p. 67) and which, according to Goodwin (1968), "charted the first major redirection of vocational education in over fifty years." (37, p. 19) Walsh and Selden (1965) observed that program planning for vocational education should look in two directions at once: toward determining occupational areas to be included in the overall program, and toward planning specific curriculums for the several occupational areas. For the one purpose, determinations are based on manpower requirements and on labor market information; for the other, they are based on occupational analysis and the programming of learning units. (76)

As attempts are made to gather employment data for agricultural occupations, it becomes apparent that labor information is restricted primarily to "farmers" and "farm workers." Taft (1968) submits that school personnel do not have reliable data on labor market demands because the employment services have little information to offer in the categories of off-farm agricultural occupations. (65) Richman (1968) points to the problem that all of the off-farm workers are lost within other categories in the census reports and that these workers are included in seven of the ten nonfarm categories. (58)

During the fall of 1968 a cooperative agreement was made between the State Department of Employment and the State Department

of Education, Agriculture Education Section, for the purpose of gathering manpower data for certain off-farm agricultural occupations. Through this unified effort the expertise and resources of both agencies were combined to attack the problem that neither agency had been able to solve successfully alone. The Department of Education was responsible for determining the occupational families, or industries, to be studied and for identifying the firms and a list of job titles to be surveyed in the state. The Employment Service was responsible for conducting the survey. It was anticipated that through such means current and projected employment information could be obtained on a continuing statewide basis.

One of the two industries selected for initial study in Oregon was ornamental horticulture. Preliminary information was obtained through an advisory committee composed of representatives from a cross section of the industry.

This committee assisted in developing the list of job titles used in the questionnaire and selected the major occupational groups to be surveyed, which included: florists, greenhouse workers, nursery workers, garden center workers, golf course workers, park gardeners, and landscape workers.

Results of the survey revealed that a total of 4,069 workers are currently employed in the occupational groups of ornamental horticulture and that 5,937 workers will be needed by 1972. This

anticipated labor demand represented over a 45 percent increase in horticulture workers needed during the next three years.

Once the labor supply and demand are determined, it is necessary to bridge the chasm between the employment data and a proposed curriculum to prepare individuals to fulfill employment requirements. Faulkner (1967) stated that "to be useful, practical and realistic agricultural education must respond to the law of supply and demand at work in the agricultural industry". (28, p. 269) Instructional and training needs should be determined by the occupational job requirements; the course of study should be developed on the basis of occupational competency requirements. Faulkner added that the time has come for the development of a suitable system for educators to use in identifying the competencies and skills required by agricultural occupations. (28)

This research represents an attempt to develop a satisfactory procedure for securing information from an agricultural industry that will provide a basis for curriculum development in the vocational agriculture program. The ornamental horticultural industry was selected to test the procedure being investigated.

Purpose of the Study

The central purpose of this study was to formulate and test a model for securing information from the ornamental horticultural

industry that will provide a basis for curriculum development in vocational agriculture. In order to develop the model, it was necessary to accomplish the following:

1. Determine typical occupations in ornamental horticulture from employment data.
2. Survey a randomly drawn sample of the total population to determine agricultural and business competencies needed for successful performance in the typical occupations.
3. Determine agricultural and business competencies common to most all the typical occupations.

Rationale

The fastest growing agricultural industry in the State of Oregon is ornamental horticulture. According to Walter Leth, (1970) Director, Oregon Department of Agriculture, the value of horticultural crops has increased from 19 million dollars in 1964 to 30 million dollars in 1969. William Koesan, (1969) Assistant Chief, Plant Division, Oregon Department of Agriculture, claims the number of licensed acres in nursery stock has increased from 4,169 acres in 1965-66 to 4,613 acres in 1967-68. During the last two years 444 additional acres have been brought into the production of nursery stock.

In 1964 Oregon ranked number ten in the United States in total value of horticultural specialty sales.¹ Of the nine regions of the United States, the Pacific region had the highest percentage (30 percent) distribution value of horticultural crops sold and was the largest producer.² Oregon rates second to California in the Pacific region for total production and value of sales of horticultural crops. (73)

The Pacific region recorded a total sales for horticultural crops of \$81,284,000 in 1954, and \$161,531,000 in 1964, an increase of 99 percent. During the same period the total sales for the United States grew from \$453,654,000 to \$706,515,000, reflecting a 55 percent increase in horticultural sales across the nation. (73)

At the International Horticultural Congress in Brussels, Tukey (1962) reported that between 1954 and 1962 the value of horticultural specialties, including cut flowers, bedding and foliage plants, and nursery crops, more than doubled. Presently horticulture is a growing industry throughout the world and no aspect of horticulture has greater promise than floriculture and ornamental horticulture. (72)

The American Association of Nurserymen made a comprehensive study of the horticulture industry and revealed that there is a shortage of adequately trained personnel for this occupation.

¹ Horticultural specialty crops include both commercial floriculture and commercial ornamental horticulture.

² Pacific region includes Alaska, California, Hawaii, Oregon and Washington.

Edsel Wood (1968), Past President, Oregon Association of Nurserymen, said that trained personnel for the ornamental horticultural industry are not available. Employers are required to teach their help practically everything they should know to perform on the job. New workers seldom know what makes a plant grow. Furthermore, the industry is growing so rapidly that many of the better employees leave and start their own businesses.³

A number of Oregon vocational agriculture departments and two community colleges are including units of study or special courses in ornamental horticulture in their instructional programs. Three additional community colleges in the two largest metropolitan areas in the state are considering horticultural programs for their students. A concerted effort is being made by the State Department of Education agricultural education staff to articulate the high school and community college horticultural programs to enhance continuity and to minimize needless duplication of course content when transferring from secondary to post-secondary programs. Information is needed about job requirements from each of the occupational groups included in the ornamental horticultural industry to determine common curriculum content.

³ Personal conversation with Mr. Wood.

Assumptions

The initial assumptions for this study include the following:

1. Vocational agriculture programs are responsible for preparing students to be employed in off-farm agricultural occupations.
2. Job opportunities in off-farm agricultural occupations exist for persons having an agricultural background and/or training.
3. School administrators, guidance counselors, teachers, and students need to be cognizant of the employment opportunities in off-farm agricultural occupations because the necessary manpower data is incomplete.
4. Reliable information concerning competencies for off-farm agricultural occupations can be obtained from employers.
5. A study of selected agricultural industries in Oregon will provide valid and useful data for planning and expanding agricultural education programs in the state.
6. Typical worker classifications confirmed by advisory committees from each agricultural industry selected will be understood by employers being surveyed.

Limitations

The following limitations are recognized in this study:

1. The ornamental horticultural industry is represented by landscape contractors and gardeners, greenhouse, florist, nursery, garden center, park, and turf management groups.
2. The typical workers employed in ornamental horticulture are those generally considered below the professional level (less than a four-year academic degree).
3. The competencies identified are considered only in terms of their relative importance; no consideration is given to depth of understanding or degree of skill required for tasks to be performed.
4. The competencies considered are those which primarily have relevance for curriculum development in vocational agriculture.

Definition of Terms

The definition of terms used in this study is as follows:

Agricultural businesses, agriculture firms--These terms are used synonymously in describing those establishments engaged in agricultural work including production, processing, distributing agricultural products, and related services.

Agricultural industry, family or category--A group of agricultural business firms characterized by performing the same functions.

Agricultural occupation--An occupation in which the workers need competencies in one or more of the primary areas of animal science, plant science, soil science, agricultural business, agricultural mechanization, and agricultural leadership.

Competency--Knowledge, understanding, and skills needed to perform essential activities in an industry.

Curriculum--The sum total of all planned experiences which compose a student's life and from which he learns. It involves not only in-school but out-of-school activities under supervision of the instructor.

Job title--A descriptive name commonly used to signify a particular occupation. The commonly used job title may be different than the official name given to the job in the Dictionary of Occupational Titles. The job title is used in this study.

Occupational area, category, group--These terms are used synonymously in referring to one of several related job classifications within an industry, i.e., florists, landscapers, or greenhouse, garden center, park, golf course, nursery, or park workers.

Off-farm agricultural occupation--An agricultural occupation other than those related to the actual production of food and fiber.

Panel of experts--Individuals recognized by others in their

respective fields as being authorities on job performance and occupational competency requirements in ornamental horticulture. The seven-member panel used in this study consisted of one representative from each of the following occupational groups: landscapers, florists, garden centers, golf courses, greenhouses, nurseries and parks.

Trade association--An organization of business firms within a specific industry.

Typical occupation--A worker category which includes the most common tasks performed by employees within a given occupational group.

Vocational education--Special education concerned with generalizations, knowledge, values, creativity, performance and conclusions identified with goals of individuals in socially useful employment; more specifically concerned with education at less than a baccalaureate level.

Vocational agriculture--Vocational education concerned with the production of food and fiber, as well as the processing, distribution, management and services related to such production. It is formalized and systematic instruction designed for students who wish to explore or enter the agricultural work force.

CHAPTER II

REVIEW OF RELATED LITERATURE

In recent years agriculture in the United States has changed dramatically. These changes have introduced a concept that "agriculture is more than farming". A. W. Tenny (1965) Director, Agricultural Education Branch, United States Office of Education, points out:

Agriculture now includes hundreds of closely associated occupations. It is comprised of two major components: the farming or production segment and the nonfarming segment, which includes the off-farm functions of agriculture. In recent years the number of persons engaged in agriculture has remained fairly constant, the decrease in the farming segment has been balanced by a rise in nonfarm-agricultural employment. Approximately six million persons are actually engaged in productive farming. Another estimated sixteen million are engaged in off-farm agricultural occupations, such as marketing, providing supplies, processing and servicing (68, p. 115).

Julian Campbell (1964) states:

...fewer students can enter the occupation of farming but an increasing number of rural boys will look for employment opportunities offered in off-farm occupations and related fields. Therefore, the objectives in the vocational agriculture program have been broadened to encompass the broad field of agriculture (12, p. 31).

Across the nation vocational educators recognize the changes in agriculture and share concern for their implications, as elucidated in a Louisiana State study (1963):

It is now a matter of grave concern that vocational agriculture programs are not preparing rural boys for enough different kinds of jobs that are known to exist in the broad complex of agriculture, requiring knowledge and skill in agricultural subjects.

Few people understand the complexity of agriculture and appreciate the scope of occupational opportunities it offers to youth--it is big business, second to none, and to satisfy all the people who seek its services daily, it must bring together a great complexity of knowledge and skill in agricultural subjects, supported by an animated structure of resources without equal anywhere.

Today, the most common question posed by those interested in agricultural education is: Where are the jobs in agriculture; how numerous are they; and what qualifications are required for entry? The question not only comes up when teachers meet to consider their problems, it also arises when leaders in agricultural education propose changes in vocational agriculture.

There is no easy answer, but a reasonable approach to the problem lies in research of a kind that will yield sufficient information needed to guide those concerned with rural youth to a full understanding and appreciation of the circumstances involved. (49, p. 2)

A conference held at Ohio State University in late May of 1963 initiated a major coordinated approach to research specific to the problem of collecting data on off-farm agricultural occupations. In this and a succeeding conference, general study procedures were discussed and agricultural competency was described as occurring within four traditional subdivisions: plant and soil science, animal science, farm management, and agricultural mechanics. The following common objectives were agreed upon:

1. To identify present and emerging agricultural occupations, other than farming and ranching, for which vocational and technical agricultural education should be available
2. To determine present and anticipated numbers of employees in these occupations
3. To estimate the annual entry opportunities in these occupations
4. To determine competencies needed for entry and satisfactory performance in these occupations
5. To determine other characteristics of these occupations such as salary, minimum age for entry, union restrictions, labor laws, required experience, formal education
6. To determine continuing education needs of those employed in these occupations (69, p. 14-15) (70, p. 3)

It was generalized from a 1965 digest of twenty-six state studies that the greatest needs for agriculturally-trained employees were in four business fields: (1) agricultural supply and service, (2) agricultural machinery and service, (3) horticultural service, and (4) food products marketing. These studies also concluded that nearly half of the employees in these and other agricultural businesses need agricultural competencies and/or background (14).

The above generalizations reflect a heavy concentration of studies in urban and eastern portions of the country, and no doubt have "averaged out" some of the variations and specifics which are more important to individual states and differing areas. Furthermore, the interpretations await final data, for most states have only

tabulated numbers of employees in each of several classifications, and have not yet processed the data on knowledge, skills, and abilities needed by employees.

The following are references to state and other studies which include information pertaining to the relative importance of the ornamental horticultural industry.

Mondart and Curtis (1965) studied the nonfarm agricultural occupations in the seven largest metropolitan areas in Louisiana. Fifty interviewers made contact with 1,067 businesses and agencies in which the employer claimed any employees with agricultural competencies. From a total of 30,300 workers, almost 30 percent were required to have knowledge and skill in agricultural subjects for satisfactory job performance. There were 1,582 job titles held by the employees with agricultural competencies (50).

The researchers in Louisiana found 111 business firms in ornamental horticulture. In number of individual businesses it ranked sixth among eight occupational families. The other occupational areas included: (1) crops, forestry, and soil conservation (2) agricultural service (3) livestock and poultry (4) farm supplies and equipment (5) farm service (6) farm machinery sales and service and (7) wildlife and recreation. The following statistics were presented by the authors in their comparison of ornamental horticulture with the other occupational families:

1. Ornamental horticulture was eighth with 872 employees;
2. Ornamental horticulture was sixth with 845 employees using knowledge and skill in agricultural subjects;
3. Ornamental horticulture was sixth with 102 job titles with expectations of increasing the job titles to 125 in the next five years. (50, p. 20-23)

Loreen (1967) conducted a study in Washington State in which 60 vocational agriculture instructors identified agricultural businesses in their areas and contacted 336 establishments selected for interviews. It was estimated that a total of 640 agriculturally-trained persons would be needed each year for employment in off-farm agricultural occupations in the state. The study also concluded that the greatest need for agriculturally-trained employees could be expected in farm supplies, farm machinery and ornamental horticultural occupations. (46)

In the State of Massachusetts, Judge (1965) found more businesses engaged in ornamental horticulture (815) than in any of the other 12 occupational families studied. The other occupational areas included were: (1) agricultural services, (2) farm and garden supply, (3) meat products, (4) dairy products, (5) public warehousing, (6) meat and fish markets, (7) fruit and vegetable markets, (8) hardware and farm equipment, (9) miscellaneous agriculture, (10) miscellaneous food stores, and (11) sports. The largest number of employees were also found in the horticultural services. Based upon a ten percent

random sample there were an estimated 4,630 full-time and 2,320 part-time employees. Judge recommended that the programs in ornamental horticulture be developed to prepare workers with the necessary agricultural competencies. (40)

In Bailey's (1965) study of off-farm agricultural employment in West Virginia, ornamental horticulture ranked fourth among eight occupational categories. The other categories used included: (1) agricultural service, (2) farm machinery, (3) farm supply, (4) farm service, (5) forestry, (6) livestock and poultry industries, and (7) wildlife and recreation. A total of 1,717 agencies were interviewed, identifying 13,851 employees. Based upon a five-year projected need, the ornamental horticultural occupations offered the second greatest opportunity for employment. These job opportunities were greatest in greenhouses and nurseries, but also were found in garden centers, tree services, landscape services, and city, county and state institutions. (3, p. 39)

Bailey proposed that training might be needed for certain occupations including turf manager, greenhouse technician, landscape aide or technician, arborist, and nursery technician. Employment projections and required competencies for the above group were not included in the study. (3, p. 39)

Cushman, Christensen, and Bice (1965) conducted a study including 260 school districts in New York State, but excluding large

urban areas. A total of 541 businessmen or service personnel were interviewed by vocational agriculture instructors. From the findings it was estimated that 28,685 full-time workers and 16,841 part-time workers were employed in off-farm agricultural occupations. Employers' estimates indicated a growth rate of 19 percent was anticipated for full-time workers in off-farm agricultural employment and a growth rate of 13 percent in the next five years.(20).

The investigators reported that the ornamental horticultural family of occupations ranked sixth in both the number of full-time workers and in employment opportunities in off-farm agricultural occupational families when compared with eleven other groups. The other occupations studied were in: (1) agricultural supplies and equipment, (2) agricultural service, (3) agricultural machinery sales and service, (4) crop marketing and processing, (5) dairy manufacturing and processing, (6) livestock marketing and processing, (7) wildlife and recreation, (8) forestry and soil conservation, (9) farm service, (10) the poultry industry, and (11) other livestock industries. (20)

A preliminary study of off-farm agricultural occupations in Delaware by Barwick (1965) showed that ornamental horticulture placed sixth among the eight occupational families. The other occupations studied were in: (1) agriculture and farm service, (2) food marketing and distribution, (3) farm machinery sales, (4) farm

supplies and equipment, (5) livestock and poultry industries, (6) crops, forestry and soil conservation, and (7) wildlife and recreation. The occupations having the largest percentage of employees requiring agricultural competencies were farm machinery sales and service and ornamental horticulture. Two occupational families projecting the greatest need for employees in the next five years were food marketing and distribution and ornamental horticulture. This study was primarily a listing of occupations by title and occupational family. (6)

In a Michigan study of opportunities for employment, Haslick (1965) discovered that landscape horticulture offered the greatest opportunity for student employment. The other occupational categories in order of importance were: (1) farm services, (2) crops marketing and processing, (3) agricultural machinery sales and service, (4) forestry and soil conservation, (5) livestock marketing and processing, (6) agricultural supplies and equipment, (7) agricultural services, (8) wildlife and conservation, (9) other livestock industries, and (10) the poultry industry. (39)

In an earlier study of 286 nurserymen, Thompson (1959) found the nursery business in California growing rapidly because of increased home building and outdoor living, building of super highways, and industrial landscaping. About 40 percent of the nurseries had been operating for ten years or less and about one-third of the companies planned to add new employees. Over 60 percent of the nursery

businesses employed one to six workers; 39 hired more than 15 employees, and the largest had 253 employees. Growers included about one-third of the workers, an average of five per company; sales personnel were next with an average of two salesmen per nursery. (71)

Dillon (1965) suggested the following trends for ornamental horticulture in Illinois:

1. The number of nurseries licensed to grow and whole-sale nursery plants in Illinois had increased 31.7 percent during the preceding five years.
2. The number of dealers licensed to retail nursery stock in Illinois had increased 25 percent during the preceding five years.
3. There had been an increase in the number of workers in horticultural firms, and increasing employment opportunities for horticultural workers in park districts, golf courses, in cemeteries, on state highway department staffs, and on instructional staffs.
4. People in the 16-24 age group with appropriate marketable skills in the ornamental horticulture area would be in demand. (21)

Baker's (1965) findings from studying twenty counties in Alabama revealed that the greatest number of firms were in the main product or service categories of livestock sales and services; flower production and sales; farm supply retail stores; lumber and wood products; and nursery production, sales, and landscaping services. (4)

A study directed by Masley (1966) sampled forty-three towns in Connecticut including 1,170 firms. A total of 290 job titles were

identified with the largest number of employees per job title in the food processing, ornamental horticulture, and livestock industries. (48)

Butler (1965) concluded that 644 employees would be needed in ornamental horticultural businesses in Oklahoma in the ensuing five years. Many managers expressed concern regarding the possibility that potential employees with the desired training would not be available. (10)

In Michigan (1965) the employment needs of the state were found for two occupational groups: machinery sales and service, and nurseries. These two industries were found to have an annual need for employees equal to nearly half the number of vocational agriculture students graduating each year in Michigan. (49)

From these studies it may be concluded that opportunities for employment are available in off-farm agricultural occupations and that the demand for workers in the ornamental horticultural family of occupations is increasing in many states across the nation. Most of the previously reviewed studies inquired into the general areas of agricultural competencies needed for the various jobs identified, i.e., plant science, animal science, soil science, agricultural mechanics and agricultural business. These broad criteria were used to determine whether the job being considered was an agricultural occupation.

A Survey of Horticultural Programs

The diversity and extent of vocational programs in horticulture across the globe is evidence of the growing awareness of occupational opportunities in one of man's ancient arts. The appreciation for and use of ornamental plants seems to be developing as more members of our society gain affluence and leisure time. Such luxuries were formerly reserved for noblemen and royalty who espoused the internationally-known botanical gardens and artistically landscaped estates.

One of the oldest vocational horticultural training programs today is found in Western Germany. It is somewhat a continuation of the gardeners' guilds of the Middle Ages, involving apprenticeship, training, and examination. Three grades of training in horticulture are presently available. In the lower grades training begins when the student completes his compulsory general education at about fifteen years of age. It consists of practical training under contract in an officially recognized horticultural establishment under a teacher (Gaertnermeister) who has passed his master's examination in horticulture. Concurrently the apprentice must attend the technical school of horticulture one day per week. The complete training extends over a period of three years and is concluded with a practical and written (horticultural assistant's) examination. The horticultural assistants may later attend one of the twelve schools in horticulture

run by the Occupational Guilds of Agriculture. He may complete the one-year course of instruction, designed for preparing young horticulturists for positions as employers or managers, and end the program by taking the master's examination in horticulture. By this time the student is usually about 23 to 25 years old and has eight or more years of practical experience. Advanced horticultural study may be obtained through a college of horticulture which trains horticultural engineers and prepares them for the state examination. (42)

Extensive training in horticulture is also provided in the Netherlands through a system of horticultural schools. The lower horticultural schools admit boys at about age twelve into a four-year program designed to give vocational training to future laborers and small growers. The secondary horticultural schools train future managers of bigger holdings and technical personnel for horticultural institutions and organizations. These programs are of two and three-year duration and are open to pupils with a certificate from a three- or four-year general secondary school, which means they normally start their horticultural training at age 16 or 17. Lower horticultural school graduates may enter as well, upon successfully completing the examination. The higher horticultural schools usually train the more technical personnel of horticultural institutions. For admission a certificate of a four- or six-year general secondary school is required. Pupils of the secondary horticultural school may enter in

the first or second class. Almost 12,000 pupils out of a population of 12 million were attending horticultural courses in 1963 in the Netherlands. (24)

Prior to 1964 horticulture in Canada had been virtually neglected as an area of vocational training. Since then vocational programs have been initiated in four provinces where two- and three-year courses in theory are integrated with practical work experience. These programs, along with machine shop, agriculture (farming), and home economics, are being recognized as leading to a legitimate trade. Some of the courses serve as pre-apprentice training in areas such as "parks-gardening"; they are followed by four-year apprenticeship training. The present surge of interest in vocational training in horticulture in British Columbia, Alberta, and Ontario stands in sharp contrast to that which had existed up to this decade. (46)

Laking (1966) claims that the need for trained personnel in Canada has expanded at an unprecedented rate since World War II. Contributing factors include enormous expansion of garden contracting and maintenance services for home gardens, industries, and corporations, as well as new emphasis on municipal and provincial parks and conservation areas--all requiring trained personnel for development and maintenance. (45)

In the United States, Feck (1968) informs us that one of the oldest vocational horticulture programs offered in the public schools is in Cleveland, Ohio. The school garden program originated in 1904 and has grown to an enrollment of 21,500 students in 1967-68. Horticulture has been offered as a specialized subject in certain Cleveland high schools since 1911. Vocational horticultural programs were initiated in 1962, and in 1965 a post-high school technical program in horticulture was begun.

Surveys conducted in 1965 revealed that there were some 2,000 individuals or companies employing over 4,000 full-time workers in agricultural, horticultural, and related industries. Cleveland has 100 acres of greenhouses, hence is called the "Greenhouse Capital of the Nation." It has 20,000 acres of city and metropolitan parks, over 70 golf courses with more than 10,000 acres of turf, nearly 1,000 garden supply stores, over 200 florist shops, and 200 landscape contractors. Horticulture is the most important phase of the agricultural economy in northeast Ohio.

In Cleveland's three-year high school program: (1) students may enroll in Horticulture I during their sophomore year and are encouraged to carry home projects or take part-time employment in horticulture businesses during the summer; (2) Horticulture II is taken during the junior year, and if qualified, students are placed in summer jobs for work experience; (3) seniors enrolled in

Horticulture III are scheduled for four periods of instruction per day, work on a cooperative basis in a business or industry one-half day for four days each week, and receive related instruction pertaining to technical problems and sales techniques one day each week. (29)

Regan (1968) reports that agricultural programs have been carried on extensively in Los Angeles since 1908. Some 21,000 junior and senior high school students are enrolled in agricultural programs in 45 junior high schools and 35 senior high schools. In grades seven through nine, three course offerings are provided: Exploratory Horticulture, Horticulture, and Floriculture. These courses offer both classroom instruction and laboratory activities. Facilities for instruction have been standardized for every school since 1950, which include classroom, laboratory room, lath house, greenhouse with outside storage facilities, and one acre of growing grounds.

The high school programs are more diversified and intensive. Seventeen high schools now offer vocational horticulture for urban youth to help meet the employment demands for the multi-million dollar ornamental and landscape industry in Los Angeles and surrounding areas of southern California. A survey of graduates in 1967 revealed that six months after graduation over 90 percent were employed in horticulture or were continuing their education in agriculture at institutions of higher learning. (57)

The city of Boston has maintained a five-teacher department of vocational agriculture since 1918 with emphasis on ornamental horticulture and dairy technology. According to Sprissler (1968) the Jamaica Plain High School was selected to provide these programs because of its proximity to Arnold Arboretum, Franklin Park, the large estates of Boston's residential area, and the commercial agricultural and horticultural enterprises that flourished on the fringes of the city.

Today the department has two divisions, agriculture and horticulture. Students enrolling in horticulture choose either floriculture or landscape gardening. Shop instruction is given to all students enrolled in the program to equip them with competencies in the use of tools and equipment. Supervised work experience is provided for all students either during the school year or in the summer. Field trips are heavily emphasized due to the availability of the arboretum and park facilities. The four-year program for vocational students culminates in a half-day spent in horticulture during their senior year. The other half-day is spent in academic subjects. Annual enrollment numbers between 90 to 100 students in the total program. (61)

Several other large metropolitan areas offering agricultural education include ornamental horticulture as a specialty option. Chrein (1968) describes an agricultural program in New York City where 120 students are enrolled with agricultural careers in mind.

During the three-year program students receive instruction in nursery, floriculture, and turf management. Many students, both boys and girls, receive summer occupational experience in botanical gardens, nurseries and garden centers in the city area. (15)

Murray (1968) pointed up the increasing demand for ornamental horticulture products and services in Miami. A high school vocational technical program in North Miami staffed with five teachers provides for horticultural instruction and offers practical experiences on a twenty-acre tract. Because most students live in the city, ornamental plant projects are conducted on the school farm. Sales of plant materials from student projects average over \$89,000 a year. The largest proportion of these sales comes from a nursery which includes some 50,000 plants. This is indicative of the type training students are receiving in preparation for entry into horticultural occupations. (51)

Fink and Bartholomew (1968) report that in the Walter Biddle Saul High School of Agricultural Sciences located in Philadelphia, there are over 400 students, 100 of whom are girls, instructed by ten teachers of agriculture. The school has a pilot program in agriculture approved by the Pennsylvania Department of Public Instruction. The ninth and tenth grade programs offer general background in agriculture and agricultural career opportunities. During grades eleven and twelve the students are able to specialize and prepare for entry-level

occupations or for admission to college. Commercial horticulture is one of the specialized course options. Horticultural competencies are developed in the commercial size greenhouse and on the 78-acre farm where turf plots and nursery stock are provided. The horticultural instructor has a completely equipped two-section greenhouse with an attached potting shed plus equipment to handle a commercial nursery.

(30)

Special programs in horticulture are being developed in response to special needs. In New York, Ortiz (1968) calls attention to a greenhouse and nursery program developed in 1963 for mentally retarded adults. These students are provided basic instruction and experiences in the proper care of plants and flowers with the help of two acres of land, a three-hundred-foot greenhouse, a lath house, cold frames, and a tropical room for orchids. According to Ortiz, training the mentally retarded person requires repetition of instruction, careful distribution of responsibility in accordance with the student's ability to carry out his assignment, and constant and patient supervision. Some of these students sustain competitive jobs in local landscape companies, private estates, county agencies, and private florists. Employers have expressed a high degree of satisfaction with the products of the program. (54) Another pilot program is reported by Walker and Cherry (1968) which is designed to prepare students for the occupations in grounds and building maintenance.

The new two-year course of study for junior and senior boys has resulted in the selection of 20 students from 54 boys who desired to enroll in the 1967-68 course. The instruction provided knowledges and skills needed by students who chose either supervisory, technical, or custodial jobs. Such a program was warranted because of the short supply of trained personnel to fill these jobs, which are considered by the instructor as agriculture related occupations. (75)

A survey was conducted by the author, who polled 49 State Supervisors of Agriculture Education for information regarding ornamental horticultural programs. Out of 43 states responding, 35 states have ornamental horticultural programs: 31 states have secondary, 19 states have post-secondary, and 15 states have both secondary and post-secondary ornamental horticultural programs. Sixty-five percent of these states used advisory committees to assist in developing their programs.

Training Desired for Ornamental Horticulture

Several studies have included an investigation of the specific competencies needed for various workers in the ornamental horticultural industry. This research represents considerable diversity and variation in depth of study for the occupations selected.

According to Phipps (1964) horticultural workers, including general directors, salesmen, supervisors, and field workers, need

the same general knowledge in the field of: (1) horticulture, (2) agricultural chemicals, (3) floriculture, and (4) soils. Phipps suggested that detailed information is needed in these four areas in order to train workers in ornamental horticulture. (56)

Donker (1963) investigated the nature of the work actually done by landscape and nursery technicians on the job as viewed by the technicians themselves and observed and evaluated by the investigator. He summarized their job requirements as:

Individual qualifications for this occupation requires first of all an understanding of plant materials and adaptation characteristics for the area in which these plants are grown. Secondly, they require a sound understanding of moisture and fertility requirements as well as disease and pest control problems associated with these plant materials. Finally, they need some training in the landscape arts. All of this is required because frequently sound advice is quite evident as one of the prime requisites for success in the field. Further recommendations include basic sales and business training. Some shop skills can be added as very desirable. (23)

Yetman's study (1965) attempted to determine the knowledge and skills employers thought essential for workers in landscape gardening. From a list of sixteen competencies employers indicated that those most needed by the student were identification of plants and care of tools; competencies in the operation of power cultivators and propagation of plants were considered least important. Employers listed personality traits, such as courtesy, willingness to learn, and interest as most important qualities for student employees to have. (79)

According to Thompson's study in California, the amount of education needed by employees in the nursery business is increasing. He found that the basic understandings necessary for production and distribution of ornamental plants require that the employee have training beyond high school. The nursery operators interviewed stated the need for business training. New employees could learn the names of plant materials and common nursery chores, but some concepts of business operations were harder to acquire on the job. Laborers had little to do with the commercial aspect of the industry, but knowledge of salesmanship and merchandising was considered important for the skilled worker and the salesman. (71)

Knowledge of plant identification and use was not considered important to the laborer, but was considered important to the skilled worker and sales person and somewhat important to the supervisor. Knowledge of propagation was not rated as necessary because only one-third of the nurseries grew the materials they merchandised. For all levels of employment except the laborer, skill in preparing plants for display and sale was considered important. Skill in forcing plants to bloom for holidays was not reported as useful to many employees except supervisors, although it was rated important in the industry. Skill in preparation of the soil and the watering of plants was rated as important to the skilled worker, sales person, and supervisor. About one-third to one-half of the skilled workers, the

sales people, and the supervisors were reported to need the ability to manage a greenhouse, according to Thompson. Although nursery workers were called upon to recommend plants for use in certain location and under various conditions, they were seldom involved in preparing a complete landscape plan. He also indicated that skilled employees and sales people had the greatest need for mechanical skills involving machines such as sprayers and rototillers. (71)

In a study to determine technical education needs in ornamental horticulture, White (1968) investigated possible courses for technicians in such areas as: arboriculture and park management, floriculture, greenhouse and nursery operation, landscaping, turf management, and general ornamental horticulture. Twelve managers or owners of successful ornamental horticulture businesses were selected to represent the industry as a jury of experts. These experts chose several courses as being essential to all six of the proposed curriculums: written communication, oral communication, records and bookkeeping, botany, agricultural math, and soils. The more technical courses were recommended for only one or two of the curriculums. These unique courses covered: mapping, grading and construction, the floral industry, horticultural marketing, propagation by cuttings, nursery management, contracts and specifications, landscape construction, and golf course design. (77)

Parsons (1966) conducted a study in the Chicago, Cleveland, and Detroit areas to determine the relative importance of competencies needed by the greenhouse grower. Greenhouse managers wanted the grower to have the following competencies: (a) basic plant knowledge, including plant parts, growth processes, and plant names; (b) operational abilities, including testing soil, operating equipment, operating a boiler, applying growth substances, identifying growing containers, sterilizing soil, propagating, cleaning, handling chemicals, transplanting, potting, mixing soils, fertilizing, controlling pests, and watering; (c) crop understanding, including understanding of light effects, grading and packaging, life cycle of plant, humidity, special cultural practices, cutting, disbudding, pinching, water requirements, and temperature; (d) greenhouse management, including knowledge of labor analysis, production, and greenhouse layout. Parsons suggests that the above competencies be considered in planning a program of instruction for greenhouse growers. Competencies considered desirable but not essential for the grower included: (a) greenhouse management skills, including insurance management, managing money, buying, selling, and marketing; (b) mechanical skills including welding, electrical, construction, woodwork, and plumbing. (55)

The agricultural tasks identified for ornamental horticulture in the New York State study by Cushman, et al, indicate the competencies needed:

1. Prepare seed beds
2. Plant seeds, bulbs, trees and shrubs
3. Use proper tillage practices
4. Operate, maintain, and adjust gasoline engines
5. Control insects, diseases, and weeds
6. Operate, maintain, and adjust garden machines and equipment
7. Maintain trees and shrubs
8. Maintain lawns
9. Manage nursery, plantings, transplantings, pruning, shaping, and trimming
10. Correct physical defects of sites being landscaped
11. Knowledge of paint and painting
12. Make lime and fertilizer recommendations
13. Choose proper planting sites
14. Operate, maintain, and adjust tractors, trucks, agricultural equipment, and agricultural machinery
15. Locate and design drives, walks, and fences
16. Provide seasonal protection to ornamental plants
17. Decide what to grow
18. Select varieties
19. Select seed, cuttings, bulbs, or stock plants
20. Knowledge or characteristics and appropriate use of landscape materials
21. Mix soil composites
22. Select, buy, adjust, or maintain lawn and garden sprinkler and irrigation equipment (20, pp. 33-34).

To determine unique competencies needed by ornamental horticulture workers, Dillon (1966) compared abilities considered essential

for employees in licensed nurseries and in licensed ornamental horticultural businesses in four Illinois counties.⁴ Interviews were conducted with general directors, supervisors, salesmen, and field workers employed in a total of forty businesses. Based on the data obtained, the following basic competencies were summarized into courses recommended for all ornamental horticultural workers:

Basic Horticulture I

1. Identifying varieties of ornamental plants and trees
2. Identifying diseases, insects, and other pests on trees and ornamental plants
3. Recognizing plant nutrient deficiency symptoms
4. Identifying weeds in the nursery or in the lawn
5. Applying fertilizer, limestone, and nitrogen materials
6. Supplying organic matter to soils
7. Establishing and restoring grass on the lawn
8. Balling and burlapping trees and shrubs
9. Shipping and storing trees and shrubs

Basic Horticulture II

1. Grading and sodding lawns
2. Pruning ornamental shrubs and trees
3. Planting trees and shrubs
4. Removing trees
5. Controlling weeds in the nursery or in the lawn
6. Maintaining, adjusting, and caring for mechanical equipment

⁴ Horticulture in this study included: fruits, vegetables, turf, flowers, flowering plants and other ornamental plants.

7. Repairing mechanical equipment
8. Performing annual care of residential and commercial lawns and landscapes
9. Determining correct time to plant trees and shrubs
10. Transplanting fruit trees and small fruits

Basic Agricultural Chemicals

1. Identifying names and functions of agricultural chemicals
2. Selecting proper weedicides for weed control programs
3. Selecting proper agricultural chemicals for plant disease control programs
4. Determining correct rates of application for agricultural chemicals
5. Applying agricultural chemicals to control diseases and insects on trees and ornamental plants
6. Applying agricultural chemicals to control diseases and insects of fruits, vegetables, and flowers
7. Applying agricultural chemicals to control weeds in the nursery or in the lawn
8. Mixing agricultural chemicals for specific jobs
9. Handling agricultural chemicals safely
10. Using agricultural chemicals for control of woody plants
11. Adjusting application equipment
12. Maintaining application equipment
13. Operating tractor or power-driven equipment to apply agricultural chemicals
14. Operating hand-powered equipment to apply agricultural chemicals

Basic Soils

1. Taking soil samples

2. Correcting drainage problems
3. Determining factors that influence soil erosion
4. Determining the need for organic matter in soils (21)

Advanced competencies were recommended by Dillon for the specialized area of floriculture and for persons aspiring to higher level positions of general director, supervisor or salesman in a licensed nursery or in a licensed ornamental horticultural business in the geographical area studied.

Curriculum Development Considerations

One of the major purposes of this study was to obtain information from an agricultural industry--ornamental horticulture--that would provide a realistic basis for curriculum development. A search through the related literature provided several approaches, illustrations, and suggestions for determining basic considerations in building sound vocational programs.

Speaking to delegates at the 1966 American Vocational Association Convention, Taylor (1966) stated that the greatest number of trained employees are needed in the following five broad areas: (1) marketing and distribution of agricultural supplies needed in farming; (2) processing and marketing of livestock and meat products, dairy products, and fruit and vegetable products; (3) ornamental horticulture; (4) agricultural machinery sales and service; and (5) agricultural service to farming and agribusiness. (67)

Walsh and Selden (1965) emphasized that after the occupational areas for which instruction is to be provided are determined, the task at hand is curriculum construction. The curriculum must develop the skills and knowledge needed in each occupational field. Curriculum experts must supplement their own capabilities with the advice and assistance of representatives of business and industry who have a wealth of knowledge growing out of their personal involvement in the occupational area as employers, managers, and workers. Knowledge of what a worker must know and what he must be able to do, supplemented by advice from occupational advisory groups, will provide the basis for building courses that will make up the occupational skill and knowledge development program. (76)

Charles Allen (1919), an early vocational teacher-scientist, addressed himself to the problem of determining what is to be taught. He contended that the first step is to analyze the trade by simply listing all the things the learner must be taught if he is taught the complete trade, i.e., jobs, tools, computations, and safety. (2) Similarly, in How to Teach a Trade, Selvidge (1923) proposed that the trade be examined to secure a list of the things one "must be able to do" and a list of the things one "must know" in order to be proficient in the trade. These should be kept as separate lists, since one represents skill and the other knowledge. (59)

Effective teaching of "performance type" activities, according to Giachino and Gallington (1954), necessitates some kind of analysis in order to identify and assemble a core of essential and related work experiences which affect the attainment of desired goals. (35)

A more recent proponent of the "analysis technique" is Fryklund (1965), who observes:

In order to teach an occupation or a subject or an activity, there first must be an inventory of the elements to be taught. Most occupations are not so adequately covered in books as are subjects like math. And perhaps this is a good thing because industry changes. The analysis technique brings the essential elements into the instructional situation whether for training in the formal school or for training on the job. (33, p. 1)

Fryklund claims that a good way to list the elements of a service occupation is to make a two-column chart. One column would include the operations (tasks to be performed) and the other the information topics. (33) In other words, on the one side are listed the manipulative (doing) elements, and on the other side are the cognitive tasks. (25)

A teacher educator at Rutgers University, Drawbaugh (1966), affirms the need for job analysis for off-farm agricultural occupations.⁵ Referring to past research on occupations in off-farm

⁵ Job analysis is in essence the basis for selecting teaching content, which is expressed in terms of essential elements the learner must be able to do and know to get a job.

agriculture, he chose to differentiate between "employment needs" and "employee tasks". He contends that only when the tasks are analyzed is light shed on the kinds of skills and knowledges to be written into the course of study. (25)

A word of caution was directed vocational educators many years ago. Selvidge recognized that job analysis and the subsequent vocational training required of the skilled worker by modern industry is narrow and meager. It is adequate in terms of production, but from the standpoint of the citizen in a republic who has a voice in determining the policy of the nation and whose conduct affects other members of society, it is entirely inadequate. (59) Norton (1938) surmised, "No one would contend that the realistic standards of business and industry should be ignored, that primary responsibility of education is to train youth for its own good and not merely to supply industry and business with workers they want." (53) More recently Barlow (1965) conveyed the contemporary thinking of vocational educators pertaining to the total education required for each individual:

It is deplorable to find a high school graduate or even a dropout who cannot read, write, speak, or calculate with facility. It is similarly deplorable if he does not have a thorough understanding of the American way of life or of his cultural heritage. It is further deplorable if he cannot find employment because he has not been prepared to enter the world of work. Educating the good citizen, in the minds of vocational educators, includes preparing him to become a producer of the goods and services which society requires. (5, pp. 3-4)

Krug (1960) discussed the significance of wage earning and its relationship to the public schools. He states that:

For the most part the people of the United States seem convinced that earning a living is an important part not only of our private but also of our public welfare and that preparation for it should in some way be part of the business of our secondary schools. Earning a living is regarded not only as a means of providing for life's necessities; it is seen as an important element in individual self-realization or fulfillment. The major emphasis in this objective, as in others, is on benefit to the individual. But public benefit has been given increasing emphasis in recent writing and discussion. The requirements of a complex technology and the shortages existing in scientific as well as other professions have tended to make us acutely conscious of what is known as the manpower problem. These considerations have reinforced previously existing convictions that the development of occupational competence is a legitimate function of the public schools. (44, p. 119)

Walter Carey (1965), President of the National Chamber of Commerce, insists:

Our new industries are clamoring for men and women who can even qualify for training in the skills they need. And these are not at levels where college and university education is required; these are jobs that could be filled right out of our vocational training schools and junior colleges...if there existed the necessary coordination and cooperation between the educational and business communities. And yet, the rate of joblessness is two to three times as high among young people today as it is in the rest of the population. (13, p. 24)

Carey emphasized the businessman's role in assisting vocational educators with their mammoth task of preparing youth for the vast number of skilled jobs available. He stressed:

The most important thing is that educators can't be expected to do the job alone. They must have the help and cooperation of the business community. What kind of help? First of all, the schools must know what kind of jobs to train their students for and what skills are needed in local business and industry, now and in the predictable future. (13, p. 25)

Further recognition that business and industry personnel are to join forces with vocational educators is found in the literature. Evans (1962) states that the vocational education program content should be based on those activities which are of concern to the people who are working in or who are studying the industry involved. (27) Bruner (1962) suggests that training programs should be determined by those actively engaged in and studying the area involved. (9) Swanson and Cramer (1965) indicate that a continuing contact with business, industry, and agriculture is necessary to prevent obsolescence of instruction. (65) Barlow (1965) states that definitions of "families" or clusters of occupations must be based on information provided by industry and business. (5) Walsh and Seldon call for cooperative committees for education with representations from the business and industry community. (76) Recommendations included in the 1968 National Outlook Seminar for Agricultural Occupations specified that industry and trade associations and organizations must be actively involved in program planning and evaluation. (52)

Engelking (1966) of Canton, Illinois, reports on a unique industry and education advisory committee group which has

successfully served a post-high school farm mechanics course. The group consists of a farm implement mechanic, a farm implement salesman, the owner of farm implement business, an agricultural engineer associated with a major farm implement company, a member of the Canton Board of Education, and a dealer development manager of a major farm implement company. (26, p. 9)

It is apparent from the related literature that the "what" in terms of competencies needed on the job has been defined, and that the "who" in terms of persons essentially involved has been identified. The question remaining is "how" do we proceed to obtain systematically the information desired for curriculum consideration?

One method introduced by Clark and Meaders (1968) to identify curriculum content for agricultural education was called the "function approach". As described by the authors, the functions of a business or industry are those processes that achieve an outcome which is essential to the overall purpose of the industry, i. e., processing, transporting, purchasing, selling, and accounting. The activities necessary for accomplishing the functions are identified and used as a basis for determining competencies needed by the individuals who are expected to perform the activities. (16)

Albracht (1966) used the sales function of the feed industry for testing certain aspects of the function approach. After identifying nine activities of the sales function, he developed a list of forty-four

competencies needed to perform the nine activities. After the competencies were identified, specialists in feeding and nutrition, educational specialists, and representatives of the feed industry were asked to rate the importance of each competency in the performance of one or more of the activities of the sales function. (1)

Gleason (1967) applied the function approach to the study of the farm machinery industry. He selected the management and service functions for which he identified competencies. These were grouped by relatedness to typical curriculum areas to suggest the kind of educational mix included in educational programs serving the industry.

To assist in the validation process Gleason employed a jury of experts who rated the activities and competencies according to a four point scale of desirability to establish an index of importance score for each item. The jury consisted of farm machinery business managers, management personnel from sales and service positions, and educators engaged in researching, designing, or implementing educational programs that prepare workers for the industry. (36)

Gardner (1964), studying the competencies needed for initial employment in the dairy equipment industry, investigated the use of a jury or panel of experts as a means of obtaining information about jobs and workers in nonfarm agricultural occupations. He demonstrated that a panel of experts is an effective method of providing information that could be used as a basis for developing training programs. (34)

for a common core, a moving inward process, hence the term centripetal. Curriculum planning is centered on identifying the elements of the core. Since these elements are likely to resemble fragments of abilities, Courtney says the instruction is apt to be general, rather than specialized, and fail to equip students with saleable skills. On the other hand, the "centrifugal" approach starts with the assumption that the farm-related occupation is based on the relatedness of abilities. This approach may be thought of as a moving outward process which starts with farming and moves out to related occupations. (19) In his comparison of knowledge and experience levels needed by workers in three agricultural occupations, Courtney pointed out that if the "centrifugal" approach were used, farmers, farm real estate brokers, and farm grain elevator operator-managers could be served by a single course. Such a course would cover knowledge and experiences basic to these three occupations. (18)

Stevens (1966) expands on ornamental horticulture as an instructional area. He states that there are three types of businesses and services that produce, distribute, and use horticultural plants for ornamental value. They are: (1) floriculture, (2) nursery management and landscaping, and (3) turf establishment and maintenance. Greenhouse production and sales, nursery production and sales, garden center sales and services, landscaping, groundskeeping and arboriculture are occupational as well as business areas. Some

courses in ornamental horticulture will provide training needed in several or all of the occupational areas but others have to cover more specialized types of production or service. (63)

Dillon and Phipps (1966) recommend providing basic courses or units containing content needed by all the persons preparing to enter horticulture jobs, and specialized courses or units relating to one, two or three specific jobs. (22)

Byram (1959) has suggested educational programs involving a cluster or family of closely related agricultural occupations, rather than training for one specific occupation. (11) Woodring (1964) suggested that vocational programs should have a broader-based emphasis on pre-employment education rather than a narrow emphasis on preparation for specific jobs. (78) Stadt (1963) of the University of Alberta stated that vocational education should be broad enough to provide for both horizontal and vertical occupational movement. (61)

Summary of Related Literature

The review of the literature indicated that occupational preparation programs should be based upon labor supply and demand and that there appear to be increasing employment opportunities in ornamental horticulture, both in many states across the nation and in several provinces in Canada. Evidence of these employment

opportunities was found in state and area studies and was apparent in the variety of existing and developing vocational horticultural programs.

The literature further emphasized the need to determine what knowledge and skills are required for satisfactory performance on the job. This determination should be made cooperatively by educators and the business-industry community and used as the basis for program planning and curriculum development.

Results of recent studies have identified a number of competencies common to certain ornamental horticultural occupations in selected geographical areas. Suggestions through the literature seemed to indicate a need for further determination of essential knowledge and skills in order to plan a common instructional program for all the occupational areas within the industry. Specialized courses could be developed, as needed, from the common base. Several studies used a procedure called "the function approach" for determining occupational competencies. This approach begins by identifying the functions performed by the industry, then list the tasks involved in each function, and analyzes the tasks in terms of knowledge and skills required. The validation of occupational competencies appeared to be successfully accomplished in several studies by the use of a jury or panel of experts consisting of representatives from business and industry.

CHAPTER III

PROCEDURE FOR CONDUCTING THE STUDY

The Major Tasks in Conducting the Study

The study involved four major tasks:

1. Development of the interview instrument to identify competencies needed in ornamental horticultural occupations
2. Selection of the population sample to represent the ornamental horticultural industry in Oregon
3. Collection of data through personal interviews with employers from a purposive random sample of business firms and agencies in the horticultural industry
4. Analysis of data to determine the competencies required of all workers in horticultural occupations.

Development and Testing of Instrument

The interview instrument employed in this study consisted of a check list containing 100 knowledge and skill items. The individual items were derived from a composite list of tasks performed by typical horticultural workers. These tasks were identified by representatives from each of the seven occupational groups comprising the industry, including: florists, landscapers and greenhouse,

nursery, garden center, park, and golf course personnel. Each group of three to six persons identified the tasks which typical workers perform.

An initial list of over 175 competencies was derived from the compilation of worker tasks. This list was subsequently modified on the basis of research literature and consultation with high school and community college teachers and representatives from the industry. It was recognized that for interviewing purposes the number of competencies should be reduced. It was apparent that shortening the interview time and structuring the interview by using an interview instrument would encourage greater cooperation and minimize possible respondent fatigue. The list was shortened by combining closely related knowledge and skill items and deleting items which were ambiguous or inappropriate. The remaining items were grouped in logical categories and included in the interview schedule. (See Appendix B)

The instrument was field tested with six horticultural business firms in the Salem vicinity. Each employer was to be contacted by telephone and interviewed in the same predetermined manner. After the first three interviews, however, several modifications were included in both the approach and in certain knowledge and skill items that needed clarification. The main problem discovered during the field test was the confusion arising from attempts to consider varying

levels of competency. Because the employers worked with predominantly untrained personnel, it was difficult for them to determine what competencies were needed by fully-trained personnel. A brief explanation and periodic reminders were necessary to help the employer project what skills and knowledge a qualified employee should have in order to perform acceptably. With this clarification the interviews elicited responses more favorable to the objectives of the study. The field test resulted in improving and in establishing better rapport (43) at the outset of the interview.

Population

For purposes of this study the population was composed of 180 ornamental horticulture firms and agencies employing two or more workers located in the nine Willamette Valley counties: Benton, Clackamas, Lane, Linn, Marion, Multnomah, Polk, Washington and Yamhill.⁶ The population was taken from those 376 business firms and agencies which returned questionnaires containing employment data in response to the statewide survey conducted by the State Department of Employment. The occupational businesses studied included nurseries, florists, garden centers, greenhouses, golf courses, parks (city, county and state) and landscapers.

⁶ These nine counties produce over 86 percent of the horticultural crops grown in Oregon.

The questionnaires returned to the Department of Employment were used to identify the population of 180 firms and agencies. These survey forms were divided into the seven occupational groups. Table 1 shows the distribution of firms and agencies according to their occupational categories and their geographical locations by county. After contacting several members of the panel of experts, it was agreed that the geographical location of the business firms and agencies did not impose any marked variation in the competencies needed by workers in the respective occupational groups.

Table 1 also shows that the total number of firms and agencies in each occupational group range from a total of 61 nurseries to a total of eight garden centers. It was from these seven groups (strata) that the sample was selected.

A stratified, purposive random sample was drawn from the population to provide an equal number of firms and/or agencies from each of the occupational groups (strata). A sample of eight firms and/or agencies was drawn from each of the seven occupational categories, making a total of 56 ornamental horticultural business firms or agencies to be interviewed. The survey forms were numbered from one to the figure representing the total number in the group. A table of random numbers (31, p. 114) was employed to select a minimum of eight firms or agencies from each group. Eight were selected because there were only eight firms in the smallest group.

Table 1. Survey Population of Business Firms and Agencies in the Ornamental Horticultural Industry by Counties* in the Willamette Valley, Oregon, 1969

OCCUPATIONAL GROUPS	NURSERY	FLORIST	LANDSCAPE	GOLF COURSE	GREENHOUSE	PARK	GARDEN CENTER	TOTAL PER COUNTY
COUNTIES								
Benton	2	2	0	1	0	1	0	6
Clackamas	10	3	3	3	5	1	2	27
Lane	6	5	3	3	2	3	1	23
Linn	0	1	0	3	2	1	1	8
Marion	12	6	2	3	3	2	1	29
Multnomah	19	15	16	4	4	2	2	62
Polk	0	0	0	1	0	0	0	1
Washington	12	5	1	1	0	1	1	21
Yamhill	0	1	0	1	0	1	0	3
TOTAL PER GROUP	61	38	25	20	16	12	8	180

* County designation was determined by business address on the survey form obtained from the Department of Employment.

Furthermore, each stratum was sufficiently homogeneous that eight firms presented the full range of variation in occupational functions and requirements. It was determined by the panel of experts that characteristics of ornamental horticultural firms are not related to any specific location (county) in the Willamette Valley. Therefore, no consideration was given to sample selection on the basis of the county within which the firms were located.

The table used for identifying a population sample included random numbers ranging from 0 to 99. One blindfolded probe, made with the investigator's index finger, determined the starting point from which consecutive numbers were used to select each of the firms and agencies to be included in the sample. Duplicate numbers and figures exceeding the highest number in each group were discarded. In six of the seven groups, two alternate firms were randomly selected for use in the event that personnel in some of the original firms or agencies should not be available for interview. There were no extra firms from which to select alternates in the seventh group. Table 2 shows the random sample by occupational groups, including alternates, with the random figures used for their selection.

Collection of the Data

The data for this study were collected by the investigator using a prepared and pre-tested field schedule through personal interviews

Table 2. Random Numbers Used to Select Population Sample for Each Occupational Group*

Occupational Groups and Number of Firms and/or Agencies in Population	Random Numbers Used To Select Population Sample for Each Group								Alternates Selected	
	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10
Nursery - 61	34	11	52	7	4	1	61	42	27	22
Florist - 38	32	17	4	12	13	10	34	16	27	7
Landscape - 25	12	10	9	5	3	17	4	11	13	20
Golf Course - 20	2	8	6	15	12	9	13	20	3	4
Greenhouse - 16	12	15	5	2	3	10	7	8	13	14
Park - 12	2	9	3	4	11	6	8	10	7	5
Garden Center - 8	1	2	3	4	5	6	7	8	--	--
TOTAL - 180										

* Fisher, Ronald A., Frank Yates. Statistical Tables for Biological, Agricultural and Medical Research. Table XXXIII Random Numbers (1). New York, Hafner, 1953.

with owners or officers of the 56 horticultural business firms and agencies included in the sample. The investigator contacted eight employers in seven occupational groups including: nurseries, green-houses, golf courses, landscapers, garden centers, florists, and parks. Interviews with the employers were arranged by telephone after a brief explanation of the study was given. At the time of the interview the purpose of the study was further detailed with the aid of an information sheet provided for the respondent. Most of the interviews were conducted during working hours at the place of business. The time required to complete the interview was from 30 to 50 minutes.

The first section recorded classification data which included: (1) title of the respondent, (2) length of time in present business or agency, (3) number of employees, (4) major source of employees, (5) willingness to serve on local school advisory committee to assist with a horticultural training program, (6) willingness to hire students for purposes of providing work experience, and (7) major problems found with applicants for employment.

The next section contained 100 knowledge and skill items to which the employer assigned a score denoting his judgment of the relative importance of the competency needed by a typical worker in his occupational area. The knowledge and skill items were read to the employer who responded with one of four choices provided on a card: 4--essential, 3--important, 2--useful, or 1--not needed.

Some of the same difficulty arose during this part of the interview that was observed during the field test. On several occasions the employers responded by saying that their workers did not need some particular competency because it could be learned on the job. At such time the investigator would remind the respondent that the study was attempting to identify those competencies that qualified workers need to perform satisfactorily on the job, regardless of where they are learned. There was a strong tendency to confuse the untrained employee with the job to be performed. In view of the predominance of untrained workers in the horticultural industry, it was often difficult for the employer to project what a qualified employee should know and be able to do.

In the last section the respondent was encouraged to identify what personal characteristics he considered most important for the typical worker. The investigator recorded all suggestions volunteered by the employer.

Tabulation and Analysis of the Data

Data collected for this study were included in three sections of the interview schedule. The classification and supplemental information found in the first and last sections was reviewed and edited by the investigator. Appendix C contains tables summarizing the findings and a listing of the comments generated by the unstructured

questions. Data gathered from the section on knowledge and skills were very carefully recorded by the investigator, in preparation for coding and key punching on data cards for processing by computer. Each response was converted to a numerical value for each item tabulated: essential--3, important--2, useful--1, not needed--0.

An experienced systems analyst and computer programmer wrote the analysis program under the direction of the investigator. Using the program, the Oregon State University computer center processed all the data. First, a complete listing of the mean scores for each item and a ranking of all items by that score was obtained. These mean score listings were computed for each occupational group as well as for all the groups combined. The rankings according to mean scores gave a measure of the relative importance of the knowledge and skill items included in the interview schedule. Second, the computer provided a complete list of the responses to each knowledge and skill item with totals for the number of employers choosing "essential", "important", "useful" or "not needed". This list revealed which items were considered most important for each of the occupational groups and for all the groups combined. It was from this information that the common competencies were determined. Third, a complete list of the mean scores for each item and a ranking of all items as rated by the panel of experts was obtained. The findings of the panel were used to compare the seven occupational groups

and served as a validating criteria in establishing the curricular elements.

The inferences in this study were drawn from the competency rankings according to mean scores and from the common competencies derived by a majority of respondents rating the knowledge and skill items either "essential" or "important". The listing of ranked competencies illustrated the degree of relative importance while the listing of common competencies suggested a judgment of absolute importance. The only items appearing in the interview schedule were those considered important by a cross-sectional representation of the horticultural industry; therefore, this study was to determine the relative standing of a number of items of already acknowledged importance and to determine which items were most common to the total industry.

CHAPTER IV

ANALYSIS OF AND FINDINGS FROM THE DATA

The data for this study were provided by employers from 56 business firms and agencies concerned primarily with determining competencies needed by workers in the ornamental horticultural industry. Supplementary and classification information was also obtained and analyzed for general purposes. The results are included in Appendix C. Findings from the interviews pertaining to knowledge and skill items appear in subsequent tables prefaced by an explanation of what they indicate.

Mean scores included in this study were based upon the following values for individual responses: essential 3, important 2, useful 1, not needed 0. A mean score of 3.00 signified that every respondent rated the knowledge and skill item as "essential" to satisfactory performance in his occupational area. At the opposite end of the scale, a mean score of zero indicated a unanimous response of "not needed" for the competency in question. All mean scores, therefore, fell between 3.00 and zero.

Table 3 lists the 100 competencies in rank order of importance for workers in ornamental horticultural occupations. These rankings, determined from mean scores, represent all employers interviewed in terms of ranking the relative importance of work performed in

Table 3. Importance Rank of 100 Competencies for Workers in Ornamental Horticulture Occupations Determined by 56 Respondents from the Ornamental Horticulture Industry in the Willamette Valley, Oregon, 1969

Code	Competency Items	Rank Order	Percentage Responses				Mean Score
			E	I	U	N	
L-1	Maintaining good relations	1	83.9	16.1	0	0	2.84
M-4	Listening and observing	2	69.8	26.8	3.6	0	2.66
M-1	Reading	3	64.3	32.1	3.6	0	2.61
L-2	Getting others to work effectively	4	53.6	41.0	5.4	0	2.48
E-1	Recognizing plant pest problems	5	35.9	51.8	12.5	0	2.23
C-5	Knowing effects of environmental factors on plant growth	6	37.5	48.2	12.5	1.8	2.21
M-3	Speaking	7	39.3	41.0	16.1	3.6	2.16
D-2	Selecting fertilizer materials	8	44.6	28.6	25.0	1.8	2.16
M-2	Writing	9	35.9	33.9	28.6	1.8	2.04
O-1	Understanding basic business operation	10	33.9	37.5	25.0	3.6	2.02
D-1	Knowing soil composition and characteristics	11	39.3	30.4	23.2	7.1	2.02
D-7	Correcting poor drainage	12	32.1	37.5	23.2	7.1	1.95
E-4	Mixing and handling chemicals safely	13	44.6	19.6	19.6	16.1	1.93
A-4	Selecting common plant materials	14	25.0	46.5	23.2	5.4	1.91
N-3	Keeping employee time records	15	37.5	28.6	19.6	14.3	1.89
E-3	Selecting chemicals for disease, insect, and rodent control	16	37.5	19.6	37.5	5.4	1.89
G-3	Pruning nursery stock	17	41.0	28.6	7.1	23.2	1.88
C-1	Knowing the life cycle of plants	18	28.6	35.9	30.4	5.4	1.88
E-5	Determining correct rates of chemical applications	19	41.0	19.6	23.2	16.1	1.86
N-2	Keeping simple records of materials used	20	23.2	42.9	26.8	7.1	1.82
E-6	Operating and maintaining spray equipment	21	35.9	28.6	17.9	17.9	1.82
E-2	Selecting weedicides for weed control	22	33.9	21.4	32.1	12.5	1.77
O-5	Transporting, storing and shipping products	23	23.2	41.0	23.2	12.5	1.75
D-3	Selecting soil conditioners	24	25.0	33.9	32.1	8.9	1.75
N-1	Keeping simple records of expenses and receipts	25	26.8	35.9	19.6	17.9	1.71
G-4	Irrigating nursery stock	26	32.1	30.4	14.3	23.2	1.71
G-2	Planting and transplanting nursery stock	27	35.9	25.0	14.3	25.0	1.71
A-1	Identifying common woody plants	28	21.4	37.5	32.1	8.9	1.71
D-6	Correcting acid soils	29	26.8	30.4	28.6	14.3	1.70
K-12	Operating and servicing small power equipment	30	21.4	39.3	23.2	16.1	1.66
J-7	Installing plant materials	31	28.6	35.9	7.1	28.6	1.64
O-3	Marking and tagging products	32	28.6	28.6	17.9	25.0	1.61
D-4	Maintaining organic matter	33	16.1	33.9	42.9	7.1	1.59
O-2	Selling horticultural products and services	34	28.6	23.2	25.0	23.2	1.57
N-4	Keeping equipment and service records	35	21.4	32.1	26.8	19.6	1.55
K-11	Conditioning garden (hand) tools	36	10.7	44.6	30.4	14.3	1.52
A-2	Identifying common herbaceous plants	37	17.9	33.9	30.4	17.9	1.52

Table 3 (Continued)

Code	Competency Items	Rank Order	Percentage Responses				Mean Score
			E	I	U	N	
F-3	Seeding the lawn	38	35.9	17.9	3.6	42.9	1.46
J-9	Maintaining trees and shrubs	39	23.2	32.1	10.7	33.9	1.45
K-15	Installing and maintaining sprinkler system	40	17.9	32.1	25.0	25.0	1.43
O-7	Obtaining product and service information	41	23.2	25.0	23.2	28.6	1.43
N-5	Keeping inventory and stock records	42	17.9	26.8	35.9	19.6	1.43
F-5	Caring for the new lawn	43	30.4	23.2	3.6	42.9	1.41
F-2	Preparing topsoil for seeding	44	30.4	21.4	5.4	42.9	1.39
B-5	Selecting and using plant growth substances	45	19.6	23.2	32.1	25.0	1.38
F-6	Fertilizing and liming the lawn	46	25.0	28.6	3.6	42.9	1.36
B-4	Potting plants	47	16.1	33.9	19.6	30.4	1.36
D-8	Controlling erosion	48	17.9	23.2	33.9	25.0	1.34
C-3	Knowing plant parts and their functions	49	7.1	30.4	51.8	10.7	1.34
F-8	Irrigating turf	50	26.8	21.4	8.9	42.9	1.32
F-4	Renovating old lawns	51	25.0	23.2	8.9	42.9	1.30
B-3	Propagating by plant part	52	16.1	26.8	25.0	32.1	1.27
K-13	Operating and servicing large power equipment	53	17.9	28.6	16.1	37.5	1.27
F-10	Reseeding and patching the lawn	54	25.0	19.6	12.5	42.9	1.27
N-6	Estimating bill of materials	55	16.1	23.2	32.1	28.6	1.27
F-9	Aerating and removing thatch	56	19.6	25.0	12.5	42.9	1.21
A-3	Identifying common greenhouse plants	57	17.9	16.1	35.9	30.4	1.21
K-5	Painting wood and other surfaces	58	8.9	28.6	35.9	26.8	1.20
K-9	Constructing wood projects	59	3.6	28.6	51.8	16.1	1.20
B-1	Selecting and preparing propagating media	60	12.5	26.8	26.8	33.9	1.18
F-7	Mowing and edging	61	21.4	19.6	12.5	46.5	1.16
J-5	Interpreting the landscape plan	62	19.6	25.0	5.4	50.0	1.14
B-7	Storing and handling seeds, bulbs, and corns	63	10.7	28.6	25.0	35.9	1.14
F-1	Grading the site	64	23.2	14.3	14.3	48.2	1.13
K-4	Cutting, threading, and fitting pipe	65	8.9	25.0	35.9	30.4	1.13
D-5	Taking soil samples for analysis	66	12.5	16.1	42.9	28.6	1.13
B-6	Retarding and forcing plants	67	12.5	19.6	32.1	35.9	1.09
J-6	Protecting trees from construction work	68	17.9	17.9	17.9	46.5	1.07
C-4	Knowing plant processes	69	3.6	21.4	51.8	23.2	1.05
G-5	Preparing nursery stock for the market	70	16.1	19.6	14.3	48.2	1.02
K-1	Measuring land	71	8.9	21.4	32.1	37.5	1.02
G-1	Preparing and managing nursery soils	72	14.3	14.3	30.4	41.0	1.02
J-8	Removing trees and shrubs	73	12.5	17.9	26.8	42.9	1.00
B-2	Propagating by seed	74	10.7	14.3	37.5	37.5	.98
J-1	Knowing the principles of landscape design	75	10.7	23.2	14.3	51.8	.93
O-4	Displaying products for sale	76	14.3	19.6	10.7	55.4	.93
J-4	Preparing the site for landscaping	77	8.9	25.0	14.3	51.8	.91
H-3	Culturing potted plants and cut flowers	78	10.7	21.4	16.1	56.8	.91
O-8	Operating a cash register	79	25.0	5.4	3.6	66.1	.89
K-7	Making simple electrical repairs	80	5.4	7.1	57.1	30.4	.88

Table 3 (Continued)

Code	Competency Items	Rank Order	Percentage Responses				Mean Score
			E	I	U	N	
H-1	Preparing growing media for greenhouse plants	81	14.3	12.5	17.9	55.4	.86
K-6	Cutting and replacing glass	82	10.7	14.3	25.0	50.0	.86
C-2	Knowing cell and tissue structures of plants	83	5.4	10.7	48.2	35.9	.86
H-4	Preparing greenhouse plants for sale	84	12.5	14.3	16.1	57.1	.82
J-10	Constructing non-plant landscape features	85	3.6	17.9	33.9	44.6	.80
H-2	Culturing bedding plants	86	14.3	5.4	21.4	58.9	.75
K-3	Mixing and pouring concrete	87	1.8	16.1	35.9	46.5	.73
K-10	Maintaining electric motors	88	3.6	12.5	37.5	46.5	.73
I-4	Caring for and storing live plant materials	89	12.5	14.3	5.4	67.9	.71
K-8	Making simple welding repairs	90	1.8	17.9	30.4	50.0	.71
H-5	Operating and servicing greenhouse equipment	91	8.9	7.1	16.1	67.9	.57
O-6	Determining market outlets and trends	92	3.6	8.9	28.6	58.9	.57
J-2	Making client and site analysis	93	8.9	8.9	10.7	71.4	.55
I-1	Knowing the principles of floral design	94	12.5	3.6	10.7	73.2	.55
K-14	Operating and servicing automatic systems (watering, heating, ventilating, lighting)	95	5.4	10.7	14.3	69.8	.52
J-3	Sketching and layout of landscape plan	96	3.6	10.7	19.6	66.1	.52
I-5	Packing and packaging plants and arrangements	97	10.7	1.8	12.5	75.0	.52
K-2	Surveying land	98	0	8.9	30.4	60.7	.48
I-2	Designing floral pieces	99	12.5	1.8	3.6	82.1	.45
I-3	Constructing floral arrangements	100	12.5	1.8	3.6	82.1	.45

their respective occupational areas. Where mean scores were identical the competencies were entered in the order according to the percentage of "essential" and "important" responses obtained from the interview schedule.

This table reveals strong agreement among respondents in the importance of human relations and communication skills in horticultural occupations. All six items included in the study ranked within the top nine placings.

Human Relations -

Maintaining good relations	- 1st place
Getting others to work effectively	- 4th place

Communications -

Listening and observing	- 2nd place
Reading	- 3rd place
Speaking	- 7th place
Writing	- 9th place

Technical knowledge and skills considered most important by the employers were in the areas of basic plant growth and characteristics, soil composition and drainage, fertilizer materials, pest control, use of chemicals, and basic business operation. Knowledge and skills in these areas were ranked among the upper 15 percent required for horticultural workers.

Competencies considered least important to overall performance in horticultural occupations included some of the specialized skills needed only in certain jobs. These skills were found largely in the florist and landscaping trades which included: designing and constructing floral arrangements, packaging plants, making site analysis, designing landscape plans, surveying land and operating and servicing greenhouse equipment, making simple welding repairs, and determining market outlets and trends. The latter competency was ranked as a managerial responsibility. These less important skills were ranked in the lower ten percent although each one was important to a specific horticultural specialty.

Even though all competencies were rated "essential" or "important" for workers in at least one occupational group in ornamental horticulture, only one knowledge or skill item was identified as "essential" or "important" to all the employers interviewed. It was maintaining good relations with customers, employers, and fellow employees. One item, surveying land, was the only competency considered not "essential" to at least one firm responding. Of the 100 knowledge and skill items investigated, few items were rated as "not needed" by at least one employer interviewed. These items included:

Maintaining good relations

Listening and observing

Reading

Getting others to work effectively

Recognizing plant pest problems

Tables 4 through 10 show the lists of competencies identified as "essential" or "important" by 50 percent or more of the respondents for each of the seven occupational categories: florist, landscaper and garden center, golf course, greenhouse, park, or nursery worker. The competencies were further ranked by mean scores derived from responses obtained for each respective group of eight employers. Knowledge and skills included in these tables reflect the important tasks required for each specific occupational group. The relative importance of these entries was evidenced by the mean scores except when the scores were tied. The ranking of competencies having identical scores was based on the number of "essential" and "important" responses obtained from the interview schedule.

Table 4 presents the list of competencies peculiar to the florist trade and ranks them according to mean scores. In addition to human relations and communication skills, recognized earlier as important to all occupational areas, the florist worker was primarily concerned with designing and constructing floral pieces and arrangements. Competencies were also required in identifying and caring for common greenhouse plants, selling florist products, and operating the cash register. Various forms of simple record keeping and product marking were stressed by employers during the interviews. The most

frequently mentioned skill was the ability to write legibly and accurately. The florist worker required the least number of competencies of all the seven occupational groups.

Table 4. List of Competencies Peculiar to Florists Ranked According to their Relative Importance by Employers in the Florist Trade.

Code	Knowledge and Skill Item	Rank	Mean Score
L-1	Maintaining good relations	1	3.00
M-3	Speaking	2	3.00
O-6	Operating a cash register	3	3.00
I-1	Knowing the principles of floral design	4	2.88
I-2	Designing floral pieces	5	2.88
I-3	Constructing floral arrangements	6	2.88
M-1	Reading	7	2.88
M-2	Writing	8	2.88
M-4	Listening and observing	9	2.88
A-3	Identifying common greenhouse plants	10	2.75
L-2	Getting others to work effectively	11	2.75
O-4	Displaying products for sale	12	2.63
I-4	Caring for and storing live plant materials	13	2.63
O-2	Selling horticultural products and service	14	2.63
O-1	Understanding basic business operation	15	2.50
I-5	Packing and packaging plants and arrangements	16	2.50
N-1	Keeping simple records of expenses and receipts	17	2.38
N-6	Estimating bill of materials	18	2.25
N-2	Keeping simple records of materials used	19	2.25
N-3	Keeping employee time records	20	2.13
A-4	Selecting common plant materials	21	2.00
O-3	Marking and tagging products	22	1.88
O-5	Transporting, storing and shipping products	23	1.88
E-1	Recognizing plant pest problems	24	1.63
O-7	Obtaining product and service information	25	1.63
H-4	Preparing greenhouse plants for sale	26	1.38
H-3	Culturing potted plants and cut flowers	27	1.38

Table 5 contains the competencies necessary for garden center workers. Personnel employed in this business category were required to have knowledge and skills in a cross section of the horticultural industry. Extensive knowledge was found essential to this occupational group, due to the diversification of products handled and to the advisory function of the job. Those competencies determined as most important were included in the following general areas: plant identification and growth habits, plant propagation, growth and culture, plant growing media and fertilizers, plant pest control, lawn establishment and maintenance, nursery planting and maintenance, landscape design and construction, horticultural tools and equipment, sales of horticultural products and services, in addition to human relations and communications. The garden center workers and landscape workers were required to have the greatest number of competencies for satisfactory performance on the job.

Table 6 pertains to competencies rated important for the golf course worker. Superintendents who were interviewed emphasized that turf management was a highly specialized and delicate operation. The major function of the golf course employee was maintaining the turf, with minor responsibilities for landscaping and general maintenance. The two competencies considered most important for golf course workers were mowing the turf and maintaining good relations. Rating near the top of the list were such skills as: preparing the

Table 5. List of Competencies Peculiar to Garden Center Workers
Ranked According to Their Relative Importance by Employers
of Garden Center Business Firms

Code	Knowledge and Skill Item	Rank	Mean Score
L-1	Maintaining good relations	1	3.00
D-2	Selecting fertilizer materials	2	2.88
E-3	Selecting chemicals for disease, insect and rodent control	3	2.75
M-1	Reading	4	2.75
O-1	Understanding basic business operation	5	2.75
O-2	Selling horticultural products and services	6	2.75
O-8	Operating a cash register	7	2.75
E-1	Recognizing plant pest problems	8	2.63
E-2	Selecting weedicides for weed control	9	2.63
G-3	Pruning nursery stock	10	2.63
A-4	Selecting common plant materials	11	2.50
M-2	Writing	12	2.50
O-3	Marking and tagging products	13	2.50
L-2	Getting others to work effectively	14	2.50
M-3	Speaking	15	2.50
M-4	Listening	16	2.50
A-2	Identifying common herbaceous plants	17	2.38
F-3	Seeding the lawn	18	2.38
F-4	Renovating old lawns	19	2.38
F-5	Caring for the new lawn	20	2.38
F-6	Fertilizing and liming the lawn	21	2.38
O-4	Displaying products for sale	22	2.38
B-5	Selecting and using plant growth substances	23	2.38
E-5	Determining correct rates of chemical applications	24	2.38
F-2	Preparing the topsoil for seeding	25	2.38
F-8	Irrigating turf	26	2.38
G-2	Planting and transplanting nursery stock	27	2.38
C-5	Knowing effects of environmental factors on plant growth	28	2.25
A-1	Identifying common woody plants	29	2.25
D-6	Correcting acid soils	30	2.25
G-4	Irrigating nursery stock	31	2.25
J-9	Maintaining trees and shrubs	32	2.25
D-1	Knowing soil composition and characteristics	33	2.25
D-3	Selecting soil conditioners	34	2.25
E-4	Mixing and handling chemicals safely	35	2.25

Table 5 (Continued)

Code	Knowledge and Skill Items	Rank	Mean Score
J-7	Installing plant materials	36	2.13
N-1	Keeping simple records of expenses and receipts	37	2.13
B-7	Storing and handling seeds, bulbs and corms	38	2.13
C-1	Knowing the life cycle of plants	39	2.13
D-7	Correcting poor drainage	40	2.13
F-7	Mowing and edging	41	2.13
F-10	Reseeding and patching the lawn	42	2.13
J-1	Knowing the principles of landscape design	43	2.13
F-9	Aerating and removing thatch	44	2.00
D-4	Maintaining organic matter	45	2.00
F-1	Grading the site	46	2.00
O-7	Obtaining product and service information	47	1.88
O-5	Transporting, storing, and shipping products	48	1.88
E-6	Operating and maintaining spray equipment	49	1.88
B-4	Potting plants	50	1.75
N-5	Keeping inventory and stock records	51	1.75
B-6	Retarding and forcing plants	52	1.75
J-5	Interpreting the landscape plan	53	1.63
J-2	Making client and site analysis	54	1.63
N-6	Estimating bill of materials	55	1.63
C-3	Knowing plant parts and their functions	56	1.63
K-12	Operating and servicing small power equipment	57	1.63
N-4	Keeping equipment and service records	58	1.50
H-2	Culturing bedding plants	59	1.50
B-1	Selecting and preparing propagating media	60	1.50
B-3	Propagating by plant part	61	1.50
H-3	Culturing potted plants and cut flowers	62	1.38
J-4	Preparing the site for landscaping	63	1.38
C-4	Knowing plant processes	64	1.25

Table 6. List of Competencies Peculiar to Golf Course Workers
Ranked According to Their Relative Importance by Golf
Course Superintendents

Code	Knowledge and Skill Items	Rank	Mean Score
F-7	Mowing and edging	1	2.75
L-1	Maintaining good relations	2	2.75
F-2	Preparing the topsoil for seeding	3	2.50
F-3	Seeding the lawn	4	2.50
F-5	Caring for the new lawn	5	2.50
F-6	Fertilizing and liming the lawn	6	2.50
F-8	Irrigating turf	7	2.50
K-12	Operating and servicing small power equipment	8	2.50
E-1	Recognizing plant pest problems	9	2.38
C-5	Knowing effects of environmental factors on plant growth	10	2.38
F-9	Aerating and removing thatch	11	2.38
F-10	Reseeding and patching the lawn	12	2.38
K-13	Operating and servicing large power equipment	13	2.38
M-1	Reading	14	2.38
M-4	Listening and observing	15	2.38
E-4	Mixing and handling chemicals safely	16	2.38
C-2	Knowing cell and tissue structures of plants	17	2.38
J-7	Installing plant materials	18	2.25
F-4	Renovating old lawns	19	2.25
E-6	Operating and maintaining spray equipment	20	2.25
D-6	Correcting acid soils	21	2.13
E-3	Selecting chemicals for disease, insect, and rodent control	22	2.13
N-3	Keeping employee time records	23	2.13
N-4	Keeping equipment and service records	24	2.13
K-11	Conditioning garden (hand) tools	25	2.00
J-9	Maintaining trees and shrubs	26	2.00
D-2	Selecting fertilizer materials	27	2.00
D-7	Correcting poor drainage	28	2.00
N-2	Keeping simple records of materials used	29	2.00
K-1	Measuring land	30	2.00
C-1	Knowing the life cycle of plants	31	2.00
E-5	Determining correct rates of chemical applications	32	2.00
D-3	Selecting soil conditioners	33	1.88

Table 6 (Continued)

Code	Knowledge and Skill Items	Rank	Mean Score
K-15	Installing and maintaining sprinkler system	34	1.88
A-2	Identifying common herbaceous plants	35	1.88
E-2	Selecting weedicides for weed control	36	1.88
D-5	Taking soil samples for analysis	37	1.88
G-3	Pruning nursery stock	38	1.75
D-8	Controlling erosion	39	1.75
D-1	Knowing soil composition and characteristics	40	1.75
M-3	Speaking	41	1.63
G-2	Planting and transplanting nursery stock	42	1.63
D-4	Maintaining organic matter	43	1.63
J-8	Removing trees and shrubs	44	1.50
O-1	Understanding basic business operation	45	1.50
K-9	Constructing wood projects	46	1.50
M-2	Writing	47	1.50
K-5	Painting wood and other surfaces	48	1.50
F-1	Grading the site	49	1.50
N-1	Keeping simple records of expenses and receipts	50	1.38
K-10	Maintaining electric motors	51	1.38
K-4	Cutting, threading, and fitting pipe	52	1.38
J-5	Interpreting the landscape plan	53	1.13

seedbed, seeding and reseeding, fertilizing and liming, irrigating and aerating the turf. Other competencies (more generalized) involved operating and servicing power equipment, handling chemicals for pest control, correcting poor soil drainage, installing plant materials and maintaining trees and shrubs. Reading, listening and observing were also listed among the most important worker competencies.

Table 7 shows the competencies required for greenhouse workers. A variety of greenhouse operations were investigated in this study in terms of both the number and type of products grown. Certain producers specialized in one crop, such as azaleas or carnations; other greenhouses were diversified, growing a large number of different flowering and foliage plants; a few operators were confined to growing bedding plants. With such diversity in greenhouse business firms, a broad spectrum of worker competencies was obtained. The most important technical knowledge and skills needed by greenhouse workers included: selecting plant materials; propagating, potting, forcing, culturing, marking, tagging, selling and transporting plants; preparing and using soils and other plant growing media; selecting, mixing and applying chemicals for pest control; operating and servicing greenhouse equipment; maintaining greenhouse structures by painting, glazing and fitting pipe and keeping simple records. Also ranking at the top, or among those competencies determined most important, were the human relations and communication entries, including getting along with others and listening and observing.

Table 7. List of Competencies Peculiar to Greenhouse Workers
Ranked According to Their Importance by Employers From
Greenhouse Operations

Code	Knowledge and Skill Items	Rank	Mean Score
L-1	Maintaining good relations	1	2.88
M-4	Listening and observing	2	2.88
E-1	Recognizing plant pest problems	3	2.63
B-4	Potting plants	4	2.63
C-5	Knowing effects of environmental factors on plant growth	5	2.63
H-1	Preparing growing media for greenhouse plants	6	2.63
H-5	Operating and servicing greenhouse equipment	7	2.50
K-6	Cutting and replacing glass	8	2.50
L-2	Getting others to work effectively	9	2.50
M-1	Reading	10	2.50
O-1	Understanding basic business operation	11	2.38
B-3	Propagating by plant part	12	2.38
E-6	Operating and maintaining spray equipment	13	2.38
O-5	Transporting, storing and shipping products	14	2.38
D-1	Knowing soil composition and characteristics	15	2.38
D-2	Selecting fertilizer materials	16	2.38
H-4	Preparing greenhouse plants for sale	17	2.38
M-3	Speaking	18	2.25
O-2	Selling horticultural products and services	19	2.25
H-3	Culturing potted plants and cut flowers	20	2.25
D-6	Correcting acid soils	21	2.25
E-5	Determining correct rates of chemical applications	22	2.25
K-5	Painting wood and other surfaces	23	2.13
M-2	Writing	24	2.13
E-4	Mixing and handling chemicals safely	25	2.13
D-7	Correcting poor drainage	26	2.13
K-4	Cutting, threading, and fitting pipe	27	2.00
B-1	Selecting and preparing propagating media	28	2.00
A-4	Selecting common plant materials	29	2.00
K-14	Operating and servicing automatic systems	30	2.00
O-3	Marking and tagging products	31	2.00
B-6	Retarding and forcing plants	32	2.00
C-1	Knowing the life cycle of plants	33	2.00
N-2	Keeping simple records of materials used	34	2.00

Table 7 (Continued)

Code	Knowledge and Skill Items	Rank	Mean Score
E-3	Selecting chemicals for disease, insect, and rodent control	35	2.00
H-2	Culturing bedding plants	36	1.88
D-4	Maintaining organic matter	37	1.88
B-5	Selecting and using plant growth substances	38	1.88
A-3	Identifying common greenhouse plants	39	1.75
K-9	Constructing wood projects	40	1.75
K-11	Conditioning garden (hand) tools	41	1.75
D-5	Taking soil samples for analysis	42	1.75
D-3	Selecting soil conditioners	43	1.75
O-7	Obtaining product and service information	44	1.63
K-12	Operating and servicing small power equipment	45	1.63
K-13	Operating and servicing large power equipment	46	1.50
N-3	Keeping employee time records	47	1.50
K-8	Making simple welding repairs	48	1.38
K-15	Installing and maintaining sprinkler systems	49	1.38
K-7	Making simple electrical repairs	50	1.38

Table 8 introduces the large number of competencies needed for landscape construction and maintenance workers. Since landscape materials are frequently planted and later maintained by the same personnel, the competencies required for both operations were combined in this study. The principle knowledge and skills required for the landscape worker included: landscape design principles, installing plant materials according to plan, maintaining nursery stock, establishing and maintaining lawns, preparing and managing soils, and selecting plant materials according to growth characteristics. Communications and human relations skills were again rated high in importance, but were rated lower than in most of the other groups. The respondents maintained that the landscape worker performs more of his tasks in relative isolation. Frequently, the foreman or manager was the person making contact with the customers.

Table 9 contains the competencies needed most by qualified park employees. The main functions identified for this occupation were park gardening and grounds maintenance. Competencies necessary to the park worker were very similar to those identified as necessary to the landscape worker. The major difference was that greater importance was given to skill in pest control for the park employee. Other knowledge and skills regarded as most important to good performance were: plant growth principles, planting and maintaining lawns and turf, installing and maintaining trees and shrubs, correcting

Table 8. List of Competencies Peculiar to Landscape Workers
Ranked According to Their Relative Importance by
Employers from Landscape Business Operations

Code	Knowledge and Skill Items	Rank	Mean Score
F-3	Seeding the lawn	1	3.00
G-3	Pruning nursery stock	2	3.00
G-4	Irrigating nursery stock	3	2.88
J-7	Installing plant materials	4	2.88
M-4	Listening and observing	5	2.88
F-1	Grading the site	6	2.75
F-2	Preparing the topsoil for seeding	7	2.75
G-2	Planting and transplanting nursery stock	8	2.75
L-1	Maintaining good relations	9	2.75
N-3	Keeping employee time records	10	2.75
F-5	Caring for the new lawn	11	2.63
J-5	Interpreting the landscape plan	12	2.63
J-6	Protecting trees from construction work	13	2.63
L-2	Getting others to work effectively	14	2.63
M-1	Reading	15	2.63
D-7	Correcting poor drainage	16	2.50
K-15	Installing and maintaining sprinkler system	17	2.50
N-2	Keeping simple records of materials used	18	2.50
F-10	Reseeding and patching the lawn	19	2.50
A-1	Identifying common woody plants	20	2.38
D-1	Knowing soil composition and characteristics	21	2.38
F-4	Renovating old lawns	22	2.38
N-1	Keeping simple records of expenses and receipts	23	2.38
M-3	Speaking	24	2.25
C-5	Knowing effects of environmental factors on plant growth	25	2.25
F-6	Fertilizing and liming the lawn	26	2.25
F-9	Aerating and removing thatch	27	2.25
D-2	Selecting fertilizer materials	28	2.13
D-3	Selecting soil conditions	29	2.13
J-9	Maintaining trees and shrubs	30	2.13
J-10	Constructing non-plant landscape features	31	2.13
F-8	Irrigating turf	32	2.13
O-1	Understanding basic business operation	33	2.13
J-4	Preparing the site for landscaping	34	2.00
G-5	Preparing nursery stock for the market	35	2.00
J-1	Knowing the principles of landscape design	36	2.00

Table 8 (Continued)

Code	Knowledge and Skill Items	Rank	Mean Score
A-4	Selecting common plant materials	37	2.00
D-8	Controlling erosion	38	2.00
K-4	Cutting, threading, and fitting pipe	39	2.00
K-12	Operating and servicing small power equipment	40	2.00
K-13	Operating and servicing large power equipment	41	2.00
N-4	Keeping equipment and service records	42	2.00
O-5	Transporting, storing, and shipping products	43	1.88
E-1	Recognizing plant pest problems	44	1.88
E-5	Determining correct rates of chemical applications	45	1.88
M-2	Writing	46	1.88
E-6	Operating and maintaining spray equipment	47	1.75
E-4	Mixing and handling chemicals safely	48	1.75
K-11	Conditioning garden (hand) tools	49	1.75
O-3	Marking and tagging products	50	1.75
N-5	Keeping inventory and stock records	51	1.75
D-6	Correcting acid soils	52	1.75
J-2	Making client and site analysis	53	1.63
J-8	Removing trees and shrubs	54	1.63
E-2	Selecting weedicides for weed control	55	1.63
J-3	Sketching and layout of landscape plan	56	1.50
D-4	Maintaining organic matter	57	1.50
F-7	Mowing and edging	58	1.50
O-7	Obtaining product and services information	59	1.50
A-2	Identifying common herbaceous plants	60	1.50
O-2	Selling horticultural products and services	61	1.50
C-1	Knowing the life cycle of plants	62	1.50
G-1	Preparing and managing nursery soils	63	1.38
K-1	Measuring land	64	1.38

Table 9. List of Competencies Peculiar to Park Gardeners and Grounds Maintenance Workers Ranked According to Their Relative Importance by City, County, and State Park Administrators

Code	Knowledge and Skill Items	Rank	Mean Score
L-1	Maintaining good relations	1	2.75
M-4	Listening and observing	2	2.75
C-5	Knowing effects of environmental factors on plant growth	3	2.63
D-2	Selecting fertilizer materials	4	2.63
M-1	Reading	5	2.63
G-3	Pruning nursery stock	6	2.50
E-4	Mixing and handling chemicals safely	7	2.38
E-5	Determining correct rates of chemical applications	8	2.38
E-6	Operating and maintaining spray equipment	9	2.38
F-6	Fertilizing and liming the lawn	10	2.38
J-5	Interpreting the landscape plan	11	2.38
J-7	Installing plant materials	12	2.38
J-9	Maintaining trees and shrubs	13	2.38
D-1	Knowing soil composition and characteristics	14	2.38
C-1	Knowing the life cycle of plants	15	2.38
E-2	Selecting weedicides for weed control	16	2.38
F-3	Seeding the lawn	17	2.38
F-5	Caring for the new lawn	18	2.38
D-3	Selecting soil conditioners	19	2.25
J-6	Protecting trees from construction work	20	2.25
E-1	Recognizing plant pest problems	21	2.25
G-4	Irrigating nursery stock	22	2.25
E-3	Selecting chemicals for disease, insect, and rodent control	23	2.25
F-8	Irrigating turf	24	2.25
L-2	Getting others to work effectively	25	2.25
A-2	Identifying common herbaceous plants	26	2.13
D-7	Correcting poor drainage	27	2.13
K-12	Operating and servicing small power equipment	28	2.13
A-4	Selecting common plant materials	29	2.13
F-2	Preparing the topsoil for seeding	30	2.13
F-4	Renovating old lawns	31	2.13
J-8	Removing trees and shrubs	32	2.13
K-11	Conditioning garden (hand) tools	33	2.00

Table 9 (Continued)

Code	Knowledge and Skill Items	Rank	Mean Score
N-3	Keeping employee time records	34	2.00
J-4	Preparing the site for landscaping	35	1.88
A-1	Identifying common woody plants	36	1.88
M-3	Speaking	37	1.88
B-5	Selecting and using plant growth substances	38	1.88
D-4	Maintaining organic matter	39	1.88
F-9	Aerating and removing thatch	40	1.88
F-10	Reseeding and patching the lawn	41	1.88
K-15	Installing and maintaining sprinkler system	42	1.88
D-8	Controlling erosion	43	1.88
K-13	Operating and servicing large power equipment	44	1.75
D-6	Correcting acid soils	45	1.75
F-7	Mowing and edging	46	1.75
G-2	Planting and transplanting nursery stock	47	1.75
M-2	Writing	48	1.63
C-3	Knowing plant parts and their functions	49	1.63
B-1	Selecting and preparing propagating media	50	1.63
F-1	Grading the site	51	1.63
O-7	Obtaining product and service information	52	1.50
K-5	Painting wood and other surfaces	53	1.50
K-9	Constructing wood projects	54	1.50
N-4	Keeping equipment and service records	55	1.50
B-7	Storing and handling seeds, bulbs, and corms	56	1.38
C-4	Knowing plant processes	57	1.38
N-1	Keeping simple records of expenses and receipts	58	1.38
N-2	Keeping simple records of materials used	59	1.38
O-1	Understanding basic business operation	60	1.38
O-5	Transporting, storing, and shipping products	61	1.38

soil problems, operating and servicing power equipment, and using garden tools; listening, observing, reading, and getting along with people.

Table 10 consists of knowledge and skills judged important to nursery workers. The major functions of the nursery business centered around propagating and growing ornamental plant materials and preparing them for the market. Competencies required to accomplish those activities included: identifying woody plants, asexual propagation, plant growth principles, fertilizing, irrigating, pruning, controlling weeds and other plant pests, operating spray equipment, and correcting soil drainage problems. Nursery work was somewhat limited in the number of competencies needed for the job to be done.

Table 11 contains all the knowledge and skill items rated "essential" or "important" for ornamental horticulture workers by 50 percent or more of the respondents. This list was selected by the respondents and constitutes the common competencies investigated in this study. These 45 entries were identified by the 56 employers as being mutually important to all of the occupational categories in the horticultural industry.

The mean scores assigned to the common competencies indicated the importance of each item in relation to the other items listed. Because several ties occurred, the rankings served primarily as a convenience. Competencies appearing at the top of the list included

Table 10. List of Competencies Peculiar to Nursery Workers
Ranked According to Their Relative Importance by
Employers from Nursery Business Operations

Code	Knowledge and Skill Items	Rank	Mean Score
L-1	Maintaining good relations	1	2.75
A-1	Identifying common woody plants	2	2.63
G-2	Planting and transplanting nursery stock	3	2.50
G-3	Pruning nursery stock	4	2.50
M-1	Reading	5	2.50
L-2	Getting others to work effectively	6	2.38
M-4	Listening and observing	7	2.36
E-4	Mixing and handling chemicals safely	8	2.34
E-1	Recognizing plant pest problems	9	2.25
G-4	Irrigating nursery stock	10	2.25
G-5	Preparing nursery stock for the market	11	2.25
O-3	Marking and tagging products	12	2.25
E-3	Selecting chemicals for disease, insect, and rodent control	13	2.25
C-5	Knowing effects of environmental factors on plant growth	14	2.13
B-3	Propagating by plant part	15	2.13
D-1	Knowing soil composition and characteristics	16	2.13
O-5	Transporting, storing, and shipping products	17	2.13
D-7	Correcting poor drainage	18	2.00
E-2	Selecting weedicides for weed control	19	2.00
E-6	Operating and maintaining spray equipment	20	2.00
B-1	Selecting and preparing propagating media	21	1.88
E-5	Determining correct rates of chemical applications	22	1.88
D-2	Selecting fertilizer	23	1.88
G-1	Preparing and managing nursery soils	24	1.86
C-1	Knowing the life cycle of plants	25	1.75
B-5	Selecting and using plant growth substances	26	1.75
N-4	Keeping equipment and service records	27	1.75
N-5	Keeping inventory and stock records	28	1.75
M-2	Writing	29	1.63
A-4	Selecting common plant materials	30	1.63
B-4	Potting plants	31	1.63
K-12	Operating and servicing small power equipment	32	1.63
D-4	Maintaining organic matter	33	1.63
M-3	Speaking	34	1.63

Table 10 (Continued)

Code	Knowledge and Skill Items	Rank	Mean Score
N-3	Keeping employee time records	35	1.63
J-7	Installing plant materials	36	1.50
N-2	Keeping simple records of materials used	37	1.50
D-6	Correcting acid soils	38	1.50
D-8	Controlling erosion	39	1.50
O-1	Understanding basic business operation	40	1.50
B-2	Propagating by seed	41	1.38
N-1	Keeping simple records of expenses and receipts	42	1.38
B-7	Storing and handling seeds, bulbs, and corms	43	1.13

Table 11. Competencies Rated "Essential" or "Important" by 50 Percent or More of the Respondents for Ornamental Horticulture Occupations

Code	Knowledge and Skill Items	Rank	Mean Score
L-1	Maintaining good relations	1	2.84
M-4	Listening and observing	2	2.66
M-1	Reading	3	2.61
L-2	Getting others to work effectively	4	2.48
E-1	Recognizing plant pest problems	5	2.23
C-5	Knowing effects of environmental factors on plant growth	6	2.21
D-2	Selecting fertilizer materials	7	2.16
M-3	Speaking	8	2.16
M-2	Writing	9	2.04
D-1	Knowing soil composition and characteristics	10	2.02
O-1	Understanding basic business operation	11	2.02
D-7	Correcting poor drainage	12	1.95
E-4	Mixing and handling chemicals safely	13	1.93
A-4	Selecting common plant materials	14	1.91
E-3	Selecting chemicals for disease, insect, and rodent control	15	1.89
N-3	Keeping employee time records	16	1.89
C-1	Knowing the life cycle of plants	17	1.88
G-3	Pruning nursery stock	18	1.88
E-5	Determining correct rates of chemical applications	19	1.86
E-6	Operating and maintaining spray equipment	20	1.82
N-2	Keeping simple records of materials used	21	1.82
E-2	Selecting weedicides for weed control	22	1.77
D-3	Selecting soil conditioners	23	1.75
O-5	Transporting, storing and shipping equipment	24	1.75
A-1	Identifying common woody plants	25	1.71
G-2	Planting and transplanting nursery stock	26	1.71
G-4	Irrigating nursery stock	27	1.71
N-1	Keeping simple records of expenses and receipts	28	1.71
D-6	Correcting acid soils	29	1.70
K-12	Operating and servicing small power equipment	30	1.66
J-7	Installing plant materials	31	1.64
O-3	Marking and tagging products	32	1.61

Table 11 (Continued)

Code	Rank	Mean Score
D-4 Maintaining organic matter	33	1.59
O-2 Selling horticultural products and services	34	1.57
N-4 Keeping equipment and service records	35	1.55
A-2 Identifying common herbaceous plants	36	1.52
K-11 Conditioning garden (hand) tools	37	1.52
F-3 Seeding the lawn	38	1.46
J-9 Maintaining trees and shrubs	39	1.45
K-15 Installing and maintaining sprinkler system	40	1.43
F-5 Caring for the new lawn	41	1.41
F-2 Preparing the topsoil for seeding	42	1.39
B-4 Potting plants	43	1.36
F-6 Fertilizing and liming the lawn	44	1.36
D-8 Controlling erosion	45	1.34

the human relations and communication skills. Other competencies recognized as important to work performed in the industry were generalized as follows: recognizing and controlling plant pests; understanding environmental factors in plant growth; knowing soils and fertilizer materials; understanding basic business operation; correcting soil problems; selecting, mixing, and applying chemicals; knowing common plant materials; keeping simple records; planting and maintaining lawns and nursery stock; operating and servicing small power equipment; and preparing and marketing horticultural products.

In response to an open-ended question which asked for knowledge and skills considered most important, the 56 employers volunteered the following generalized competencies. They are listed in the order of frequency mentioned with the most popular competency first on the list.

- How plants grow
- Knowledge of plant materials and growth characteristics
- Knowledge of plant pests and their control
- Operation and maintenance of equipment
- Knowledge of fertilizers
- Knowledge of floral design principles
- Maintenance of turf and lawns
- Salesmanship
- Knowledge of irrigation and watering
- Handling plant materials, planting, transplanting, pruning, balling
- Propagation
- Soils and other growing media

Greenhouse operation and maintenance

Knowledge of grading and labeling

Knowledge of landscape plan

Use of the phone

Writing legibly

Keeping production records

Use of hand tools

Human relations and communication skills were for the most part conspicuously absent from the above list. The investigator recorded only those items volunteered by the respondent. The terms "knowledge and skills" seemed to associate in the minds of the employers with technical subject matter, rather than human relations and communications competencies.

In Table 12 a comparison was made between the mean scores computed for the 56 respondents and for the seven members on the panel of experts. Scores from both groups were composites of individual items representing their relative importance to all occupational categories in the horticultural industry. Seventy-two percent of the mean scores ascribed to the panel were greater than the mean scores for corresponding competencies obtained from the respondents. The average disparity between the two scores was .25 per item. At the same time, 28 percent of the mean scores from the respondent group exceeded those obtained from the panel. Differences between these two groups averaged .16 per item. In general, the panel rated the competencies at a relatively higher level than did the respondents.

Table 12. Comparison of Mean Scores Between Respondents and Panel of Experts for Competencies in Ornamental Horticulture Occupations

KNOWLEDGE AND SKILL ITEMS	MEAN SCORES	
	Respondents	Panel of Experts
A. Plant Identification		
1. Identifying common woody plants	1.71	2.14
2. Identifying common herbaceous plants	1.52	2.00
3. Identifying common greenhouse plants	1.21	1.43
4. Selecting common plant materials according to growth habits and uses	1.01	1.71
B. Plant Propagation		
1. Selecting and preparing propagating media	1.18	1.29
2. Propagating by seed	.98	1.14
3. Propagating by plant part	1.27	1.29
4. Potting plants	1.36	1.86
5. Selecting and using plant growth substances	1.38	1.43
6. Retarding and forcing plants	1.09	1.29
7. Storing and handling seeds, bulbs and corms	1.14	.71
C. Plant Growth Principles		
1. Knowing the life cycle of plants	1.88	2.00
2. Knowing cell and tissue structures of plants	.86	1.00
3. Knowing plant parts and their functions	1.34	2.00
4. Knowing plant processes	1.05	1.29
5. Knowing effects of environmental factors on plant growth	2.21	1.71
D. Soils and Fertilizers		
1. Knowing soil composition and characteristics	2.02	1.57
2. Selecting fertilizer materials	2.16	2.57
3. Selecting soil conditioners	1.75	2.14
4. Maintaining organic matter	1.59	1.86
5. Taking soil samples for analysis	1.13	1.29
6. Correcting acid soils	1.70	1.71

Table 12 (Continued)

KNOWLEDGE AND SKILL ITEMS	MEAN SCORES	
	Respondents	Panel of Experts
7. Correcting poor drainage	1.95	2.00
8. Controlling erosion	1.34	1.29
E. Plant Pests		
1. Recognizing plant pest problems	2.23	2.43
2. Selecting weedicides for weed control	1.77	1.71
3. Selecting chemicals for disease, insect, and rodent control	1.89	2.00
4. Mixing and handling chemicals safely	1.93	2.57
5. Determining correct rates of chemical applications	1.86	2.14
6. Operating and maintaining spray equipment	1.82	2.00
F. Turf Establishment and Maintenance		
1. Grading the site	1.13	1.43
2. Preparing the topsoil for seeding	1.39	1.43
3. Seeding the lawn	1.46	1.43
4. Renovating old lawns	1.30	1.29
5. Caring for the new lawn	1.41	1.43
6. Fertilizing and liming the lawn	1.36	1.43
7. Mowing and edging	1.16	1.29
8. Irrigating turf	1.32	1.14
9. Aerating and removing thatch	1.21	1.14
10. Reseeding and patching the lawn	1.27	1.14
G. Nursery Management		
1. Preparing and managing nursery soils	1.02	1.14
2. Planting and transplanting nursery stock	1.71	1.86
3. Pruning nursery stock	1.88	1.57
4. Irrigating nursery stock	1.71	1.43
5. Preparing nursery stock for the market	1.02	1.29
H. Greenhouse Management		
1. Preparing growing media for greenhouse plants	.86	1.29
2. Culturing bedding plants	.75	.59
3. Culturing potted plants and cut flowers	.91	1.14
4. Preparing greenhouse plants for sale	.82	1.29
5. Operating and service greenhouse equipment	.57	.86

Table 12 (Continued)

KNOWLEDGE AND SKILL ITEMS	MEAN SCORES	
	Respondents	Panel of Experts
I. Floral Design		
1. Knowing the principles of floral design	.55	.71
2. Designing floral pieces	.45	.57
3. Constructing floral arrangements	.45	.57
4. Caring for and storing live plant materials	.71	.86
5. Packing and packaging plants and arrangements	.52	.86
J. Landscaping		
1. Knowing the principles of landscape design	.93	1.00
2. Making client and site analysis	.55	.43
3. Sketching and layout of landscape plan	.52	.29
4. Preparing the site for landscaping	.91	.86
5. Interpreting the landscape plan	1.14	1.00
6. Protecting trees from construction work	1.07	1.00
7. Installing plant materials	1.64	1.29
8. Removing trees and shrubs	1.00	1.00
9. Maintaining trees and shrubs	1.45	1.57
10. Constructing non-plant landscape features	.80	.86
K. Horticultural Mechanics		
1. Measuring land	1.02	1.00
2. Surveying land	.48	.57
3. Mixing and pouring concrete	.73	1.29
4. Cutting, threading and fitting pipe	1.13	1.29
5. Painting wood and other surfaces	1.20	1.29
6. Cutting and replacing glass	.86	.71
7. Making simple electrical repairs	.88	1.29
8. Making simple welding repairs	.71	1.00
9. Constructing wood projects	1.20	1.29
10. Maintaining electric motors	.73	1.14
11. Conditioning garden (hand) tools	1.52	1.86
12. Operating and servicing small power equipment	1.66	1.71

Table 12 (Continued)

KNOWLEDGE AND SKILL ITEMS	MEAN SCORES	
	Respondents	Panel of Experts
13. Operating and servicing large power equipment	1.27	1.86
14. Operating and servicing automatic systems	.52	.86
15. Installing and maintaining sprinkler system	1.43	1.29
L. Human Relations		
1. Maintaining good relations	2.84	3.00
2. Getting others to work effectively	2.48	3.00
M. Communications		
1. Reading	2.61	2.57
2. Writing	2.04	2.43
3. Speaking	2.16	2.57
4. Listening and observing	2.66	3.00
N. Records		
1. Keeping simple records of expenses and receipts	1.71	1.71
2. Keeping simple records of materials used	1.82	2.29
3. Keeping employee time records	1.89	1.71
4. Keeping equipment and service records	1.55	1.71
5. Keeping inventory and stock records	1.43	1.86
6. Estimating bill of materials	1.27	1.29
O. Business and Related Information		
1. Understanding basic business operation	2.02	2.29
2. Selling horticultural products and services	1.57	1.43
3. Marking and tagging products	1.61	1.57
4. Displaying products for sale	.93	.86
5. Transporting, storing, and shipping products	1.75	1.86
6. Determining market outlets and trends	.57	.71
7. Obtaining product and service information	1.43	1.43
8. Operating a cash register	.89	.71

There were eight knowledge and skill items rated with a mean score variation of .50 or more between the respondent group and the panel of experts. The respondent group rated two competencies above those recorded for the panel: knowing soil composition and characteristics and knowing the effects of environmental factors on plant growth.

The panel rated six competencies above those recorded for the respondent group: knowing plant parts and their functions, mixing and handling chemicals safely, operating and servicing large power equipment, mixing and pouring concrete, getting others to work effectively, potting plants.

Differences found in the above competencies were based upon mean score values. Further analysis was made to compare the same competencies in terms of their assigned ratings of "essential" or "important" by a majority of the two groups. Four of the eight competencies were rated important by both groups: knowing soil composition and characteristics, knowing effects of environmental factors on plant growth, mixing and handling chemicals safely, getting others to work effectively.

Based on the same criteria, one competency was rated by both groups as not being important: mixing and pouring concrete. Two of the three remaining items, including operating and servicing large power equipment and potting plants, were rated important as high as 57 percent and as low as 43 percent by the two respondent groups.

The last item, knowing plant parts and their functions, showed the greatest difference of opinion between the panel and the respondents, differences of 71 percent and 37 percent, respectively. Aside from this latter discrepancy, the variation in mean scores produced by responding groups was largely removed when comparing competencies on the basis of importance ratings.

In summary, Table 13 shows the 100 competencies cross checked with each occupational group and with all groups combined where 50 percent or more of the respondents rated the items as "essential" or "important". Checked items in the last column were determined by responses from all 56 employers as a composite group and were determined the common competencies for horticultural occupations. Only three items were not rated as "essential" or "important" by at least 50 percent of any one occupational group: surveying land, mixing and pouring concrete, and determining market outlets and trends.

Table 13. Summary of Competencies Rated "Essential" or "Important" by 50 Percent or More of Respondents for Each Occupational Group and for All Groups Combined

Knowledge and Skill Items	Occupational Groups							
	Florist Workers	Garden Center Workers	Golf Course Workers	Greenhouse Workers	Landscape Workers	Park Workers	Nursery Workers	All Horticultural Workers Combined
A. Plant Identification								
1. Identifying common woody plants		x			x	x	x	x
2. Identifying common herbaceous plants		x	x		x	x		x
3. Identifying common greenhouse plants	x			x				
4. Selecting common plant materials according to growth habits and uses	x	x		x	x	x	x	x
B. Plant Propagation								
1. Selecting and preparing propagating media		x		x		x	x	
2. Propagating by seed							x	
3. Propagating by plant part		x		x			x	
4. Potting plants		x		x			x	x
5. Selecting and using plant growth substances		x		x		x	x	
6. Retarding and forcing plants		x		x				
7. Storing and handling seeds, bulbs, and corms		x				x	x	

Table 13 (Continued)

Knowledge and Skill Items	Occupational Groups							
	Florist Workers	Garden Center Workers	Golf Course Workers	Greenhouse Workers	Landscape Workers	Park Workers	Nursery Workers	All Horticultural Workers Combined
C. Plant Growth Principles								
1. Knowing the life cycle of plants		x	x	x	x	x	x	x
2. Knowing cell and tissue structure of plants			x					
3. Knowing plant parts and their functions		x				x		
4. Knowing plant processes		x				x		
5. Knowing effects of environmental factors plant growth		x	x	x	x	x	x	x
D. Soils and Fertilizers								
1. Knowing soil composition and characteristics		x	x	x	x	x	x	x
2. Selecting fertilizer materials		x	x	x	x	x	x	x
3. Selecting soil conditioners		x	x	x	x	x		x
4. Maintaining organic matter		x	x	x	x	x	x	x
5. Taking soil samples for analysis			x	x				
6. Correcting acid soils		x	x	x	x	x	x	x

Table 13 (Continued)

Knowledge and Skill Items	Occupational Groups							
	Florist Workers	Garden Center Workers	Golf Course Workers	Greenhouse Workers	Landscape Workers	Park Workers	Nursery Workers	All Horticultural Workers Combined
7. Correcting poor drainage		x	x	x	x	x	x	x
8. Controlling erosion			x		x	x	x	x
E. Plant Pests								
1. Recognizing plant pest problems	x	x	x	x	x	x	x	x
2. Selecting weedicides for weed control		x	x		x	x	x	x
3. Selecting chemicals for disease, insect, and rodent control		x	x	x		x	x	x
4. Mixing and handling chemicals safely		x	x	x	x	x	x	x
5. Determining correct rates of chemical applications		x	x	x	x	x	x	x
6. Operating and maintaining spray equipment		x	x	x	x	x	x	x
F. Turf Establishment and Maintenance								
1. Grading the site		x	x		x	x		
2. Preparing the topsoil for seeding		x	x		x	x		x
3. Seeding the lawn		x	x		x	x		x

Table 13 (Continued)

Knowledge and Skill Items	Occupational Groups							
	Florist Workers	Garden Center Workers	Golf Course Workers	Greenhouse Workers	Landscape Workers	Park Workers	Nursery Workers	All Horticultural Workers Combined
4. Renovating old lawns		x	x		x	x		
5. Caring for the new lawn		x	x		x	x		x
6. Fertilizing and liming the lawn		x	x		x	x		x
7. Mowing and edging		x	x		x	x		
8. Irrigating turf		x	x		x	x		
9. Aerating and removing thatch		x	x		x	x		
10. Reseeding and patching the lawn		x	x		x	x		
G. Nursery Management								
1. Preparing and managing nursery soils					x		x	
2. Planting and transplanting nursery stock		x	x		x	x	x	x
3. Pruning nursery stock		x	x		x	x	x	x
4. Irrigating nursery stock		x			x	x	x	x
5. Preparing nursery stock for the market					x		x	

Table 13 (Continued)

Knowledge and Skill Items	Occupational Groups							
	Florist Workers	Garden Center Workers	Golf Course Workers	Greenhouse Workers	Landscape Workers	Park Workers	Nursery Workers	All Horticultural Workers Combined
H. Greenhouse Management								
1. Preparing growing media for greenhouse plants				x				
2. Culturing bedding plants		x		x				
3. Culturing potted plants and cut flowers	x	x		x				
4. Preparing greenhouse plants for sale	x			x				
5. Operating and servicing greenhouse equipment				x				
I. Floral Design								
1. Knowing the principles of floral design	x							
2. Designing floral pieces	x							
3. Constructing floral arrangements	x							
4. Caring for and storing live plant materials	x							
5. Packing and packaging plants and arrangements	x							

Table 13 (Continued)

Knowledge and Skill Items	Occupational Groups							
	Florist Workers	Garden Center Workers	Golf Course Workers	Greenhouse Workers	Landscape Workers	Park Workers	Nursery Workers	All Horticultural Workers Combined
J. Landscaping								
1. Knowing the principles of landscape design		x			x			
2. Making client and site analysis		x			x			
3. Sketching and layout of landscape plan					x			
4. Preparing the site for landscaping		x			x	x		
5. Interpreting the landscape plan		x	x		x	x		
6. Protecting trees from construction work					x	x		
7. Installing plant materials		x	x		x	x	x	x
8. Removing trees			x		x	x		
9. Maintaining trees and shrubs		x	x		x	x		x
10. Constructing nonplant landscape features					x			
K. Horticultural Mechanics								
1. Measuring land			x		x			
2. Surveying land								

Table 13 (Continued)

Knowledge and Skill Items	Occupational Groups						
	Florist Worker	Garden Center Worker	Golf Course Worker	Greenhouse Worker	Landscape Worker	Park Worker	Nursery Worker
3. Mixing and pouring concrete							
4. Cutting, threading, and fitting pipe			x	x	x		
5. Painting wood and other surfaces			x	x		x	
6. Cutting and replacing glass				x			
7. Making simple electrical repairs				x			
8. Making simple welding repairs				x			
9. Constructing wood projects			x	x		x	
10. Maintaining electric motors			x				
11. Conditioning garden (hand) tools			x	x	x	x	
12. Operating and servicing small power equipment		x	x	x	x	x	x
13. Operating and servicing large power equipment			x	x	x	x	
14. Operating and servicing automatic systems				x			
15. Installing and maintaining sprinkler system			x	x	x	x	
							All Horticultural Workers Combined

Table 13 (Continued)

Knowledge and Skill Items	Occupational Groups							
	Florist Workers	Garden Center Workers	Golf Course Workers	Greenhouse Workers	Landscape Workers	Park Workers	Nursery Workers	All Horticultural Workers Combined
L. Human Relations								
1. Maintaining good relations with customers, employers, and fellow employees	x	x	x	x	x	x	x	x
2. Getting others to work effectively	x	x	x	x	x	x	x	x
M. Communications								
1. Reading	x	x	x	x	x	x	x	x
2. Writing	x	x	x	x	x	x	x	x
3. Speaking	x	x	x	x	x	x	x	x
4. Listening and observing	x	x	x	x	x	x	x	x
N. Records								
1. Keeping simple records of expenses and receipts	x	x	x		x	x	x	x
2. Keeping simple records of materials used	x		x	x	x	x	x	x
3. Keeping employee time records	x		x	x	x	x	x	x
4. Keeping equipment and service records		x	x		x	x	x	x

Table 13 (Continued)

Knowledge and Skill Items	Occupational Groups							
	Florist Workers	Garden Center Workers	Golf Course Workers	Greenhouse Workers	Landscape Workers	Park Workers	Nursery Workers	All Horticultural Workers Combined
5. Keeping inventory and stock records		x			x		x	
6. Estimating bill of materials	x	x						
O. Business and Related Information								
1. Understanding basic business operation	x	x	x	x	x	x	x	x
2. Selling horticultural products and services	x	x		x	x			x
3. Marking and tagging products	x	x		x	x		x	x
4. Displaying products for sale	x	x						
5. Transporting, storing, and shipping products	x	x		x	x	x	x	x
6. Determining market outlets and trends								
7. Obtaining product and service information	x	x		x	x	x	x	x
8. Operating a cash register (handling money)	x	x						

CHAPTER V

SUMMARY, IMPLICATIONS, AND RECOMMENDATIONS

In 1968, the Oregon Departments of Education and Employment conducted a manpower survey which entailed an analysis of the ornamental horticultural industry to determine its major occupational categories, and to identify job titles in each occupational area, in addition to the business firms and agencies related to the industry. It was this survey which became the springboard for the present study.

Restatement of the Problem

The central purpose of this study was to formulate and test a model for securing information from the ornamental horticultural industry that would provide a basis for curriculum development in vocational agriculture. In order to develop the model, it was necessary to accomplish the following:

1. Determine typical occupations in ornamental horticulture from employment survey data.
2. Survey a randomly drawn sample of the total population to determine agricultural and business competencies needed for successful performance in the typical occupations.
3. Determine agricultural and business competencies common to most all the typical occupations.

Method and Procedures

The population chosen for this investigation included owners or managers of 180 ornamental horticulture business firms and agencies employing two or more workers located in the nine Willamette Valley counties in Oregon.

An interview schedule was developed with the assistance of an advisory committee composed of representatives from seven occupational groups including: florists, landscapers, and garden center, golf course, greenhouse, park, and nursery workers. The instrument contained 100 competencies which were identified as most important to satisfactory performance by typical workers in each of the occupational areas. The knowledge and skill items included were those considered important to at least one occupational category in ornamental horticulture.

Personal interviews were conducted with 56 employers representing seven occupational categories in ornamental horticulture (with equal distribution in each group). A panel of experts, each representing one of the occupational areas, was also interviewed to draw comparisons with the respondent group. All of the interviewees were employers who ranked the 100 competencies according to their relative importance for the satisfactory performance of workers in their respective occupational areas. Each knowledge and skill item

was judgmentally ranked as "essential", "important", "useful", or "not needed" for the typical worker in question.

The competencies were analyzed and ranked according to mean scores in relation both to their particular occupational groups and as a composite of all the occupational groups. Those items rated as "essential" or "important" by 50 percent or more of the respondents were identified for all seven categories. Mean scores were also compared between the respondents and the panel of experts.

Summary of Findings

1. Human relations and communications skills were rated in the top nine (of the 100) competencies considered important for all workers in ornamental horticulture occupations by 56 respondents.
2. Competencies in the technical areas considered most important⁷ by the employers were in the areas of: basic plant growth and characteristics, soil composition and drainage, fertilizer materials, pest control, use of chemicals, and basic business operation.
3. Specialized competencies, particularly those relating to principles of design, were rated least important for all horticultural occupations combined.

⁷ Rated "essential" or "important" by 50 percent or more of the respondents in each occupational group.

4. Twenty-seven necessary competencies were identified for florists, the smallest number required of any of the occupational groups.
5. Sixty-four competencies were rated important for garden center workers due to the wide range of functions included in handling garden supplies, plant materials, and equipment.
6. Fifty-three competencies were rated important for golf course workers. They were largely in the areas of turf maintenance and getting along with people.
7. Fifty competencies were rated important for greenhouse workers for the successful performance in the producing of plant materials in plant growing structures.
8. Sixty-four competencies were rated important to the construction and maintenance functions of landscape workers.
9. Sixty-one competencies were rated important for the park worker whose major function was gardening and grounds maintenance.
10. Forty-three competencies were rated important to satisfactory performance of tasks required of the nursery worker.
11. Mean scores derived for the 100 knowledge and skill items were generally higher (in 72 percent of the items) for the panel of experts than for the respondent group, however, the discrepancies were only relative and were largely

removed in comparisons of items rated important or not important.

12. Forty-five competencies were rated "essential" or "important" by 50 percent or more of the respondents, hence were identified as common competencies for all occupational categories in the ornamental horticultural industry.
13. Competencies listed in open-ended responses as being the most important to successful performance on the job were: knowledge of plant materials (plant identification, how plants grow, and growth characteristics); and knowledge of plant pests and their control.
14. "Listening and observing" were rated as the most important communications skill needed by ornamental horticulture workers.
15. The major deficiencies encountered by employers when they screened applicants for horticultural jobs were: lack of basic knowledge of plant materials, lack of basic knowledge of plant growth, lack of basic skills in working with plants, lack of experience with tools and equipment, lack of dependability, and lack of a knowledge of how to work.

Implications

This research demonstrated that occupational information

essential to curriculum planning in ornamental horticulture can be obtained through the systematic procedure employed in this study. It appears that the same approach could also be used with other off-farm agricultural industries. Competencies identified as important to successful performance in ornamental horticulture, coupled with the procedure for their identification, should be considered for secondary curriculum development and revision as well as for teacher preparation and inservice programs. General and vocational educators alike should become aware of the importance of human relations and communications skills as they apply to students preparing for the world of work.

Recommendations

The purpose of the recommendations is to suggest a plan of action whereby information obtained from this study might be understood in terms of curriculum utilization in vocational agriculture and to explore some of the implications of such action. The suggested plan of action would capitalize on the experiences and data gained through this study and would entail a three-phase inservice workshop with teachers of vocational agriculture.

Phase I would focus on preparing teachers to conduct interviews with selected employers in their local communities. Phase II would involve teachers in conducting the interviews in their respective communities. Phase III would involve teachers in interpreting and

converting the job information into curricular elements and learning activities.

Phase I: The introductory phase of the inservice program should include familiarizing the teachers with job opportunities and competency requirements in the various occupational categories within the ornamental horticultural industry. Special emphasis should be placed upon determining what kind of questions to ask employers, e.g., what does the employee do, what tasks does he perform, and what does he need to know in order to perform such tasks? The teachers should also become familiar with the interview schedule used for the study to serve as a guide for their own interviews. This phase would also include a role-playing session and/or a demonstration interview with an actual representative from the ornamental horticultural industry. Outcomes for teachers during this phase might include the following:

1. They become aware of employment opportunities in the industry
2. They become aware of how industry can assist vocational educators with curriculum development and/or improvement
3. They become aware of what knowledge and skills are important for employees in the industry.

Phase II: During this phase the instructors should conduct interviews with at least three to five business firms in their local communities. These interviews should be conducted with employers

in successful firms which hire full-time labor. The interviews would be facilitated by using a check list of competencies which might be taken from the original study. The first two or three employers should be asked specifically what their typical workers do on the job. These tasks should be recorded for future reference in Phase III. The check list may be used later as a guide in determining the relative importance of competencies and/or the degree of supervision needed for each task performed by the worker. Outcomes for teachers during this phase of the inservice program might include the following:

1. They become aware of competencies currently needed by workers in the industry
2. They become acquainted with possible work experience stations in the industry
3. They discover possible placement opportunities for graduates of their program

Phase III: This final phase of the inservice workshop involves the teachers in large and small group meetings for the purpose of interpreting and converting the competencies and other job information into curricular elements and learning activities. Once the instructors have conducted a few personal interviews they will have developed a familiarity with the competencies included in the original study and will have additional experience to draw from in developing curriculum

cooperatively. The following questions will arise during the final phase of the workshop:

1. What competencies should be stressed in the curriculum in terms of priority?
2. What competencies should best be taught on the job?
3. At what level and/or depth should the competencies be taught?
4. Which competencies should be taught by teachers other than those in vocational agriculture?
5. How can maximum use of the other disciplines be achieved in terms of the student's career objectives?

These questions suggest an interdisciplinary approach to career development in the secondary school. To prepare students for employment vocational agriculture teachers must enlist the cooperative effort of the entire education team. Together the members of the team can design a relevant program of career preparation if the needs, as identified through studies such as this one, are communicated to each teacher as well as to the students.

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APPENDICES

APPENDIX A

Guide Used for Initial Telephone
Contact with Respondents

Mr. (Mrs.)* _____, this is Curt Loewen, a State staff member in Agriculture Education in Salem, calling about job information pertaining to the ornamental horticultural industry. Do you have a few minutes or should I call back when you have a little more time?

Mr. (Mrs.)* _____, you were one of many respondents to a recent survey conducted by the Department of Employment to determine the number of employees in your business (agency). Perhaps, you recall filling out that form a few weeks ago? At any rate, as a follow-up of that survey, a statewide study is being made to determine what knowledge and skills people need to perform well in ornamental horticultural jobs. According to that survey, there is a rapidly growing need for employees in most all the horticultural worker areas, yet we understand that trained personnel are difficult to find. Is this true in your experience? The purpose of this study is to obtain information which will be helpful in training people for your type of business (agency).

With your permission, we would like to include your business (agency) as one of those in the state to be personally contacted for an interview. At some convenient time we would like to ask you some questions about a typical job performed in your business (agency) where the major part of the work concerns the culture and use of horticultural plant materials. This job might include activities that involve selecting, propagating, growing, maintaining, using, and marketing plant materials and/or handling horticultural supplies. We will bring a check list containing some 100 items to which you will be asked about their relative importance in performing the job satisfactorily. It will take from 30 to 45 minutes to complete the interview. May we schedule a time to meet with you in the near future? What time in the week would be most convenient? Morning or afternoon? We will look forward to meeting with you at that time.

* Employer's name obtained from Department of Employment survey

APPENDIX B

Check List for Interviewing Employers Concerning Job
Information for Workers in the Ornamental
Horticultural Industry

Mr. (Mrs) _____, as mentioned on the phone, you were one of the many respondents to a recent survey conducted by the Department of Employment. That was the first attempt ever made to determine the number of workers in the ornamental horticultural industry in Oregon.

As a follow-up of that survey, a statewide study is being made to determine what knowledge and skills people need to perform well in landscape horticultural jobs. According to that survey there is a rapidly growing need for employees in most all the horticultural worker areas, yet we understand that trained personnel are difficult to find. The purpose of this study is to obtain information which will be helpful in preparing people for this type of work.

Therefore, we would like to ask you some questions about a typical job in your business (agency) where the major part of the work concerns the culture and use of landscape horticultural materials. These would be jobs that involve selecting, propagating, growing, maintaining, using, and marketing landscape plant materials and/or handling horticultural supplies.

We would like you to think of this particular job and its requirements for good performance. For example, what does this person do? What would you like him (her) to do better? Or, what would you have liked him to be able to do that he was unable to do when first employed? In other words, think of this job as it should be performed by a trained, qualified employee.

Please be assured that whatever you say will be absolutely confidential. There is no way individuals can be identified with particular answers. In fact, after the interviews are completed, we won't even be able to tell which individual is associated with particular answers ourselves.

Check List for Interviewing Employers Concerning Job
Information for Workers in the Ornamental
Horticultural Industry

I Classification Information

A. Title of respondent:

- (1) _____ Owner (4) _____ Foreman
 (2) _____ Owner-Manager (5) _____ Other _____
 (3) _____ Manager

B. Industry or service category: _____

C. Length of time in present business or agency (years): _____

D. Major function(s) of the business (or agency):

- (1) _____
 (2) _____
 (3) _____
 (4) _____

E. Number of employees:

	<u>Full-time</u>	<u>Part-time</u>
(1) 1 to 5	_____	_____
(2) 6 to 10	_____	_____
(3) 11 to 15	_____	_____
(4) 16 to 20	_____	_____
(5) Over 20	_____	_____

F. Major source of employees:

- (1) _____ Department of Employment
 (2) _____ Walk in
 (3) _____ Personal referral
 (4) _____ Other _____

G. Would you be willing to serve in an advisory capacity with officials of your local school to help organize a program of

training which would be effective in meeting the needs of your business?

(1) _____ Yes (2) _____ No

H. Would you be willing to hire a student in your business who is enrolled in a horticultural program for purposes of providing work experience and job training in the horticultural industry?

(1) _____ Yes (5) _____ during the year (part-time)

(2) _____ No (6) _____ male student

(3) _____ summer (part-time) (7) _____ female student

(4) _____ summer (full-time) (8) _____ either sex

I. When you screen applicants for employment in your business what major problems do you find in these people?

(1) _____

(2) _____

(3) _____

(4) _____

J. Typical job category selected for interview: _____

II. Knowledge and Skills

Now may I read you a list of Knowledge and skill items and ask you about their importance according to the four choices on this card? (hand card) This isn't any kind of test, and there aren't any right answers. We just want to know how you feel about these things.

Knowledge and Skill Items

The first item is "identifying common woody plants". According to the four choices on the card, how important is _____ (item) _____ to good performance on the job?

	Essential	Important	Useful	Not Needed
A. Plant Identification				
1. Identifying common woody plants (shrubs, trees, vines)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Identifying common herbaceous plants (annuals, perennials, turf grasses, ground covers)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Identifying common greenhouse plants (flowers, foliage, flowering plants)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Selecting common plant materials according to growth habits and uses	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
B. Plant Propagation				
1. Selecting and preparing propagating media	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Propagating by seed (sexually)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Propagating by plant part (asexually)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Potting plants	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Selecting and using plant growth substances	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Retarding and forcing plants	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Storing and handling seeds, bulbs and corms	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C. Plant Growth Principles				
1. Knowing the life cycle of plants	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Essential	Important	Useful	Not Needed
2. Knowing cell and tissue structures of plants	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Knowing plant parts and their functions (stems, roots, leaves, flowers)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Knowing plant processes (photosynthesis, transpiration, translocation, respiration)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Knowing effects of environmental factors on plant growth (light, heat, moisture, aeration, fertility)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
D. Soils and Fertilizers				
1. Knowing soil composition and characteristics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Selecting fertilizer materials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Selecting soil conditioners	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Maintaining organic matter	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Taking soil samples for analysis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Correcting acid soils	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Correcting poor drainage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Controlling erosion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
E. Plant Pests				
1. Recognizing plant pest problems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Selecting weedicides for weed control	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Selecting chemicals for disease, insect, and rodent control	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Mixing and handling chemicals safely	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Determining correct rates of application	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Operating and maintaining spray equipment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Essential	Important	Useful	Not Needed
F. Turf Establishment and Maintenance				
1. Grading the site	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Preparing the topsoil for seeding	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Seeding the lawn	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Renovating old lawns	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Caring for the new lawn	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Fertilizing and liming the lawn	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Mowing and edging	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Irrigating turf	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Aerating and removing thatch	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Reseeding and patching the lawn	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
G. Nursery Management				
1. Preparing and managing nursery soils	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Planting and transplanting nursery stock	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Pruning nurwery stock	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Irrigating nursery stock	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Preparing nursery stock for the market	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
H. Greenhouse Management				
1. Preparing growing media for greenhouse plants	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Culturing bedding plants	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Culturing potted plants and cut flowers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Preparing greenhouse plants for sale	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Operating and servicing greenhouse equipment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Essential	Important	Useful	Not Needed
I. Floral Design				
1. Knowing the principles of floral design	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Designing floral pieces (weddings, funerals, all occasions)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Constructing floral arrangements	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Caring for and storing live plant materials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Packing and packaging plants and arrangements	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
J. Landscaping				
1. Knowing the principles of landscape design	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Making client and site analysis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Sketching and layout of landscape plan	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Preparing the site for landscaping	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Interpreting the landscape plan	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Protecting trees from construction work	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Installing plant materials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Removing trees	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Maintaining trees and shrubs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Constructing non-plant landscape features	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
K. Horticultural Mechanics				
1. Measuring land	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Surveying land	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Mixing and pouring concrete	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Essential	Important	Useful	Not Needed
4. Cutting, threading and fitting pipe	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Painting wood and other surfaces	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Cutting and replacing glass	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Making simple electrical repairs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Making simple welding repairs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Constructing wood projects	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Maintaining electric motors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Conditioning garden (hand) tools	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Operating and servicing small power equipment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Operating and servicing large power equipment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Operating and servicing automatic systems (watering, heating, ventilating, lighting)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Installing and maintaining sprinkler system	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
L. Human Relations				
1. Maintaining good relations with customers, employers and fellow employees	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Getting others to work effectively	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
M. Communications				
1. Reading (directions, product information)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Writing (orders, reports, letters)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Speaking (person-to-person, in groups, on telephone)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Listening and observing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Essential	Important	Useful	Not Needed
N. Records				
1. Keeping simple records of expenses and receipts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Keeping simple records of materials used	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Keeping employee time records	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Keeping equipment and service records	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Keeping inventory and stock records	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Extimating bill of materials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
O. Business and Related Information				
1. Understanding basic business operation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Selling horticultural products and services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Marking and tagging products	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Displaying products for sale	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Transporting, storing and shipping products	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Determining market outlets and trends	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Obtaining product and service information	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Operating a cash register (handling money)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

When you screen applicants for this _____ job what knowledge and skills, including those we have just read and others, do you consider most important?

(1) _____

- (2) _____
- (3) _____
- (4) _____
- (5) _____

III Personal Characteristics

Now, let us leave knowledge and skills and turn to the kind of personal characteristics your employee needs, i.e., willingness to learn, accepts responsibility, good appearance, physical strength and stamina.

When you screen applicants for this job, what personal characteristics, including those just mentioned and others, do you consider most important?

- (1) _____
- (2) _____
- (3) _____
- (4) _____
- (5) _____

That completed the questionnaire. Thank you for your cooperation in sharing information about job requirements and expectations.

We hope the results of this study will assist you and the landscape horticulture industry with better qualified employees in the not too distant future.

APPENDIX C

Summary of Classification and
Supplementary Information

Questions included in sections one and three of the interview schedule elicited classification and supplementary information from 56 respondents in the ornamental horticultural industry. Responses to those questions are summarized for clarification and review.

The designated titles for each of the employers interviewed varied with the type of business firm or agency in which they were associated. For the most part the respondents were identified as owner-managers. The following indicates the number of respondents in each of the title classifications:

<u>Title</u>	<u>Number of Respondents</u>
Owner-manager	34
Superintendent	10
Owner	8
Manager	2
Supervisor	<u>2</u>
Total	56

The number and type of business firms and agencies contacted for the study show an equal distribution in each occupational category:

Florists	8
Garden Centers	8
Golf Courses	8
Greenhouses	8
Landscapers	8
Nurseries	8
Parks	<u>8</u>
Total	56

Most of the respondents had from 11 to 20 years of experience in their fields. The second largest group fell in the five- to ten-year range.

<u>Experience Range</u>	<u>Number Respondents</u>
Under 5 years	5
5 to 10 years	11
11 to 20 years	19

21 to 30 years	8
31 to 40 years	4
over 40 years	<u>6</u>
Total	56

The major functions identified by the 56 business firms and agencies indicated that some of the occupational groups discharge more than one service. The growing and wholesaling functions were the most common among the responding groups.

<u>Functions</u>	<u>Number Firms and Agencies Involved</u>
Growing plant materials	16
Wholesaling plant materials	16
Retailing flowers	9
Landscape construction	9
Retailing garden supplies	8
Landscape maintenance	8
Park maintenance	8
Turf maintenance	8
Propagation	8

The number of workers, both full-time and part-time, employed by the firms and agencies interviewed indicate the relative size of business enterprises or service agencies contacted. These data suggest that most business operations in the ornamental horticulture industry are relatively small with very few employing more than ten workers at any one time during the year.

<u>Number of Employees</u>	<u>Number Firms or Agencies</u>	
	<u>Full-time</u>	<u>Part-time</u>
1 to 5	41	35
6 to 10	9	14
11 to 15	3	5
16 to 20	1	1
over 20	2	1

The major sources of horticultural workers employed by the firms and agencies interviewed were personal referrals and friends. Job-seekers are frequently located through the employment agency or through personal contact with the firm. Several employers indicated limited success from newspaper advertisement.

<u>Source of Employees</u>	<u>Number Firms Considered a Major Source</u>
Personal referral	31
Walk or call in	15
Employment Service	14
Advertisement	9
Civil Service (parks	2

Ninety percent of the respondents indicated a willingness to serve in an advisory capacity to officials of their local schools to help organize a program of training which would be effective in meeting the manpower needs of their businesses. The other 10 percent stated that they were either retiring soon or were too busy to help.

Opportunities for work experience and job training for students in horticultural programs were found in over 94 percent of the 56 respondents' places of business. Male students were preferred by 38 employers while female students were preferred by only four employers. Twelve respondents indicated no preference between the sexes. The following shows the kind of employment available and the number of firms that would provide opportunities for work experience.

<u>Period and Extent of Employment</u>	<u>Number of Firms</u>
Summer (full-time)	33
Summer (part-time)	32
During the year (part-time)	37

When employers indicated what major problems they found when screening applicants for horticultural jobs, a lack of knowledge and experience was considered the most common. Problems of prospective employees were identified as follows:

- Lack of basic knowledge of plant growth
- Lack of basic skills in working with plants
- Lack of experience with tools and equipment
- Not dependable
- Do not know how to work
- Lack of interest in learning
- Lack of initiative
- Poor appearance
- Dislike of heavy work
- Poor handwriting and spelling

In the third and final section of the interview schedule, the respondents were asked to identify what personal characteristics they considered most important to successful performance on the job. The following characteristics were listed in the order of importance according to frequency mentioned:

Personal Characteristics

Good appearance	Friendliness
Willingness to learn	Honesty
Interest in the job	Good speaking voice
Dependability	Initiative
Willingness to work	Ability to make suggestions

Accepts responsibility	Alertness - observant
Gets along with others	Creative
Physical strength and stamina	Courteous
Enthusiasm	Loyalty
Orderliness	Manual dexterity
Desire to accommodate	Love of nature
Follows directions	
Ability to communicate	
Cooperative	
Attention to details	

APPENDIX D

List of 100 Competencies Investigated with Rank Order and Percentages Derived from 56 Respondents Indicating Relative Importance of Each Item to Workers in the Ornamental Horticulture Industry, Willamette Valley, Oregon, 1969.

Code	Competency Items	Rank Order	Percentage Responses			
			E	I	U	N
A-1	Identifying common woody plants	28	21.4	37.5	32.1	8.9
A-2	Identifying common herbaceous plants	37	17.9	33.9	30.4	17.9
A-3	Identifying common greenhouse plants	57	17.9	16.1	35.9	30.4
A-4	Selecting common plant materials	14	25.0	46.5	23.2	5.4
B-1	Selecting and preparing propagating media	60	12.5	26.8	26.8	33.9
B-2	Propagating by seed	74	10.7	14.3	37.5	37.5
B-3	Propagating by plant part	52	16.1	26.8	25.0	32.1
B-4	Potting plants	47	16.1	33.9	19.6	30.4
B-5	Selecting and using plant growth substances	45	19.6	23.2	32.1	25.0
B-6	Retarding and forcing plants	67	10.5	19.6	32.1	35.9
B-7	Storing and handling seeds, bulbs and corms	63	10.7	28.6	25.0	35.9
C-1	Knowing the life cycle of plants	18	28.6	35.9	30.4	5.4
C-2	Knowing cell and tissue structure of plants	83	5.4	10.7	48.2	35.9
C-3	Selecting soil conditioners	49	7.1	30.4	51.8	10.7
C-4	Knowing plant processes	69	3.6	21.4	51.8	23.2
C-5	Knowing effects of environmental factors on plant growth	6	37.5	48.2	12.5	1.8
D-1	Knowing soil composition and characteristics	11	39.3	30.4	23.2	7.1
D-2	Selecting fertilizer materials	8	44.6	28.6	25.0	1.8
D-3	Selecting soil conditioners	24	25.0	33.9	32.1	8.9
D-4	Maintaining organic matter	33	16.1	33.9	42.9	7.1
D-5	Taking soil samples for analysis	66	12.5	16.1	42.9	28.6
D-6	Correcting acid soils	29	26.8	30.4	28.6	14.3
D-7	Correcting poor drainage	12	32.1	37.5	23.2	7.1
D-8	Controlling erosion	48	7.9	23.2	33.9	25.0
E-1	Recognizing plant pest problems	5	35.9	51.8	23.5	0
E-2	Selecting weedicides for weed control	22	33.9	21.4	32.1	12.5
E-3	Selecting chemicals for disease, insect, and rodent control	16	37.5	19.6	37.5	5.4
E-4	Mixing and handling chemicals safely	13	44.6	19.6	19.6	16.1
E-5	Determining correct rates of application	19	41.0	19.6	23.2	16.1
E-6	Operating and maintaining spray equipment	21	35.9	28.6	17.9	17.9

Code	Competency Items	Rank Order	Percent of Responses			
			E	I	U	N
F-1	Grading the site	64	23.2	14.3	14.3	48.2
F-2	Preparing the topsoil for seeding	44	30.4	21.4	5.4	42.9
F-3	Seeding the lawn	38	35.9	17.9	3.6	42.9
F-4	Renovating old lawns	51	25.0	23.2	8.9	42.9
F-5	Caring for the new lawn	43	30.4	23.2	3.6	42.9
F-6	Fertilizing and liming the lawn	46	25.0	28.6	3.6	42.9
F-7	Mowing and edging	61	21.4	19.6	12.5	46.5
F-8	Irrigating turf	50	26.8	21.4	8.9	42.9
F-9	Aerating and removing thatch	56	19.6	25.0	12.5	42.9
F-10	Reseeding and patching the lawn	54	28.0	19.6	12.5	42.9
G-1	Preparing and managing nursery soils	72	14.3	14.3	30.4	41.0
G-2	Planting and transplanting nursery stock	27	35.9	25.0	14.3	25.0
G-3	Pruning nursery stock	17	41.0	28.6	7.1	23.2
G-4	Irrigating nursery stock	26	32.1	30.4	14.3	23.2
G-5	Preparing nursery stock for the market	70	16.1	19.6	14.3	48.2
H-1	Preparing growing media for greenhouse plants	81	14.3	12.5	17.9	55.4
H-2	Culturing bedding plants	86	14.3	5.4	21.4	58.9
H-3	Culturing potted plants and cut flowers	78	10.7	21.4	16.1	51.8
H-4	Preparing greenhouse plants for sale	84	12.5	14.3	16.1	57.1
H-5	Operating and servicing greenhouse equipment	91	8.9	7.1	16.1	67.9
I-1	Knowing the principles of floral design	94	12.5	3.6	10.7	73.2
I-2	Designing floral pieces	99	12.5	1.8	3.6	82.1
I-3	Constructing floral arrangements	100	12.5	1.8	3.6	82.1
I-4	Caring for and storing live plant materials	84	12.5	14.3	5.4	67.9
I-5	Packing and packaging plants and arrangements	97	10.7	1.8	12.5	75.0
J-1	Knowing the principles of landscape design	75	10.7	23.2	14.3	51.8
J-2	Making client and site analysis	93	8.9	8.9	10.7	71.4
J-3	Sketching and layout of landscape plan	96	3.6	10.7	19.6	66.1
J-4	Preparing the site for landscaping	77	8.9	25.0	14.3	51.8
J-5	Interpreting the landscape plan	62	19.6	25.0	5.4	50.0
J-6	Protecting trees from construction work	68	17.9	17.9	17.9	46.5
J-7	Installing plant materials	31	28.6	35.9	7.1	28.6
J-8	Removing trees	73	12.5	17.9	26.8	42.9
J-9	Maintaining trees and shrubs	39	23.2	32.1	10.7	33.9
J-10	Constructing non-plant landscape features	85	3.6	17.9	33.9	44.6
K-1	Measuring land	71	8.9	21.4	32.1	37.5
K-2	Surveying land	98	0	8.9	30.4	60.7

Code	Competency Items	Rank Order	Percent of Responses			
			E	I	U	N
K-3	Mixing and pouring concrete	87	1.8	16.1	35.9	46.5
K-4	Cutting, threading, and fitting pipe	65	8.9	25.0	35.9	30.4
K-5	Painting wood and other surfaces	58	8.9	28.6	35.9	26.8
K-6	Cutting and replacing glass	82	10.7	14.3	25.0	50.0
K-7	Making simple electrical repairs	80	5.4	7.1	57.1	30.4
K-8	Making simple welding repairs	90	1.8	17.9	30.4	50.0
K-9	Constructing wood projects	59	3.6	28.6	51.8	16.1
K-10	Maintaining electric motors	88	3.6	12.5	37.5	46.5
K-11	Conditioning garden (hand) tools	36	10.7	44.6	30.4	14.3
K-12	Operating and servicing small power equipment	30	21.4	39.3	23.2	16.1
K-13	Operating and servicing large power equipment	53	17.9	28.6	16.1	37.5
K-14	Operating and servicing automatic systems	95	5.4	10.7	14.3	69.8
K-15	Installing and maintaining sprinkler system	40	17.9	32.1	25.0	25.0
L-1	Maintaining good relations with customers, employers, and fellow employees	1	83.9	16.1	0	0
L-2	Getting others to work effectively	4	53.6	41.0	5.4	0
M-1	Reading	3	64.3	32.1	3.6	0
M-2	Writing	9	35.9	33.9	28.6	1.8
M-3	Speaking	7	39.3	41.0	16.1	3.6
M-4	Listening and observing	2	69.8	26.8	3.6	0
N-1	Keeping simple records of expenses and receipts	25	26.8	35.9	19.6	17.9
N-2	Keeping simple records of materials used	20	23.2	42.9	26.8	7.1
N-3	Keeping employee time records	15	37.5	28.6	19.6	14.3
N-4	Keeping equipment and service records	35	21.4	32.1	26.8	19.6
N-5	Keeping inventory and stock records	42	17.9	26.8	35.9	19.6
N-6	Estimating bill of materials	55	16.1	23.2	32.1	28.6
O-1	Understanding basic business operation	10	33.9	37.5	25.0	3.6
O-2	Selling horticultural products and services	34	28.6	23.2	25.0	23.2
O-3	Marking and tagging products	32	28.6	28.6	17.9	25.0
O-4	Displaying products for sale	76	14.3	19.6	10.7	55.4
O-5	Transporting, storing and shipping products	23	23.2	41.0	23.2	12.5
O-6	Determining market outlets and trends	92	3.6	8.9	28.6	58.9
O-7	Obtaining product and service information	41	23.2	25.0	23.2	28.6
O-8	Operating a cash register (handling money)	79	25.0	5.4	3.6	66.1