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COMPETENCIES NEEDED FOR CAREERS IN ORNAMENTAL HORTICULTURE IN UTAH

by

Dennis George Bahen

A thesis submitted in partial fulfillment
of the requirement for the degree

of

MASTER OF SCIENCE

in

Agricultural Education

Approved:

UTAH STATE UNIVERSITY
Logan, Utah

1980

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Dennis George Bahen

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ABSTRACT

Competencies Needed for Careers
in Ornamental Horticulture in Utah
by

Dennis George Bahen, Master of Science
Utah State University, 1980

Major Professor: Gilbert A. Long
Department: Agricultural Education

The purpose of the study was to present descriptive data about the industry, determine the importance of the competencies needed for job entry, and assess the manpower needs of the ornamental horticulture industry in Utah.

The identified population of 576 ornamental horticulture enterprises was categorized into seven areas of specialization: Arborists (4.5%), Maintenance of Landscapes (10.8%), Landscape Construction (18.6%), Golf Courses (13.5%), Greenhouse Production (5.4%), Florist-Plant Shops (30.9%) and Garden Center-Nurseries (16.3%).

The data were collected by a survey-questionnaire. One hundred and sixteen ornamental horticulture enterprises responded to the survey. This amounted to 38% of the industry sampled and 20% of the population.

Findings of the study indicated that single enterprises conduct work in a number of the areas of specialization.

Ninety-two of the ninety-four competencies were rated at least of some importance to entry level workers. The most important competencies

common to all the areas of specialization were: human relations and communications, pest identification and control, record keeping, and safety.

Other highly rated individual competencies in the major areas of specialization included: 1) Arborists--mix and handle chemicals safely, turf establishment and maintenance, removal of trees and shrubs, and pruning techniques; 2) Maintenance of Landscapes--mix and handle chemicals safely, apply fertilizer materials, operate and maintain spray equipment, maintain turf and operate and service automatic systems; 3) Landscape Construction--plant and transplant, turf establishment and maintenance and sell products and services; 4) Golf Courses--apply fertilizer materials, maintain golf greens and turf and apply knowledge of irrigation and watering methods; 5) Greenhouse Production--apply knowledge of irrigation and watering methods; sell products and services, and operate a cash register and handle money; 6) Florist-Plant Shops--design and construct floral pieces, dish gardens, and terrariums, operate a cash register and handle money and design displays; 7) Garden Center Nurseries--operate a cash register and handle money, sell products and services, and select plant materials according to growth habits and uses.

The number of employees anticipated in the future is growing at a 16% yearly rate. The greatest anticipated yearly expansion of full time employees in the areas of Landscape Construction (63%), Arboriculture (35%) and Greenhouse Production (32%). Members of owners' families comprise 17% of the industry's employees.

The study also indicated a preference for workers presenting specific job competencies at job entry.

CHAPTER I

INTRODUCTION

Education in general and vocational education specifically are charged with the education and training of individuals to enter and succeed in their chosen career.

"Career education deals with those parts of the educational system focused on providing the individual with skills, understandings, and values necessary for obtaining and succeeding in one's life work. As such, career education calls for the united effort of the school and community to help all individuals learn about and prepare to engage in work as a part of their way of living." (Utah State Board of Education, 1978).

Vocational agricultural education was first recognized by the federal government when it passed the Smith-Hughes Act of 1917. Funding was provided for training programs in production agriculture. Additional federal legislation in the form of the George-Reed Act of 1929, the George-Ellzey Act of 1934, and the George-Dean Act of 1936 helped pave the way for vocational education by providing federal funding (Humpherys, 1965). The Vocational Education Act of 1963 expanded upon these acts by encouraging schools to offer vocational courses of instruction for any occupation in agriculture/agribusiness (United States Department of Health, Education and Welfare "USDHEW", 1978).

The Problem

Historically, vocational agriculture has been taught primarily by

vocational instructors having a broad background in production agriculture. This background usually came from being reared on a diversified farm. Modern times have changed all this. Although the vocational agricultural instructors generally have a farming background, it is more limited in scope due to modern farm specialization.

Vocational agricultural instructors have the responsibility for "the development of occupational competence in the areas where a labor demand exists" (Simpson, 1976.) How do agricultural instructors go about defining what to include in their curriculum to adequately train their students for entry into a selected occupation? How do they stay current in their profession?

Background of the Problem

The United States Office of Education, (USOE), Division of Vocational and Technical Education, saw a need to help with these problem areas. The USOE recommended that two national studies be made. The first study was to identify and validate major production agriculture and agribusiness occupations and their manpower needs. The second study was to determine the competencies required for entry into the identified occupations. The studies were completed in 1978 (USDHEW, 1978).

The Department of Agricultural Education at Utah State University has a departmental objective of identifying agriculture occupations in Utah, their manpower needs, and competencies needed for entry and advancement. Studies at Utah State University (Wood, 1978; Thomsen, 1977; Bigo, 1979; Summers, 1979) (have been completed in the areas of production agriculture and agriculture sales and service. These studies provide guidelines to vocational agricultural instructors in assessing their curriculum needs and requirements.

Purpose of the Study

One area of instruction in vocational agriculture is Ornamental Horticulture. This area of instruction was recognized as important early in the twentieth century. The status of agricultural education in the secondary schools was presented in a paper at a meeting of the Association of Land-Grant Colleges in 1909. The paper concluded that "agriculture, horticulture, and forestry should be a regular part of public secondary education" (Humpherys, 1965). Ornamental horticulture is concerned with "Persons who work in occupations that specialize in planting, caring for, and marketing trees, shrubs, plants, flowers, and turf areas"(USDHEW, 1978). Peterson (1969) stated that, "Because of the increase in population and the resultant urbanization of many of the formerly rural, farm-oriented communities, there has been an increased emphasis, both locally and nationally, on ornamental horticulture and the opportunities it might hold for interested people." To this end, Peterson (1969) identified the need for technical training in ornamental horticulture in Utah. Zurbrick (1974) undertook research in Arizona to identify competencies needed in the ornamental horticulture industry by beginning employees. Others (Kaas, 1975; Hawaii DOE, 1976; Cole, 1973) have also completed research in the instructional area of ornamental horticulture.

Updating of the Utah curriculums in the area of ornamental horticulture is needed. Peterson (1969) concluded that the results of his study "indicate the need for future research in ornamental horticulture to establish trends in the industry and to determine the opportunities for employment". Vocational agriculture instructors can obtain a general background about ornamental horticulture from research done

in other states, but need to look at the ornamental horticulture industry within the state of Utah to determine specifically what competencies need to be taught. There have been a number of Utah studies completed which relate to the ornamental horticulture industry and area of study (Peterson, 1969; Schank, 1964; McKee, 1974; Stevens, 1966).

It is the purpose of this study to survey ornamental horticulture in Utah and assess the scope, size, and needed competencies of entry employees of the ornamental horticulture industry. The information gained in this study could be utilized to help keep agricultural education current, to aid agricultural instructors in the evaluation and updating of their ornamental horticulture curriculum, assist agricultural educators in their program articulation efforts, or guide anyone interested in pursuing ornamental horticulture as a career.

Objectives

The major objectives of this study are:

1. To identify those businesses and governmental departments and/or agencies involved in ornamental horticulture activities in Utah.
2. To assess the relative proportion of businesses and governmental departments and/or agencies involved in each of the major ornamental horticulture areas or categories in Utah.
3. To determine the relative importance of the identified competencies needed in ornamental horticulture for job entry.
4. To determine the manpower needs of the ornamental horticulture industry in Utah.

CHAPTER II

REVIEW OF LITERATURE

There are several areas of background study which were important in the formulation of this study. This chapter will review the efforts of other persons and groups who have contributed insight into these areas.

Career Education and Vocational Education

In our rapidly changing society, "persons are apt to change occupations three, four, or more times throughout their working lives." (Utah State Advisory Council for Vocational and Technical Education, "USACVTE", 1977). To the casual observer, it would seem that the learning of specific job skills as advocated by career and vocational educators, would be unnecessary. But a person must first find and hold a first job before being too concerned with subsequent jobs. Therefore, "students need to develop specific skills for specific jobs, at least in an occupational cluster" (USACVTE, 1977). This skill or competency development will help the individual to succeed in the job and give him/her a good foundation upon which to build a career.

Career education and vocational education are not the same concept, although career education received its impetus from the vocational education community. A vocation is part of a career and is defined as "one's primary work role at any given point in time" (USDHEW, 1976). The Utah State Board of Education's State Advisory Council for Career Education emphasizes that "career education calls for the united effort of the school and community to help all individuals learn about

and prepare to engage in work as a part of their way of living" (1978).

Agricultural Education and
Ornamental Horticulture

The United States Department of Health, Education and Welfare (USDHEW) and the Department of Labor (DL) have identified, defined, and classified vocational-technical instructional programs into seven major areas. One of the major areas is agriculture.

"Agriculture is comprised of the group of related courses or units of subject matter which are organized for carrying on learning experiences concerned with preparation for or upgrading in occupations requiring knowledge and skills in agricultural subjects. The functions of agricultural production, agricultural supplies, agricultural mechanization, agricultural products (processing) ornamental horticulture, forestry, agricultural resources, and the services related thereto, are emphasized in the instruction designed to provide opportunities for pupils to prepare for or improve their competencies in agricultural occupations. An agricultural occupation may include one or any combination of these functions." (USDHEW, 1970, p. 153).

Peterson (1969, p. 20) states that "Ornamental horticulture is a rapidly expanding facet of agriculture. It is closely correlated with the expanding population of the United States."

The population of the United States has increased from 204.9 million persons in 1970 to 215.8 million persons in 1977. Projected estimates put the population at 245.9 million persons by the year 2000 (United States Department of Commerce "USDOC", 1978).

The value of new construction in the United States has increased every year, except 1975 from 1965 to 1977 (USDOC, 1978).

The value of flowers sold in the United States has increased from 2.5 million dollars in 1970 to 6 million dollars in 1977 (United States Department of Agriculture "USDA", 1978).

The "Utah Job Outlook" publication of the Utah Department of

Employment Security (UDES) summarizes the job outlook in agriculture for the years 1976 to 1981. There is an increase of jobs projected in Utah agriculture from 26,370 in 1976 to 29,740 in 1981, or a total of 1,750 job openings (UDES, 1976).

Ornamental horticulture will become an even more important industry as population and construction increase and energy supplies become more limited. As persons stay closer to home, their personal environment will become more important and horticultural sales and services will increase.

Ornamental Horticulture Industry Classifications and Job Titles

In describing the ornamental horticulture industry various references have provided models to guide this study.

The National Ag Occupations Competency Study divides the industry into six occupational clusters which include: 1) Arboriculture, 2) Governmental Agencies, 3) Golf Courses, 4) Florists, 5) Landscape Gardeners, and 6) Garden Centers.

Zurbrick (1974) evaluated competencies in ornamental horticulture by major job titles: 1) Greenskeeper, 2) Groundskeeper, 3) Laborer, Golf Course, 4) Landscape Gardener, 5) Nurseryman, 6) Nursery Salesman, and 7) Nursery Worker.

Kaas (1975) classified his population into nine areas: 1) Arborists, 2) Farm and Garden Supply Centers, 3) Golf Courses, 4) Greenhouses, 5) Landscapers, 6) Nursery Production, 7) Park and Highway Management, 8) Retail Florists, and 9) Wholesale Florists.

The "Handbook of Agricultural Occupations" gives occupational briefs on the following occupations in ornamental horticulture: 1)

Retail Florist, 2) Garden Center Employee, 3) Golf Course Employee, 4) Greenhouse Employee, 5) Landscape Service Employee, 6) Landscape Gardener, 7) Nursery Employee, 8) Tree Surgeon, and 9) Lawn and Garden Equipment Mechanic (Hoover, 1977).

The Department of Agricultural Education at Utah State University prepared a curriculum guide in ornamental horticulture for the Utah State Board for Vocational Education (1972) which defined various jobs in the instructional area of ornamental horticulture. The guide included: 1) Greenhouse Worker, 2) Nursery Worker and Landscaping Assistant, 3) Landscape Gardener, 4) Groundskeeper, 5) Greensworker, 6) Athletic Field Groundskeeper, 7) Flower Shop Worker, and 8) Garden Center Employee.

Moore (1969) in his book "Ornamental Horticulture as a Vocation" lists job possibilities in ornamental horticulture according to various areas of activity which include: 1) Professional, 2) Technical, 3) Managerial, 4) Clerical, 5) Production, 6) Sales, and 7) Service. A complete list of Moore's job titles are included in Appendix A.

In addition, the United States Department of Labor, Employment and Training Administration lists various occupational titles in the Fourth Edition of the "Dictionary of Occupational Titles" (1977). See Table 1 for details.

Cooperative Work Stations

A cooperative work station is essential in giving agricultural education students realistic experiences in their supervised agricultural occupational experience program. "The primary purpose of supervised agricultural experience programs are: 1) providing

Table 1

Dictionary of Occupational Titles (D.O.T.) Listings of Ornamental
Horticulture Job Titles

Job Title	D.O.T. Reference
Horticulturist	040
Extension work, instructor	090
Farm adviser	096
Vocational instructor	097
Writer	131
Horticulture sales	272
Horticulture speciality occupations	405
Supervisor	
Bonsai culturist	
Grower	
Propagator	
Farm worker	
Growth media mixer	
Budder	
Horticulture worker	
Flower picker	
Gardening and Groundskeeping	406
Cemetary worker and supervisor	
Park worker and supervisor	
Greenskeeper	
Greens superintendent	
Gardener	
Groundskeeper	
Plant life and related service occupations	408
Supervisor, spray, lawn and tree service	
Supervisor, insect and disease inspection	
Supervisor, tree trimming	
Landscape gardener	
Tree surgeon	
Pest control worker (scout)	
Weed inspector	
Hydro-sprayer operator	
Tree trimmer	
Lawn service worker	
Sprayer, hand	
Mechanic	624

specialized educational experiences, 2) aiding in establishing in an occupation, and 3) contributing to opportunities for earning." (Bender, Taylor, Hansen, Newcomb, 1974).

The Oregon Board of Education (1969) emphasizes that it is appropriate that all students obtain work experience enrollment during their high school ornamental horticultural preparation.

Petrick (1977) suggested that program directors should attempt to simulate occupational conditions by incorporating work experience in courses. Every effort should be made to simulate an atmosphere like that found in the horticulture industry.

In a research report "Education in Agriculture in California", it was emphasized that job experience in conjunction with classroom study enhances adequate training of an employee and that such experience enhances the teacher-student relationship together with the employer-employee relationship as early as it is accomplished.

Cole (1973, p. 34) states that "Eighty-nine percent of the employers in the study were willing to open at least one cooperative work experience station for training students in their phase of the industry."

Jensen (1978) indicated in a Washington study that 80% of the responding businesses indicated a desire to offer a cooperative work experience station.

Preference for Trained Employees

Cole (1973, p. 38) reported that "100% of the employers interviewed indicated that if a potential employee had ornamental horticulture in high school, he would receive preference when applying for a job." The study further indicated that 24% of the research respondents would give a higher wage to the employee who had previous training in ornamental horticulture.

Employee Training Needs

According to the research report "Education in Agriculture in California" (1971), the major personnel problem of employers is the lack of qualified workers. Sixty-four percent of the research respondents indicated that it was a problem.

Zurbrick (1974, p. 1) states that "it has never been nor will it likely ever become educationally sound or economically feasible to train persons for a specific job. Thus, the instructional program must be sufficiently broad to encompass many job titles and yet be specific enough to provide the necessary competencies required for gainful employment in the desired area of endeavor."

Key (1978, p. 100) writes of a conflict of goals by many vocational educators. One goal of vocational instructors is to "develop the total individual, with good general agricultural skills, a broad background of agricultural knowledge and a strong appreciation of agriculture as a way of life." Other instructors want to develop a competent worker, with specific agricultural skills and knowledge for a very specific agricultural occupation and strong desire to enter that specific occupation." Key stated, "I tend to support a combination of the specific competency approach and the total individual approach."

Utah Employer Needs and Vocational Education

"Are Employer Needs Being Met?" (Simpson, 1976) is a publication of the Utah State Advisory Council for Vocational and Technical Education. The Advisory Council wanted to find the answers to four questions: "1) How well are the vocational education institutions meeting Utah's employers' needs for trained people? 2) What do Utah's employers want from the vocational education system? 3) How familiar are Utah's

employer's with the vocational education institutions, programs, and graduates' skills? 4) What are Utah's employers willing to do to assist vocational educators in better preparing students for employment?" (Simpson, 1976 p. 12). The findings of the study indicated that the vocational education system in Utah is meeting the needs of the employers qualitatively, but many jobs go to unskilled workers which could go to trained workers. Utah's employers need more vocationally trained applicants for these jobs. "Employers stress the need to emphasize areas such as skills improvement, on-the-job experience, attitude, appearance, personality and work habits." Only 27% of the employers in the research were considered to be familiar with vocational programs in their area. Sixty-four percent of the responding employers would give students the opportunity to work at their enterprises while attending high school.

Competencies

"Improving technology and changing jobs suggest that vocational educators continue a thorough and systematic study of competencies needed for job entry and effect training programs." (Clary & Woodin, 1965 p. 26).

As a result of this ever changing society, vocational educators have done extensive research into the various competencies or skills necessary for entry and advancement in vocational areas. The following studies are cited to shed light on the state of competency based vocational education relating to the ornamental horticulture industry and instructional area.

Key (1978, p. 100) states that "We must also keep in mind that we are preparing students to enter whatever occupational occupation they enter with the attitude that they will work hard, do their best, and

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keep learning new competencies and skills as long as they are in that occupation."

Phillips (1979) in an editorial for the "VocEd Magazine" says that most workers fail not because of a lack of skills but because they have problems "related to human relations and worker attitudes."

Survey results in Washington (Jensen, 1978) indicate that the important units of instruction for ornamental horticulture are plant identification, customer relations, plant diseases, insects, plant growth, fertilizers, salesmanship, telephone etiquette, pesticide safety, and leadership development.

Peterson (1969) researched competencies needed in ornamental horticulture in Utah and found that retail salesmanship, plant identification, disease and insect control rated the highest degree of competency.

Petrick (1977) emphasizes human relations skills, attitude development, a willingness to work, and salesmanship skills in his article "Learning by Doing in Ornamental Horticulture" which appeared in the December 1977 "Agricultural Education Magazine".

McKee (1974) in a research study relating to the golf course industry indicated that mechanical skills, care of hand tools, fertilization, business tasks, turf skills, pest identification, and pest control were important competencies. He also compared these skills to other areas of ornamental horticulture and found them to be compatible. He indicated that there is not a need for a specialized curriculum for the golf course industry separate from an ornamental horticulture program.

Arizona's study by Zurbrick (1974) rates the following

competencies important: 1) human relations skills, 2) plant identification, 3) personal safety and first aid, 4) pest identification and control, 5) production techniques, and 6) record keeping.

Cole (1973, p. 39) states that "To become known as a qualified employee one must be familiar with 1) basic plant growth characteristics, 2) soil composition and drainage, 3) fertilizer materials, 4) pest control, and 5) basic record keeping." He also stresses that "Good personal relations is an essential in ornamental horticulture just as it is in any other industry."

Summary

Career education and vocational education have as a major goal the preparation of persons for work. Work is not to be considered as mere labor. Work can be considered as effort which results in benefits to the worker and/or others. The preparation of persons for work should involve the family, school, community, business and industry.

Ornamental horticulture is a fast-growing area of agricultural employment. Population growth and the resurgence of the green revolution in the past decade have contributed to this growth.

Because of the growth of the ornamental horticulture industry, vocational educators are expanding the course offerings in ornamental horticulture to students in high schools, technical programs, and universities.

In an effort to align ornamental horticultural education with industry needs, research has been carried out to identify those skills that workers need to enter and succeed in the industry.

An integral part of vocational education is the setting up of

cooperative work stations which give the learner real experiences while attending school.

The combination of the classroom/laboratory with a cooperative work experience will help to produce a skilled, adaptable worker to place in the ornamental horticulture industry.

CHAPTER III

METHODOLOGY

Objectives

It is the purpose of this study to present descriptive information about the industry, determine the importance of the identified competencies needed for job entry, and to assess the manpower needs of the ornamental horticulture industry in Utah.

Research Design

The design of this study is a cross-sectional survey design. Borg and Gall (1971) define the cross-sectional survey as a survey which collects information "from a sample drawn from a predetermined population."

Population

The population of those businesses and governmental departments and/or agencies involved in ornamental horticulture in Utah was identified by: 1) listing those enterprises which appear in the yellow pages and governmental listings in the 16 telephone books in the state, 2) a list of all Utah Golf Association member enterprises, 3) a list of the Landscape Contractors in Utah, and 4) the assistance of Mr. Randy Hoffman, Utah State University Area Horticulturist.

The population assessment of those businesses and governmental departments and/or agencies involved in ornamental horticulture were categorized into areas of specialization which include: 1) Arborists

(Tree Service), 2) Maintenance of Landscapes, 3) Landscape Construction, 4) Golf Course, 5) Greenhouse Production, 6) Florist-Plant Shop, and 7) Garden Center-Nursery. The population distribution appears in Table 2.

Table 2

Distribution of Businesses and Governmental Departments and/or Agencies by Major Areas of Specialization in Ornamental Horticulture in Utah According to Population Assessment

Area of Specialization	Number in Category	Percent of Population
Arborists (Tree Service)	26	4.5%
Maintenance of Landscapes	62	10.8%
Landscape Construction	107	18.6%
Golf Course	78	13.5%
Greenhouse Production	31	5.4%
Florist- Plant Shop	178	30.9%
Garden Center- Nursery	94	16.3%
Total Population	576	100%

Sample

A random, stratified sample of 307 enterprises or 53% of the population was taken from the identified population of 576. A stratified sample was necessary to assure adequate representation in all areas of specialization. The sample included a range of from 26 to 50 enterprises in each area of specialization.

Survey-questionnaire

The first draft questionnaire, field test questionnaire, and cover letter (See Appendix B) were field tested utilizing one ornamental horticulture enterprise from the sample in each major area of specialization. The seven representatives were chosen from the Logan, Utah area and were asked to complete the survey to aid the researcher in detecting any problems associated with the survey-questionnaire. The results of the field test surveys were utilized in the final tabulation of results.

Findings of the field test indicated the following: 1) The average time to fill out the survey-questionnaire was 16 minutes, 2) The instructions were found to be adequately explained, 3) The questions were not confusing, 4) There were no important questions omitted in the survey, and 5) There were no suggestions for changing the survey-questionnaire.

The final format of the survey-questionnaire was changed as follows: 1) numbers preceding the skills were eliminated, and 2) the question asking participants to indicate where they obtained their knowledge and skills related to their work was replaced by the question asking them to list the job titles of employees in their horticulture enterprise.

The survey-questionnaire (Appendix C) solicited responses to:

- 1) The area(s) of specialization of their enterprise, 2) The number of employees, full and part time two years ago, at present, and anticipated two years from now, 3) The number of full and part time employees who are family members of the owner's family, 4) The job titles of the employees in their enterprise, 5) Indicate an awareness of Utah State University's technical program in vocational horticulture, 6) Indicate whether preference would be given a person for employment if he or she had taken training in ornamental horticulture, 7) Indicate whether they would be willing to cooperate with vocational education by providing a cooperative work station, and 8) Rate a list of 94 job competencies according to their importance on a Likert-type scale as follows: 0, does not apply; 1, not important; 2, of some importance; 3, important; 4, very important.

The 94 competencies utilized in the survey-questionnaire (See Appendix D) were obtained from those identified competencies considered important in three studies (Cole, 1973; Zurbrick, 1974; USDHEW, 1978).

The competencies were categorized by the researcher into 14 competency groupings to aid in the analysis of the data. (See Appendix E).

An initial mailing of the survey-questionnaire was made on May 3, 1979. A cover letter (See Appendix F) was included with the survey-questionnaire along with a postage-paid return envelope.

A second follow-up mailing was made on May 22, 1979 (See Appendix F).

Preceding the third mailing, telephone contact was made to all enterprises which could be reached in a one-week period that had not responded to the survey. This telephone contact obtained information about industry descriptions and solicited their cooperation with the competency section of the study. After the telephone contact was made, all non-respondents to date received a final mailing (See Appendix F).

Returns

One-hundred and sixteen usable returns were received by the researcher. This amounted to 38% of the sample of 307. It also represents 20% of the identified population.

In addition to the usable returns, 20 returns or 6.5% were received that were unusable and 12 returns or 4% were undeliverable by the Post Office Department.

The "Distribution of surveys returned by major areas of specialization in ornamental horticulture in Utah" appears in Table 3. It should be noted that there were 15 respondents (12.9%) who had a second area of specialization with an emphasis level of 40% or greater which could be considered approximately equal to the main area, although in Table 3, they were not considered so. The main area of specialization was tabulated only.

Table 3

Distribution of Surveys Returned by Major Areas of Specialization
in Ornamental Horticulture in Utah

N=116

Area of Specialization	NUMBER OF USABLE RETURNS	% OF SAMPLE
Arborists (Tree Service)	9	7.8%
Maintenance of Landscapes	14	12.1%
Landscape Construction	14	12.1%
Golf Course	18	15.5%
Greenhouse Production	18	15.5%
Florist- Plant Shop	22	19%
Garden Center- Nursery	21	18.1%

Data Analysis

Information received from the respondents was transferred to computer cards by keypunching.

Data were analyzed using the "Statistical Package for the Social Sciences" (SPSS) program which was developed at the University of California, Davis campus (Nie, Hull, Jenkins, Steinbrenner, Bent; 1975). A burrough's 6700 computer was utilized for program evaluation to find means, rankings, ranges, and frequencies.

CHAPTER IV

FINDINGS

Career education and vocational education focus on preparing persons with the necessary skills, understandings, and values for successful work experiences in life.

Instructors have the responsibility to keep abreast of various trends in the business world so they can better prepare their students for these experiences. This study has attempted to obtain information useful to instructors in the instructional area of ornamental horticulture from industry representatives.

The procedures discussed in the preceding chapter on methodology were carried out between December 1978 and August 1979 in the State of Utah. The results of these procedures are reported in the following pages.

The researcher will first discuss the major objectives of the study. In addition, other results will be presented.

Objective One

The first objective of the study was to identify those businesses and governmental departments and/or agencies involved in ornamental horticulture activities in Utah. The data in Table 2 show the distribution of those ornamental horticulture enterprises by major areas of specialization. All enterprises were privately owned except for 27 governmental departments and/or agencies in the areas of golf courses and maintenance of landscapes.

The largest number of enterprises in the identified population is in the area of Florist-Plant Shops. In descending order of numbers of enterprises are the areas of Landscape Construction, Garden Center-Nurseries, Golf Courses, Maintenance of Landscapes, Greenhouse Production and Arborists (Tree Service).

Objective Two

The second objective of this study was to assess the relative proportion of ornamental businesses and governmental departments and/or agencies involved in each of the seven chosen major ornamental horticulture areas of specialization.

A summary of the distribution of ornamental horticulture enterprises with activity in the areas of specialization appears in Table 4. These data help point out activity in addition to their major activity, showing that the enterprises do other work outside their major emphasis. Table 5 details this activity overlap of the ornamental horticulture enterprises.

Of interest to the researcher was the close interaction between the areas of Greenhouse Production, Florist-Plant Shops, and Garden Center-Nurseries. Golf Courses stand alone except for their minor interactions with Landscape Construction and Maintenance of Landscapes. Garden Center Nurseries branch out in all directions except Maintenance of Landscapes and Golf Course work. Landscape Construction, Maintenance of Landscapes, and Tree Service also have high interaction.

Objective Three

The third objective of the study was to determine the relative importance of the identified competencies needed in ornamental horticulture for job entry.

In rating the ninety-four identified competencies, a

Table 4

Distribution of Ornamental Horticulture Enterprises with Activity in the Major Areas of Specialization According to Survey Respondents

Area of Specialization	Number with 50% Plus Activity	Number with 49% Less Activity	Percent of Sample
Arborists (Tree Service)	9	10	9%
Maintenance of Landscapes	14	16	14.2%
Landscape Construction	14	21	16.5%
Golf Course	19	3	10%
Greenhouse Production	17	13	14.3%
Florist-Plant Shop	23	11	16%
Garden Center-Nursery	24	18	19.8%
Totals	120	92	99.8%

Note: This table indicates each survey respondent's major and minor activity. Most appear in both columns, some appear only in one column because they do all of their work in one area of specialization. For this reason, the total of 212 differs from the total number of respondents (116).

Table 5

Rank Order Level of Activity in Related Specialties Within the Ornamental Horticulture Industry

Major Area of Specialization	Rank Order of Activity in Ornamental Horticulture Areas of Specialization						
	Arborists (Tree Service)	Maintenance of Landscapes	Landscape Construction	Golf Courses	Greenhouse Production	Florist- Plant Shops	Garden Center Nursery
Arborists (Tree Service)	1	3	2				4
Maintenance of Landscapes	3	1	4	2			
Landscape Construction	4	3	1				2
Golf Course	4	2	3	1			
Greenhouse Production		5	4		1	2	3
Florist- Plant Shop		5	4		3	1	2
Garden Center- Nursery	5	5	4		2	3	1

*Note: Rating 1-5 (1, largest activity; 5, least activity; blank, no activity)

Likert-type rating scale was used: 0, does not apply; 1, not important; 2, of some importance, 3, important; 4, very important.

The results of the competency analysis are discussed from two points of view. The competencies were formed into competency groupings (See Appendix E and G) and also rated and ranked according to individual skill numbers (See Appendix D and G).

Grouped competencies. The competencies were formed into 14 competency groups for cluster analysis (See Appendix E and G). In descending order of importance, the grouped areas were ranked: 1) Safety and First Aid; 2) Human relations and Communications; 3) Pest Identification and Control; 4) Record Keeping; 5) Turf, 6) Marketing; 7) Floral Skills, Plant Identification and Production; 8) Machinery and Equipment, Growing Structures, and Landscaping; 9) Soil and Media; 10) Propagation (See Table 6).

The grouped results support the conclusions of other studies cited in the review of literature. Exceptions to other studies are the high ratings of turf skills and the low rating of plant propagation skills.

Grouped competencies by area of specialization. According to the results noted in Table 6, the following competencies were rated most important in the areas of specialization: 1) Arborists (Tree Service)--Safety and First Aid, Turf, Landscaping, Growing Structures, Human Relations and Communications, and Record Keeping; 2) Maintenance of Landscapes--Pest Identification and Control, Landscaping, Growing Structures, Human Relations and Communications, Safety and First Aid, Machinery and Equipment, Record Keeping, and Turf; Landscape Construction--Record Keeping, Human Relations and Communications, Safety and First

Table 6
Competency Group Means for Areas of Specialization

Possible Score = 4.0

Competency Group	Arborists (Tree Service)	Maintenance of Landscapes	Landscape Construction	Golf Course	Greenhouse Production	Florist- Plant Shop	Garden Center- Nursery	Center- Grouped Areas
I. Plant I.D. (1 Skill)	2.3	2.7	3.0	1.9	2.8	3.1	3.1	2.7
II. Propagation (4 Skills)	2.2	2.3	1.8	2.3	2.4	2.0	2.0	2.2
III. Production & Use (20 Skills)	2.2	2.7	2.6	2.9	2.7	2.5	2.7	2.7
IV. Soil & Media (9 Skills)	1.8	2.6	2.4	2.9	2.4	2.3	2.5	2.5
V. Pest I.D. & Control (5 Skills)	2.7	3.3	2.9	2.7	3.0	2.8	3.2	3.1
VI. Growing Structures (4 Skills)	3.0	3.3	2.7	3.0	2.1	2.0	2.1	2.6
VII. Turf (8 Skills)	3.3	2.9	3.0	3.5	1.7	2.0	2.2	2.9
VIII. Machinery & Equipment (7 Skills)	2.5	3.0	2.4	2.7	2.2	2.2	2.0	2.6

Table 6 (Continued)

Competency Group	Arborists (Tree Service)	Maintenance of Landscapes	Landscape Construction	Golf Course	Greenhouse Production	Florist- Plant Shop	Garden Center- Nursery	Center- Grouped Areas
IX. Marketing (11 Skills)	1.9	2.7	2.7	2.8	2.6	3.1	2.8	2.8
X. Floral & Potted Plants (5 Skills)	0.0	2.1	1.5	1.2	2.9	3.5	2.1	2.7
XI. Record Keeping (6 Skills)	2.8	3.0	3.3	3.2	2.7	3.0	2.8	3.0
XII. Human Relations & Communication (5 Skills)	2.9	3.2	3.3	3.3	3.0	3.3	3.2	3.2
XIII. Landscaping (8 Skills)	3.2	3.3	3.0	2.3	2.1	1.9	2.4	2.6
XIV. Safety & First Aid (1 Skill)	3.5	3.2	3.2	3.7	3.5	3.3	3.3	3.4

Aid, Landscaping, Plant Identification, Turf, Pest Identification and Control; 4) Golf Course--Safety and First Aid, Turf, Human Relations and Communications, Record Keeping, Growing Structures, Soil and Media, and Production; 5) Greenhouse Production--Safety and First Aid, Pest Identification and Control, Human Relations and Communications, Floral, Plant Identification, Production, Record Keeping; 6) Florist-Plant Shops--Floral, Human Relations and Communications, Safety and First Aid, Plant Identification, Marketing, Record Keeping; 7) Garden Center Nurseries--Safety and First Aid, Human Relations and Communications, Pest Identification and Control Plant Identification, Marketing, Record Keeping.

Individual competency ratings. Following is an analysis of the individual competencies. Appendix D gives reference to each competency by skill number. Appendix G lists the results of all competencies in the study.

The competencies with mean values of 2.5 or greater out of a possible score of 4.0 are first valued and ranked in order for all major areas of specialization combined (See Table 7). The three most important competencies for all major areas of specialization are from the skill grouping entitled Human Relations and Communications. They are: 1) Maintain good relations with customers, employers, and fellow employees, 2) Observe things that need to be done, and 3) Stimulate others to work effectively.

There were two skills rated not important by the survey respondents for all major areas of specialization combined. They were: 1) Apply knowledge of cell and tissue structure of plants, and 2) Propagate by grafting. These skills are noted because they are often included in ornamental horticulture curriculums but were not considered important by survey respondents.

Table 7

Competencies in Ornamental Horticulture as Rated by
Survey Respondents for all Major Areas of Specialization

N=94

Possible Score = 4.0

Competency	Mean Value
Maintain good relations with customers, employers, and fellow employees.....	3.8
Observe things that need to be done	3.6
Stimulate others to work effectively	3.5
Operate a cash register and handle money	3.4
Understand personal safety and first aid	3.4
Sell products and services.....	3.3
Recognize plant pest problems.....	3.2
Select control methods for pest problems.....	3.2
Mix and handle chemicals safely.....	3.2
Plant and transplant.....	3.2
Keep records of materials used.....	3.1
Keep records of expenses and receipts.....	3.1
Apply fertilizer materials.....	3.1
Apply knowledge of pest prevention methods.....	3.1
Determine correct rates of application of horticultural products.....	3.1
Maintain turf.....	3.1
Operate and maintain spray equipment.....	3.0
Prepare topsoil for turf seeding.....	3.0
Seed a lawn (rate, method, plugging, sprigging).....	3.0
Renovate old turf and turf areas.....	3.0
Understand basic business operation.....	3.0
Apply knowledge of irrigation and watering methods.....	3.0
Recognize common nutrient deficiencies.....	3.0

Table 7 (Continued)

Competency	Mean Value
Keep employee time records.....	3.0
Write receipts.....	3.0
Mark and tag products.....	2.9
Apply knowledge of major soil elements (N,P,K).....	2.9
Apply knowledge of the effects that the environment has on plant growth (light, moisture, aeration, fertility, temperature)....	2.9
Select fertilizer materials.....	2.9
Apply knowledge of integrated pest management.....	2.9
Grade a site for turf.....	2.9
Cut and lay sod.....	2.9
Pruning techniques.....	2.9
Design and construct dish gardens and terrariums.....	2.9
Install and maintain sprinkler systems.....	2.9
Keep production records.....	2.9
Keep equipment and service records.....	2.9
Keep inventory and stock records.....	2.8
Estimate bill of materials.....	2.8
Construct floral arrangements.....	2.8
Interpret the landscape plan.....	2.8
Remove trees and shrubs.....	2.8
Operate and service small power equipment.....	2.8
Operate and service large power equipment.....	2.8
Operate and service automatic systems (watering, heating, lighting, ventilating).....	2.8
Aerate and remove thatch.....	2.8

Table 7 (Continued)

Competency	Mean Value
Maintain Golf Greens.....	2.8
Measure and prepare the site for landscaping.....	2.7
Identification of horticultural plants.....	2.7
Select plant materials according to growth habits and uses.....	2.7
Apply knowledge of minor soil elements.....	2.7
Apply knowledge of soil composition and characteristics.....	2.7
Apply soil conditioners.....	2.7
Mix soil mixes and other growing media.....	2.7
Correct poor drainage.....	2.7
Apply knowledge of the principles of floral design.....	2.7
Design floral pieces (weddings, funerals, occasions).....	2.7
Culture greenhouse plants.....	2.6
Design displays.....	2.6
Select soil conditioners.....	2.6
Make budgets.....	2.6
Transport, store, and ship products.....	2.6
Obtain product and service information.....	2.6
Apply knowledge of landscape design principles.....	2.5
Construct non-plant landscape features.....	2.5
Condition hand tools.....	2.5
Select and use plant growth substances.....	2.5
Understand the function of organic matter in the soil.....	2.5
Select components for soil mixes and other growing media.....	2.5
Secure plant materials from other sources.....	2.5

Table 7 (Continued)

Competency	Mean Value
Determine market outlets and trends.....	2.4
Stake and tie woody plants.....	2.4
Rebuild power equipment.....	2.4
Apply knowledge of plant parts and their functions (stems, roots, leaves, etc.).....	2.4
Understand the function of living organisms in the soil.....	2.4
Take soil samples for analysis.....	2.4
Sterilize soil and growing structures.....	2.4
Control erosion.....	2.4
Ability to climb trees in a safe manner.....	2.4
Operate and service greenhouse equipment.....	2.4
Cut and grade flowers.....	2.3
Make simple electrical repairs.....	2.3
Make simple welding repairs.....	2.3
Construct wood projects, make wood repairs, apply wood preservatives.....	2.3
Select seed varieties.....	2.3
Schedule seeding dates.....	2.3
Propagate by plant parts.....	2.3
Apply knowledge of the life cycle of plants.....	2.3
Apply knowledge of plant processes (photosynthesis, respiration translocation, transpiration).....	2.3
Store and handle seeds, bulbs, and corms.....	2.2
Propagate by seeds (sexually).....	2.1
Apply knowledge of hydroponics.....	2.1

Table 7 (Continued)

Competency	Mean Value
Apply knowledge of cell and tissue structure of plants.....	1.9
Propagate by grafting.....	1.8

Those competencies which were rated a mean value of 2.5 or greater out of a maximum rating of 4.0, are valued and ranked in order of importance by area of specialization in Tables 8-14.

The data presented in Table 8 give the mean and ranking of individual competencies rated by survey respondents in the arborist area of specialization with a mean value of 2.5 or greater.

Important competencies for entry employment by arborists are:

- 1) chemical handling and safety, 2) turf skills, 3) good human relations, 4) pruning techniques, 5) removal of trees and shrubs, 6) ability to climb trees safely, and 7) planting and transplanting.

Table 8

Competencies (Mean Value 2.5 or Greater) for Entry Employment by Arborists (Tree Service) as Rated by Survey Respondents

N=9

Possible Score = 4.0

Competency	Mean Value
Mix and handle chemicals safely.....	4.0
Seed a lawn (rate, method, plugging, sprigging).....	4.0
Renovate old turf and turf areas.....	4.0

Table 8 (Continued)

Competency	Mean Value
Cut and lay sod.....	4.0
Maintain good relations with customers, employers, and fellow employees.....	3.9
Prepare topsoil for turf seeding.....	3.8
Pruning techniques.....	3.8
Remove trees and shrubs.....	3.8
Operate and maintain spray equipment.....	3.7
Stimulate others to work effectively.....	3.6
Observe things that need to be done.....	3.6
Determine correct rates of application of horticultural products.....	3.5
Ability to climb trees in a safe manner.....	3.5
Grade a site for turf.....	3.5
Install and maintain sprinkler systems.....	3.5
Understand personal safety and first aid.....	3.5
Plant and transplant.....	3.4
Select control methods for pest problems.....	3.3
Apply knowledge of pest prevention methods.....	3.3
Measure and prepare the site for landscaping.....	3.3
Condition hand tools.....	3.3
Operate and service small power equipment.....	3.3
Operate and service large power equipment.....	3.3
Keep records of expenses and receipts.....	3.3
Keep records of materials used.....	3.3
Stake and tie woody plants.....	3.2

Table 8 (Continued)

Competency	Mean Value
Recognize plant pest problems.....	3.0
Apply knowledge of integrated pest management.....	3.0
Maintain turf.....	3.0
Aerate and remove thatch.....	3.0
Interpret the landscape plan.....	3.0
Apply knowledge of landscape design principles.....	2.8
Operate and service automatic systems.....	2.8
Keep equipment and service records.....	2.8
Sell products and services.....	2.8
Apply fertilizer materials.....	2.7
Keep employee time records.....	2.7
Make simple welding repairs.....	2.6
Construct wood projects, make wood repairs, apply wood preservatives.....	2.6
Keep production records.....	2.6
Understand basic business operation.....	2.6
Apply knowledge of the effects that the environment has on plant growth (light, moisture, aeration, fertility, temperature).....	2.5
Apply knowledge of hydroponics.....	2.5
Construct non-plant landscape features.....	2.5
Make simple electrical repairs.....	2.5

The data presented in Table 9 show the important competencies for entry employment into the maintenance of landscapes area of specialization.

Survey respondents from the maintenance of landscapes area rated the following competencies the most important: 1) good human relations, 2) mixing and handling chemicals, 3) application of fertilizer materials, 4) operation and maintenance of spray equipment and automatic systems, and 5) turf skills.

Table 9
Competencies (Mean Value 2.5 or Greater) for Entry
Employment into the Maintenance of Landscapes as Rated by Survey Respondents

N= 14

Possible Score = 4.0	
Competency	Mean Value
Maintain good relations with customers, employers, and fellow employees.....	3.9
Mix and handle chemicals safely.....	3.6
Apply fertilizer materials.....	3.5
Operate and maintain spray equipment.....	3.5
Maintain turf.....	3.5
Operate and service automatic systems (watering, heating, lighting, ventilating).....	3.5
Observe things that need to be done.....	3.5
Rebuild power equipment.....	3.4
Install and maintain sprinkler systems.....	3.4
Recognize plant pest problems.....	3.3
Select control methods for pest problems.....	3.3
Determine correct rates of application of horticultural products...	3.3

Table 9 (Continued)

Competency	Mean Value
Stimulate others to work effectively.....	3.3
Keep equipment and service records.....	3.3
Sell products and services.....	3.3
Apply knowledge of irrigation and watering methods.....	3.2
Operate and service large power equipment.....	3.2
Understand personal safety and first aid.....	3.2
Keep records of expenses and receipts.....	3.2
Keep records of materials used.....	3.2
Understand basic business operation.....	3.2
Operate a cash register and handle money.....	3.2
Apply knowledge of integrated pest management.....	3.1
Apply knowledge of pest prevention methods.....	3.1
Renovate old turf and turf areas.....	3.1
Pruning techniques.....	3.1
Stake and tie woody plants.....	3.1
Condition hand tools.....	3.1
Operate and service small power equipment.....	3.1
Recognize common nutrient deficiencies.....	3.0
Correct poor drainage.....	3.0
Plant and transplant.....	3.0
Remove trees and shrubs.....	3.0
Make simple electrical repairs.....	3.0
Construct wood projects, make wood repairs, apply wood preservatives.....	3.0

Table 9 (Continued)

Competency	Mean Value
Keep employee time records.....	3.0
Write receipts.....	3.0
Estimate bill of materials.....	3.0
Select fertilizer materials.....	2.9
Interpret the landscape plan.....	2.9
Select and use plant growth substances.....	2.8
Apply knowledge of major soil elements (N,P,K).....	2.8
Cut and lay sod.....	2.8
Construct non-plant landscape features.....	2.8
Make simple welding repairs.....	2.8
Identification of horticultural plants.....	2.7
Apply knowledge of the effects that the environment has on plant growth (light, moisture, aeration, fertility, temperature) ..	2.7
Understand the function of organic matter in the soil.....	2.7
Select components for soil mixes and other growing media.....	2.7
Ability to climb trees in a safe manner.....	2.7
Apply knowledge of landscape design principles.....	2.7
Keep production records.....	2.7
Keep inventory and stock records.....	2.7
Make budgets.....	2.7
Maintain golf greens.....	2.7
Select plant materials according to growth habits and uses.....	2.6
Apply knowledge of the life cycle of plants.....	2.6
Apply knowledge of plant parts and their functions (stems, roots, leaves, etc.).....	2.6

Table 9 (Continued)

Competency	Mean Value
Apply knowledge of plant processes (photosynthesis, respiration, translocation, transpiration).....	2.6
Apply knowledge of minor soil elements.....	2.6
Apply knowledge of soil composition and characteristics.....	2.6
Apply soil conditioners.....	2.6
Understand the function of living organisms in the soil.....	2.6
Take soil samples for analysis.....	2.6
Control erosion.....	2.6
Obtain product and service information.....	2.6
Grade a site for turf.....	2.5
Prepare topsoil for turf seeding.....	2.5
Secure plant materials from other sources.....	2.5
Design and construct dish gardens and terrariums.....	2.5
Measure and prepare the site for landscaping.....	2.5
Determine market outlets and trends.....	2.5

The data from the landscape construction area of specialization concerning important competencies, appears in Table 10.

Those competencies rated the most important for entry employment into landscape construction follow: 1) good human relations, 2) planting and transplanting, 3) turf skills, 4) record keeping, 5) sales, 6) pest control, and 7) landscaping principles.

Table 10

Competencies (Mean Value of 2.5 or Greater) for Entry Employment into Landscape Construction as Rated by Survey Respondents

N= 14

Possible Score = 4.0	
Competency	Mean Value
Maintain good relations with customers, employers, and fellow employees.....	3.8
Stimulate others to work effectively.....	3.8
Plant and transplant.....	3.7
Prepare topsoil for turf seeding.....	3.5
Seed a lawn (rate, method, plugging, sprigging).....	3.5
Cut and lay sod.....	3.5
Observe things that need to be done.....	3.5
Grade a site for turf.....	3.4
Keep employee time records.....	3.4
Keep equipment and service records.....	3.4
Sell products and services.....	3.4
Select control methods for pest problems.....	3.3
Determine correct rates of application of horticultural products	3.3
Measure and prepare the site for landscaping.....	3.3

Table 10 (Continued)

Competency	Mean Value
Interpret the landscape plan.....	3.3
Keep production records.....	3.3
Keep records of materials used.....	3.3
Apply fertilizer materials.....	3.2
Renovate old turf and turf areas.....	3.2
Pruning techniques.....	3.2
Apply knowledge of landscape design principles.....	3.2
Remove trees and shrubs.....	3.2
Understand personal safety and first aid.....	3.2
Keep records of expenses and receipts.....	3.2
Operate and service small power equipment.....	3.1
Operate a cash register and handle money.....	3.1
Identification of horticultural plants.....	3.0
Select fertilizer materials.....	3.0
Recognize plant pest problems.....	3.0
Construct non-plant landscape features.....	3.0
Estimate bill of materials.....	3.0
Select plant materials according to growth habits and uses.....	2.9
Select soil conditioners.....	2.9
Apply soil conditioners.....	2.9
Control erosion.....	2.9
Apply knowledge of pest prevention methods.....	2.9
Operate and service large power equipment.....	2.9

Table 10 (Continued)

Competency	Mean Value
Install and maintain sprinkler systems.....	2.9
Keep inventory and stock records.....	2.9
Apply knowledge of irrigation and watering methods.....	2.8
Recognize common nutrient deficiencies.....	2.8
Mix and handle chemicals safely.....	2.8
Aerate and remove thatch.....	2.8
Secure plant materials from other sources.....	2.8
Stake and tie woody plants.....	2.8
Write receipts.....	2.8
Mark and tag products.....	2.8
Select and use plant growth substances.....	2.7
Apply knowledge of major soil elements (N,P,K).....	2.7
Understand the function of organic matter in the soil.....	2.7
Correct poor drainage.....	2.7
Construct wood projects, make wood repairs, apply wood preservatives.....	2.7
Condition hand tools.....	2.7
Make budgets.....	2.7
Understand basic business operation.....	2.7
Obtain product and service information.....	2.7
Apply knowledge of integrated pest management.....	2.6
Operate and maintain spray equipment.....	2.6
Apply knowledge of the effects that the environment has on plant growth (light, moisture, aeration, fertility, temperature).....	2.5

Table 10 (Continued)

Competency	Mean Value
Apply knowledge of soil composition and characteristics.....	2.5
Maintain turf	2.5

The data presented in Table 11 give the mean and ranking of individual competencies rated by survey respondents in the golf course area of specialization with a mean value of 2.5 or greater.

Important competencies for entry employment by golf courses are: 1) application of fertilizer materials, 2) maintain golf greens and turf, 3) good human relations, 4) irrigation and watering methods, 5) safety and first aid, 6) mixing and handling chemicals safely, and 7) install and maintain sprinkler systems.

Table 11

Competencies (Mean Value of 2.5 or Greater) for Entry Employment by Golf Courses as Rated by Survey Respondents

N=18

Possible Score = 4.0

Competency	Mean Value
Apply fertilizer materials.....	3.9
Maintain golf greens.....	3.9
Maintain good relations with customers, employers, and fellow employees.....	3.9
Maintain turf.....	3.8
Apply knowledge of irrigation and watering methods.....	3.7

Table 11 (Continued)

Competency	Mean Value
Stimulate others to work effectively.....	3.7
Understand personal safety and first aid.....	3.7
Mix and handle chemicals safely.....	3.6
Install and maintain sprinkler systems.....	3.6
Observe things that need to be done.....	3.6
Correct poor drainage.....	3.5
Aerate and remove thatch.....	3.5
Operate and service small power equipment.....	3.5
Operate a cash register and handle money.....	3.5
Select fertilizer materials.....	3.4
Determine correct rates of application of horticultural products....	3.4
Operate and maintain spray equipment.....	3.4
Renovate old turf and turf areas.....	3.4
Cut and lay sod.....	3.4
Plant and transplant.....	3.3
Operate and service large power equipment.....	3.4
Operate and service automatic systems (watering, heating, lighting).	3.4
Apply knowledge of minor soil elements.....	3.3
Recognize plant pest problems.....	3.3
Select control methods for pest problems.....	3.3
Apply knowledge of pest prevention methods.....	3.3
Prepare topsoil for turf seeding.....	3.3
Seed a lawn (rate, method, plugging, sprigging).....	3.3

Table 11 (Continued)

Competency	Mean Value
Keep records of expenses and receipts.....	3.3
Keep records of materials used.....	3.3
Keep employee time records.....	3.3
Keep equipment and service records.....	3.3
Make budgets.....	3.3
Sell products and services.....	3.3
Apply knowledge of major soil elements (N,P,K).....	3.2
Recognize common nutrient deficiencies.....	3.2
Keep inventory and stock records.....	3.2
Apply knowledge of soil composition and characteristics.....	3.1
Apply soil conditioners.....	3.1
Apply knowledge of integrated pest management.....	3.1
Grade a site for turf.....	3.1
Write receipts.....	3.1
Estimate bill of materials.....	3.1
Understand basic business operation.....	3.1
Control erosion.....	3.0
Apply knowledge of the effects that the environment has on plant growth (light, moisture, aeration, fertility, temperature).....	2.9
Select soil conditioners.....	2.9
Mix soil mixes and other growing media.....	2.9
Select components for soil mixes and other growing media.....	2.9
Secure plant materials from other sources.....	2.9
Condition hand tools.....	2.9

Table 11 (Continued)

Competency	Mean Value
Select seed varieties.....	2.8
Take soil samples for analysis.....	2.8
Sterilize soil and growing structures.....	2.8
Understand the function of living organisms in the soil.....	2.7
Understand the function of organic matter in the soil.....	2.7
Pruning techniques.....	2.7
Keep production records.....	2.7
Schedule seeding dates.....	2.6
Remove trees and shrubs.....	2.6
Mark and tag products.....	2.6
Determine market outlets and trends.....	2.6
Obtain product and service information.....	2.6
Select plant materials according to growth habits and uses.....	2.5
Apply knowledge of hydroponics.....	2.5
Rebuild power equipment.....	2.5

The data in Table 12 presents the important competencies for entry employment into greenhouse production according to survey respondents.

Those competencies considered important by greenhouse production respondents include the following: 1) good human relations, 2) personal safety and first aid, 3) irrigation and watering methods, 4) recognition of plant pest problems and 5) selling products and services.

Table 12

Competencies (Mean Value of 2.5 or Greater) for Entry
Employment in Greenhouse Production as Rated by Survey Respondents

N= 18

Possible Score = 4.0

Competency	Mean Value
Maintain good relations with customers, employers, and fellow employees.....	3.7
Understand personal safety and first aid.....	3.5
Observe things that need to be done.....	3.5
Stimulate others to work effectively.....	3.4
Apply knowledge of irrigation and watering methods.....	3.3
Recognize plant pest problems.....	3.3
Sell products and services.....	3.2
Operate a cash register and handle money.....	3.2
Apply knowledge of the effects that the environment has on plant growth (light, moisture, aeration, fertility, temperature)....	3.1
Apply knowledge of pest prevention methods.....	3.1
Mix and handle chemicals safely.....	3.1
Plant and transplant.....	3.1
Culture greenhouse plants.....	3.1
Design floral pieces (weddings, funerals, occasions).....	3.1
Construct floral arrangements.....	3.1
Understand basic business operation.....	3.1
Propagate by plant parts.....	3.0
Apply knowledge of the principles of floral design.....	3.0
Design and construct dish gardens and terrariums.....	3.0
Determine correct rates of application of horticultural products..	3.0
Recognize common nutrient deficiencies.....	2.9

Table 12 (Continued)

Competency	Mean Value
Mix soil mixes and other growing media.....	2.9
Operate and service greenhouse equipment.....	2.9
Design displays.....	2.9
Keep records of expenses and receipts.....	2.9
Write receipts.....	2.9
Identification of horticultural plants.....	2.8
Apply knowledge of major soil elements.....	2.8
Select fertilizer materials.....	2.8
Apply fertilizer materials.....	2.8
Select control methods for pest problems.....	2.8
Apply knowledge of integrated pest management.....	2.8
Operate and maintain spray equipment.....	2.8
Keep production records.....	2.8
Keep records of materials used.....	2.8
Select plant materials according to growth habits and uses.....	2.7
Keep employee time records.....	2.7
Schedule seeding dates.....	2.6
Select and use plant growth substances.....	2.6
Apply knowledge of plant parts and their functions (stems, roots, leaves, etc.).....	2.6
Apply knowledge of minor soil elements.....	2.6
Apply knowledge of soil composition and characteristics.....	2.6
Mark and tag products.....	2.6
Transport, store and ship products.....	2.6

Table 12 (Continued)

Competency	Mean Value
Take soil samples for analysis.....	2.5
Select components for soil mixes and other growing media.....	2.5
Pruning techniques.....	2.5
Obtain product and service information.....	2.5

The data presented in Table 13 show the important competencies for entry employment into the florist-plant shops area of specialization.

Survey respondents from the florist-plant shop area of specialization rated the following competencies the most important: 1) good human relations, 2) designing and constructing floral arrangements, 3) designing dish gardens and terrariums, 4) operation of cash registers and handling money, 5) designing displays and 6) understanding of basic business operation.

Table 13

Competencies (Mean Value of 2.5 or Greater) for Entry Employment by Florist-Plant Shops as Rated by Survey Respondents

N= 22

Possible Score = 4.0

Competency	Mean Value
Maintain good relations with customers, employers, and fellow workers.....	3.8

Table 13 (Continued)

Competency	Mean Value
Design floral pieces (weddings, funerals, occasions).....	3.7
Construct floral arrangements.....	3.7
Design and construct dish gardens and terrariums.....	3.7
Operate a cash register and handle money.....	3.7
Stimulate others to work effectively.....	3.6
Observe things that need to be done.....	3.6
Design displays.....	3.5
Apply knowledge of the principles of floral design.....	3.4
Understand basic business operation.....	3.4
Sell products and services.....	3.4
Understand personal safety and first aid.....	3.3
Keep records of expenses and receipts.....	3.3
Write receipts.....	3.3
Apply knowledge of the effects that the environment has on plant growth (light, moisture, aeration, fertility, temperature).....	3.2
Recognize plant pest problems.....	3.2
Mark and tag products.....	3.2
Select control methods for pest problems.....	3.1
Keep records of materials used.....	3.1
Cut and grade flowers.....	3.0
Keep production records.....	3.0
Estimate bill of materials.....	3.0
Select plant materials according to growth habits and uses.....	2.9
Recognize common nutrient deficiencies.....	2.9

Table 13 (Continued)

Competency	Mean Value
Keep inventory and stock records.....	2.9
Identification of horticultural plants.....	2.8
Apply knowledge of pest prevention methods.....	2.8
Plant and transplant.....	2.8
Culture greenhouse plants.....	2.8
Keep employee time records.....	2.8
Apply fertilizer materials.....	2.7
Mix soil mixes and other growing media.....	2.7
Operate and maintain spray equipment.....	2.7
Secure plant materials from other sources.....	2.7
Transport, store, and ship products.....	2.7
Apply knowledge of plant parts and their functions (stems, roots, leaves, etc.).....	2.6
Apply knowledge of major soil elements (N,P,K).....	2.6
Apply knowledge of soil composition and characteristics.....	2.6
Mix and handle chemicals safely.....	2.6
Determine correct rates of application of horticultural products...	2.6
Keep equipment and service records.....	2.6
Determine market outlets and trends.....	2.6
Select and use plant growth substances.....	2.5
Apply knowledge of irrigation and watering methods.....	2.5
Select fertilizer materials.....	2.5
Understand the function of organic matter in the soil.....	2.5
Apply knowledge of integrated pest management.....	2.5

Table 13 (Continued)

Competency	Mean Value
Grade a site for turf.....	2.5
Prepare topsoil for turf seeding.....	2.5
Seed a lawn (rate, method, plugging, sprigging).....	2.5
Renovate old turf and turf areas.....	2.5
Maintain turf.....	2.5
Interpret the landscape plan.....	2.5
Remove trees and shrubs.....	2.5
Make budgets.....	2.5

The data presented in Table 14 give the mean and ranking of individual competencies rated by survey respondents in the Garden Center-Nursery area of specialization with a mean value of 2.5 or greater.

Important competencies for entry employment by garden center-nurseries are: 1) good human relations, 2) operation of cash registers and handling money, 3) recognition of pest problems, 4) controlling pests, 5) selling products and services, 6) personal safety and first aid, and 7) selection of plant materials according to their growth habits and uses.

Table 14

Competencies (Mean Value of 2.5 or Greater) for Entry
Employment by Garden Center-Nurseries as Rated by Survey Respondents

N= 21

Possible Score = 4.0

Competency	Mean Value
Maintain good relations with customers, employers, and fellow employees.....	3.9
Observe things that need to be done.....	3.6
Operate a cash register and handle money.....	3.5
Stimulate others to work effectively.....	3.5
Recognize plant pest problems.....	3.4
Select control methods for pest problems.....	3.4
Sell products and services.....	3.4
Understand personal safety and first aid.....	3.3
Select plant materials according to growth habits and uses.....	3.2
Apply knowledge of major soil elements (N,P,K).....	3.2
Determine correct rates of application of horticultural products.	3.2
Plant and transplant.....	3.2
Identification of horticultural plants.....	3.1
Select fertilizer materials.....	3.1
Recognize common nutrient deficiencies.....	3.1
Apply knowledge of pest prevention methods.....	3.1
Keep records of materials used.....	3.1
Mark and tag products.....	3.1
Apply knowledge of soil composition and characteristics.....	3.0
Apply knowledge of integrated pest management.....	3.0
Mix and handle chemicals safely.....	3.0

Table 14 (Continued)

Competency	Mean Value
Keep employee time records.....	3.0
Understand basic business operation.....	3.0
Apply knowledge of the effects that the environment has on plant growth (light, moisture, aeration fertility, temperature)....	2.9
Apply fertilizer materials.....	2.9
Pruning techniques.....	2.9
Culture greenhouse plants.....	2.9
Interpret the landscape plan.....	2.9
Keep production records.....	2.9
Transport, store, and ship products.....	2.9
Apply knowledge of irrigation and watering methods.....	2.8
Apply knowledge of minor soil elements.....	2.8
Select soil conditioners.....	2.8
Apply knowledge of landscape design principles.....	2.8
Write receipts.....	2.8
Keep inventory and stock records.....	2.8
Estimate bill of materials.....	2.8
Obtain product and service information.....	2.8
Apply soil conditioners.....	2.7
Mix soil mixes and other soil media.....	2.7
Seed a lawn (rate, method, plugging, sprigging).....	2.7
Measure and prepare the site for landscaping.....	2.7
Select and use plant growth substances.....	2.6

Table 14 (Continued)

Competency	Mean Value
Store and handle seeds, bulbs, and corms.....	2.6
Prepare topsoil for turf seeding.....	2.6
Operate and service greenhouse equipment.....	2.6
Keep records of expenses and receipts.....	2.6
Understand the function of organic matter in the soil.....	2.5
Select components for soil mixes and other growing media.....	2.5
Maintain turf.....	2.5
Keep equipment and service records.....	2.5
Make budgets.....	2.5
Determine market outlets and trends.....	2.5

Table 15 lists the mean values from 2.0 to 2.4 by skill number by area of specialization. The researcher included this table to aid the reader in obtaining the information on rankings of the individual competencies which were rated at least of some importance. Mean scores for all 94 competencies are listed in Appendix G.

Table 15
 Competencies by Skill Number with Mean Values from 2.0 - 2.4 in
 Areas of Specialization

Area of Specialization	2.4	Mean Values			
		2.3	2.2	2.1	2.0
Arborist (Tree Service)	19	1	22	12	8
	70	13	24	86	14
		16			21
		17			23
		25			30
		84			51
					85
					91
Maintenance of Landscapes	6	3	4	9	32
	7	29	5	11	53
	21	59	52		54
	27				57
	43				90
	91				
Landscape Construction	27	3	12	4	9
	70	10	14	5	26
	91	23	17	67	32
	92	39	28		52
		55	29		
		54			
		66			
	73				
Golf Course	8	7	14	10	9
	12	39	11		60
	61	62	3		
	67	64			
		66			
		68			
	91				
Greenhouse Production	10	3	23	67	32
	22	4	51	74	41
	59	9	65		42
	85	14	68		48
		21	73		61
		24	86		63
		29	92		64
		30			71
		43			72
		60			
		62			
	83				

Table 15 (Continued)

Area of Specialization	Mean Values				
	2.4	2.3	2.2	2.1	2.0
Florist- Plant Shop	14	3	6	4	26
	53	5	10	11	61
	93	9	28	50	67
		17	30	65	68
		21	69	66	70
		22			71
		23			
		72			
		73			
Garden Center- Nursery	10	44	5	26	3
	14	58	6	54	31
	29	59	12	55	46
	30	63	23	64	57
	40	65	48	69	
	41		73	71	
	51		4	74	

Objective Four

The fourth objective of the study was to determine the manpower needs of the ornamental horticulture industry in Utah.

The range of the number of full and part time employees working for survey respondents, the average number of employees two years ago, at present, and anticipated two years from now, and the four-year gains are noted in Tables 16 and 17.

The average number of presently employed workers in the survey per enterprise was 7.8 full time and 5.8 part time. Projecting these figures to the 576 enterprises in the identified population, would yield 4,493 full time and 3,341 part time employees in Utah, utilizing data from the survey respondents. With a projected 12% two-year gain for full time employees and a 43% two-year gain for part time employees there will be a need in the next two years for an additional 539 full time and 1,437 part time employees in the state according to data from the survey respondents. This projection differs from the past two years which indicated a 39% gain in full time employees and a 21% gain in part time employees.

The number of owner family members employed was also of interest to the study (See Table 18). Sixteen percent of the full time and eighteen percent of the part time workers presently employed are members of the owner's family. Projecting these figures to the 576 enterprises in the population yields 816 full time and 671 part time owner family members in the state, according to data from the survey respondents.

Areas of specialization which have the highest percentage of working family members are Arborists (Tree Service), Landscape Construction, Greenhouse Production, and Florist-Plant Shops.

Table 16
Full Time Employees in Ornamental Horticulture Enterprises

Average Number of Employees						
Area of Specialization	Present Range	2 Years Ago	Present	2 Years From Now	Four Year Gain	Percent Gain
Arborists (Tree Service)	0-6	2.1	3.9	5	2.9	138%
Maintenance of Landscapes	1-65	7.6	9.5	11.8	4.2	55%
Landscape Construction	0-35	3.1	9.3	10.9	7.8	252%
Golf Course	2-18	5.8	5.8	6.1	.3	5%
Greenhouse Production	0-10	1.9	2.8	4.3	2.4	126%
Florist-Plant Shop	1-36	3.6	4.4	6.8	3.2	89%
Garden Center-Nursery	1-210	15.2	19.1	16.1	.9	6%
Total Sample N-116	0-210	5.6	7.8	8.7	3.1	55%

Table 17
Part Time Employees in Ornamental Horticulture Enterprises

Average Number of Employees						
Area of Specialization	Present Range	2 Years Ago	Present	2 Years From Now	Four Year Gain	Percent Gain
Arborists (Tree Service)	1-6	2.8	2.3	3.8	1.0	37%
Maintenance of Landscapes	1-31	5.3	8.2	10.0	4.7	88%
Landscape Construction	0-19	5.2	5.5	7.9	2.7	51%
Golf Course	1-15	4.8	6.3	6.7	1.9	40%
Greenhouse Production	0-12	3.0	4.1	7.6	4.6	153%
Florist-Plant Shop	0-20	4.2	4.2	6.1	1.9	45%
Garden Center-Nursery	1-60	8.0	10.3	16.1	8.1	101%
Total Sample N=116	0-60	4.8	5.8	8.3	3.5	73%

Table 18
 Percentage of Owner Family Members Employed at Present in
 Ornamental Horticulture Enterprises

Area of Specialization	Full Time		Part Time	
	Mean	Percent	Mean	Percent
Arborists (Tree Service)	.9	23	1	43
Maintenance of Landscapes	.7	7	.3	4
Landscape Construction	1.9	20	2.2	40
Golf Course	.7	11	.7	11
Greenhouse Production	1.9	71	1.4	33
Florist- Plant Shop	1	23	1	22
Garden Center- Nursery	2.4	12	2.3	22
Total Sample N=116	1.4	16	1.2	18

Other Findings

Industry awareness of a technical program at Utah State University.

An awareness of a technical program in vocational horticulture at Utah State University by survey respondents is indicated in Table 19. The 72% affirmative response by survey participants is considerably higher than the state average awareness of vocational programs of 27% which was cited in the review of literature.

Table 19

Responses of Survey Respondents to "Are you aware that Utah State University offers a technical program in Vocational Horticulture?"

<u>Response</u>	<u>Number</u>	<u>Percent</u>
Yes	84	72
No	31	27
No response	1	1
TOTAL:	116	100

Preference for trained workers. Survey respondents indicated a preference for trained workers when 74% responded positively to the question concerning hiring preference (See Table 20). Although not as high as Cole's (1973) 100% preference, it appears that the majority of ornamental horticulture enterprises prefer hiring trained personnel.

Table 20

Responses of Survey Respondents to "If a potential employee had taken a training program in Ornamental Horticulture, would he/she receive preference in applying for a job with your enterprise?"

Response	Number	Percent
Yes	85	73
No	22	19
Possibly	8	7
No response	1	1
TOTAL:	116	100

Cooperative work stations. A cooperative work experience is emphasized in vocational education. Survey respondents indicated a 61% positive response to the question concerning their willingness to provide a cooperative work station (See Table 21). This finding is not as positive as other studies (Cole, 1973; Jensen, 1978) which indicated an 80% plus willingness to provide a cooperative work station.

Table 21

Responses of Survey Respondents to "Would you be willing to cooperate with vocational horticulture education by providing a cooperative work station?"

Response	Number	Percent
Yes	70	61
No	33	28
Possibly	12	10
No response	1	1
TOTAL:	116	100

Job titles. An additional question on the survey-questionnaire asked participants to list the job titles of their employees. This distribution by area of specialization appears in Table 22 as an aid to the reader in assessing job titles available in Utah. This listing is not a complete listing of all job titles in the state.

JOB TITLES OF EMPLOYEES BY AREAS OF SPECIALIZATION

ARBORISTS (TREE SERVICE)

Sprayman
Supervisor
Climber
Groundman Cleanup
Boss
Foreman
Laborer
Cleanup Person
Cutter
Owner
Helper

LANDSCAPE CONSTRUCTION

Foreman
Tractor Man
Sprinkler Man
Nursery Manager
Assistant Manager
Landscape Foreman
Sales Clerk
Land Laborer
Landscape Architect
Carpenter
Pruner
Tree Climber
Designer
Landscape Helper
Operations
Foreman, Grading
Foreman, Trees
Foreman, Sprinklers
Foreman, Turf
Foreman, Driver

MAINTENANCE OF LANDSCAPES

Plumber
Electrician
Heavy Equipment Operator
Building and Maintenance
Specialist
Mechanic
Foreman
Maintenance Worker
Maintenance Supervisor
Carpenter
Park Administrator
Maintenance Specialist
Crew Chief
Groundskeeper
Park Maintenance Person
Field Supervisor
Equestrian Park Manager
Landscape Architect
Office Worker
Daily Cleaning Person
Applicator
Salesman
Mower

GOLF COURSES

Superintendent
Assistant Superintendent
Mower
Waterman
Groundsman
Mechanic
Tractor Operator
Gardener
Small Equipment Operator
Laborer
Handyman
Course Superintendent
Greens Superintendent

GREENHOUSE PRODUCTION

Grower
Greenhouse Worker
Florist
Secretary
General Manager
Order Puller
Delivery Man
Truck Driver
Salesman
Designer
Greenhouse Manager
Bookkeeper
Potter
Utility Man

GARDEN CENTER-NURSERY

Nursery Manager
Assistant Manager
Landscape Foreman
Sales Clerk
Land Laborer
Grower
Dept. Manager
Supervisor
Designer
Buyer
Water Master
Clerk
Manager, Sales
Manager, Hardwoods
Manager, Lath House
Manager, Floor
Manager, Production
Shipping Supervisor
Controller
Truck Driver
Propagationist
Annual Flower Foreman
Water boy
Bookkeeper
Cashier
Potter
Transplanter
Shipping and Receiving
Pruning worker
Plant Care
Nurseryman

FLORIST-PLANT SHOP

Sales help
Mechanic
Manager
Assistant
Clerk
Designer
Delivery Person
Cutter
Grader
Maintenance
Packer
Secretary
Transplanter
Laborer
Grower
Bookkeeper
Telephone Operator
Wedding Consultant

CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

The purpose of the study was to provide descriptive data about the industry, determine the importance of the competencies needed for job entry, and assess the manpower needs of the ornamental horticulture industry in Utah.

The identified population of 576 ornamental horticulture enterprises was categorized into seven areas of specialization: Arborists (4.5%), Maintenance of Landscapes (10.8%), Landscape Construction (18.6%), Golf Courses (13.5%), Greenhouse Production (5.4%) Florist-Plant Shops (30.9%), and Garden Center Nurseries (16.3%).

The data were collected by a mailed survey-questionnaire. One-hundred and sixteen ornamental horticulture enterprises responded to the survey. This amounted to 38% of the industry sampled.

Data were analyzed using the "Statistical Package for the Social Sciences" (SPSS) program which was developed at the University of California. A Burrough's 6700 computer was utilized for program evaluation to find means, rankings, ranges, and frequencies.

Findings of the study indicated that single enterprises conduct work in a number of the areas of specialization.

Ninety-two of the ninety-four competencies measured in the survey were rated at least of some importance to entry level workers. The most important competencies were in the following groupings: Human Relations and Communications, Pest Identification and Control, Record Keeping, Turf, Marketing, and Safety and First Aid.

The three most important individual competencies for all major areas of specialization were from the skill grouping titled "Human Relations and Communications". These were: 1) Maintain good relations with customers, employers, and fellow employees, 2) Observe things that need to be done, and 3) Stimulate others to work effectively. Pest identification and control, record keeping, and safety were also highly rated competencies.

In addition, other highly rated individual competencies in the major areas of specialization included: 1) Arborists--mix and handle chemicals safely, turf establishment and maintenance, removal of trees and shrubs, and pruning techniques; 2) Maintenance of Landscapes--mix and handle chemicals safely, apply fertilizer materials, and operate and maintain spray equipment; 3) Landscape Construction--plant and transplant, turf establishment and maintenance, and sell products and services; 4) Golf Courses--apply fertilizer materials, maintain golf greens and turf, and apply knowledge of irrigation and watering methods; 5) Greenhouse Production--apply knowledge of irrigation and watering methods, sell products and services, and operate a cash register and handle money; 6) Florist-Plant Shops--design and construct floral pieces, dish gardens, and terrariums, operate a cash register and handle money, and design displays; 7) Garden Center Nurseries--operate a cash register and handle money, sell products and services, and select plant materials according to growth habits and uses.

The number of employees anticipated in the future is growing at a 16% yearly rate. The greatest anticipated expansion of full time employees is in the areas of landscape construction (63%), arboriculture (35%) and greenhouse production (32%). Members of owners' families comprise 17% of the industry's employees.

The study also indicated a preference for trained workers by the ornamental horticulture industry.

The results of this study could be used to help vocational instructors and others update their curriculum efforts in ornamental horticulture, aid in program articulation efforts, or guide anyone interested in pursuing ornamental horticulture as a career.

Conclusions

The findings of this study support the following conclusions based upon data provided by survey respondents:

1. The population of enterprises involved in ornamental horticulture work at a variety of tasks which overlap into the various areas of specialization. The industry in Utah does not have clear-cut distinctions.
2. There is a growth in numbers of employees anticipated by industry representatives in the next two years.
3. There is a 17% segment of employees who are members of the owner's family. There are 34% of family members employed with 16% full-time and 18% part time.
4. Ninety-two of the ninety-four competencies which were selected for the study were considered to be at least of some importance to the ornamental horticulture industry.
5. There is a commonality of competencies needed by all who enter into ornamental horticulture occupations.
6. Safety and First Aid, Human Relations, and Communications, Record Keeping, and Pest Identification and Control were the competency groups which were considered most important by industry representatives. It is important to note that an entry-level employee must, to be successful, possess a variety of skills which cover the

various competency groupings, not just a few of the more important skills.

7. There are some small differences which exist between this study and others cited in the review of literature, but in general, the results tend to compliment and support each other.

8. There is a 72% industry awareness of Utah State University's Vocational Horticulture Program from those surveyed.

9. There is a preference for trained workers in the ornamental horticulture industry in Utah by 74% of the respondents.

10. The ornamental horticulture industry is generally willing to provide cooperative work experience stations for vocational ornamental horticulture students.

11. The data in this research paper concerning important competencies needed for entry employment should be analyzed in detail by the curriculum specialist so there will not be confusion resulting from generalizations presented in various segments of the paper.

Recommendations

As a result of this investigation, the following recommendations are suggested:

1. that competencies considered important by industry representatives be converted into instructional objectives for the writing of curriculum and the development of instructional materials.

2. that competencies considered important in the areas of specialization be used to help individualize plans and assignments for students desiring to specialize in an area of specialization.

3. that local studies be used as a tool by vocational instructors to assess local needs, set up cooperative work experience stations, and place students upon graduation.

4. that additional research be conducted in the area of cities, towns, and counties to assess their involvement in ornamental horticulture activities.

5. that additional research be conducted to assess future job demand, wage levels, and advancement opportunities to help students in selecting the industry as a vocation.

6. that teachers of all subjects implementing career education into their curriculums analyze the findings of this study and use segments for teaching career skills.

7. that programs in vocational ornamental horticulture include a work experience for students indicating an interest in pursuing a career in ornamental horticulture.

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APPENDIXES

APPENDIX A

JOB POSSIBILITIES IN ORNAMENTAL HORTICULTURE

by
Stanley B. Moore

AREA OF ACTIVITY	JOB POSSIBILITIES
Professional	Landscape Architect Horticulturist Floriculturist Ornamental Horticulturist Teacher
Technical	Landscape Consultant Ornamental Horticulture Pest Control Specialist Ornamental Horticulture Plant Disease Specialist Floral Designer
Managerial	Ornamental Horticulture Manager Golf Course Superintendent Park Superintendent Florist Assistant Manager Branch Manager Departmental Manager Sales Manager Nursery Manager Greenhouse Manager Garden Center Manager
Clerical	Office Supervisor Secretary Bookkeeper Office Clerk
Production	Greenhouse Grower Head Grower Nursery Grower Foreman Propagator Assistant Greenhouse Grower Greenhouse Worker Bedder Assistant Nursery Grower
Sales	Sales Supervisor Head Salesman Ornamental Horticulture Salesman Florist Salesman Nursery Salesman Garden Center Salesman Sales Clerk

AREA OF ACTIVITY

JOB POSSIBILITIES

Service

Arborist
Tree Surgeon
Tree Pruner
Landscape
Landscape Gardener
Groundskeeper
Maintenance Foreman-Gardener
Greenskeeper
Turf Manager
Assistant Groundskeeper
Maintenance Man
Lawn Keeper
Tree Sprayer
Park Laborer
Assistant Greenskeeper
Greensman
Deliveryman
Truck Driver
Garden Center Worker

APPENDIX B

DEPARTMENT OF
AGRICULTURAL EDUCATION

April 12, 1979

Dear Horticulture Supervisor,

Horticulture is a fast growing entity in Utah. There is a rising demand for employees to fill jobs in this expanding industry. In order to better prepare vocational horticulture employees for employment by you, the Department of Agricultural Education and the Agriculture Experiment Station are conducting this survey to assess the horticulture industry needs. We hope that you will help us in this endeavor by giving us a few minutes of your time to help advance horticulture.

Will you please fill out the attached survey form and return it to us in the enclosed envelope by April 19.

The information you give us will be utilized in summary form and handled in strict confidence.

We will be pleased to answer any questions concerning the survey, and will be happy to send you a summary of the results if you so desire.

Thank you for your time and effort in helping to advance horticulture education in Utah.

Sincerely,

Gilbert A. Long, Head
Department of Agricultural Education
752-4100 Ext. 7311

Dennis G. Bahen, Research Assistant
Department of Agricultural Education
752-4100 Ext. 7311

HELLO!!

Thank you for your help in this research effort. It is our hope to make horticulture education in Utah more meaningful. Only with your help is this possible.

The following pages are a preliminary field test of our survey. It is necessary to try the survey out before sending it to over two hundred other participants in the state to assess areas of difficulty or find out its weaknesses.

Your help in this field test will make the total effect of the survey more accurate.

In addition to the survey would you also fill out the following?

1. How many minutes did it take you to fill out the survey? _____
2. Were the instructions adequately explained? _____ If not how could they be improved? _____

3. Which questions were confusing? _____

4. Are there questions of importance which we did not include in the survey?

5. Any other suggestions? _____

THANKS AGAIN.....

GENERAL INFORMATION

PLEASE PROVIDE THE FOLLOWING INFORMATION:

* Name of business, department, agency, etc.: _____

* Address of the above: _____

* Telephone number: _____

* Name of person filling out survey and title: _____

* Area(s) of specialization: (PLEASE LIST THE PERCENTAGE IN EACH GROUP)

- | | |
|-------------------------------------|---------------------------------|
| 1. Arborist (tree service) _____% | 5. Greenhouse Production _____% |
| 2. Maintenance of Landscapes _____% | 6. Florist-Plant Shop _____% |
| 3. Landscape Construction _____% | 7. Garden Center-Nursery _____% |
| 4. Golf Course _____% | |

* Number of Employees:

Two Years Ago Present Two Years From Now

Full Time _____ _____ _____

Part Time _____ _____ _____

* Family Employees: (OF THE ABOVE LISTED EMPLOYEES PRESENTLY EMPLOYED, HOW MANY ARE MEMBERS OF THE OWNERS FAMILY?)

Full Time Family Members _____

Part Time Family Members _____

* Where did you obtain the knowledge and skills related to your work?

High School _____ College Courses _____

Vocational School _____ College Degree _____

On-the-job _____

* Are you aware that Utah State University offers a technical program in Vocational Horticulture?

Yes _____ No _____

* If a potential employee had taken a training course in Ornamental Horticulture, would he/she receive preference in applying for a job?

Yes _____ No _____

* Would you be willing to cooperate with vocational horticulture education by providing a cooperative work station?

Yes _____ No _____

INSTRUCTIONS: The preceding questions have dealt with your horticulture organization. The following questions pertain to skills of your employees necessary for entry into your enterprise. How important are the following skills for entry into your organization? Please respond by circling the appropriate numbers according to the following scale:

- 0- DOES NOT APPLY
 1- NOT IMPORTANT
 2- OF SOME IMPORTANCE
 3- IMPORTANT
 4- VERY IMPORTANT

EXAMPLE: Adjust valves on a tractor 0 1 2 3 4

In this example you can see that it is "of some importance" for the employee to be able to adjust valves on a tractor.

SKILL AREA	RATING SCALE
20. Identification of horticultural plants.....	0 1 2 3 4
21. Select plant materials according to growth habits & uses...	0 1 2 3 4
22. Propagate by seeds (sexually).....	0 1 2 3 4
23. Select seed varieties.....	0 1 2 3 4
24. Schedule seeding dates.....	0 1 2 3 4
25. Propagate by plant parts (asexually).....	0 1 2 3 4
26. Propagate by grafting.....	0 1 2 3 4
27. Select and use plant growth substances.....	0 1 2 3 4
28. Store and handle seeds, bulbs, and corms.....	0 1 2 3 4
29. Knowledge of the life cycle of plants.....	0 1 2 3 4
30. Knowledge of cell and tissue structure of plants.....	0 1 2 3 4
31. Knowledge of plant parts and their functions (stems, roots, leaves, etc.).....	0 1 2 3 4
32. Knowledge of irrigation and watering methods.....	0 1 2 3 4
33. Knowledge of plant processes (photosynthesis, respiration, translocation, transpiration).....	0 1 2 3 4
34. Knowledge of the effects that the environment has on plant growth (light, moisture, aeration, fertility, temperature).....	0 1 2 3 4
35. Knowledge of major soil elements (N,P,K).....	0 1 2 3 4
36. Knowledge of minor soil elements.....	0 1 2 3 4
37. Knowledge of soil composition and characteristics (texture, structure, drainage, pH).....	0 1 2 3 4
38. Select fertilizer materials.....	0 1 2 3 4
39. Apply fertilizer materials.....	0 1 2 3 4
40. Select soil conditioners.....	0 1 2 3 4
41. Apply soil conditioners.....	0 1 2 3 4
42. Understand the function of living organisms in the soil.....	0 1 2 3 4
43. Understand the function of organic matter in the soil.....	0 1 2 3 4
44. Recognize common nutrient deficiencies.....	0 1 2 3 4
45. Take soil samples for analysis.....	0 1 2 3 4
46. Mix soil mixes and other growing media.....	0 1 2 3 4
47. Select components for soil mixes and other growing media...	0 1 2 3 4
48. Sterilize soil and growing structures.....	0 1 2 3 4
49. Correct poor drainage.....	0 1 2 3 4
50. Control erosion.....	0 1 2 3 4
51. Knowledge of hydroponics.....	0 1 2 3 4
52. Recognize plant pest problems.....	0 1 2 3 4
53. Select control methods for pest problems.....	0 1 2 3 4
54. Knowledge of integrated pest management.....	0 1 2 3 4
55. Knowledge of pest prevention methods.....	0 1 2 3 4
56. Mix and handle chemicals safely.....	0 1 2 3 4
57. Determine correct rates of application of horticultural products.....	0 1 2 3 4

58. Operate and maintain spray equipment.....	0	1	2	3	4
59. Grade a site for turf.....	0	1	2	3	4
60. Prepare topsoil for turf seeding.....	0	1	2	3	4
61. Seed a lawn (rate, method, plugging, sprigging).....	0	1	2	3	4
62. Renovate old turf and turf areas.....	0	1	2	3	4
63. Maintain turf.....	0	1	2	3	4
64. Aerate and remove thatch.....	0	1	2	3	4
65. Maintain golf greens.....	0	1	2	3	4
66. Cut and lay sod.....	0	1	2	3	4
67. Plant and transplant.....	0	1	2	3	4
68. Pruning techniques.....	0	1	2	3	4
69. Secure plant materials from other sources.....	0	1	2	3	4
70. Culture greenhouse plants.....	0	1	2	3	4
71. Operate and service greenhouse equipment.....	0	1	2	3	4
72. Knowledge of the principles of floral design.....	0	1	2	3	4
73. Design displays.....	0	1	2	3	4
74. Design floral pieces (weddings, funerals, occasions).....	0	1	2	3	4
75. Construct floral arrangements.....	0	1	2	3	4
76. Design and construct dish gardens and terrariums.....	0	1	2	3	4
77. Cut and grade flowers.....	0	1	2	3	4
78. Knowledge of landscape design principles.....	0	1	2	3	4
79. Measure and prepare the site for landscaping.....	0	1	2	3	4
80. Interpret the landscape plan.....	0	1	2	3	4
81. Remove trees and shrubs.....	0	1	2	3	4
82. Construct non-plant landscape features.....	0	1	2	3	4
83. Stake and tie woody plants.....	0	1	2	3	4
84. Make simple electrical repairs.....	0	1	2	3	4
85. Make simple welding repairs.....	0	1	2	3	4
86. Construct wood projects, make wood repairs, apply wood preservatives.....	0	1	2	3	4
87. Condition hand tools.....	0	1	2	3	4
88. Rebuild power equipment.....	0	1	2	3	4
89. Operate and service small power equipment.....	0	1	2	3	4
90. Operate and service large power equipment.....	0	1	2	3	4
91. Operate and service automatic systems (watering, heating, lighting, ventilating).....	0	1	2	3	4
92. Install and maintain sprinkler systems.....	0	1	2	3	4
93. Maintain good relations with customers, employers, and fellow employees.....	0	1	2	3	4
94. Stimulate others to work effectively.....	0	1	2	3	4
95. Understand personal safety and first aid.....	0	1	2	3	4
96. Observe things that need to be done.....	0	1	2	3	4
97. Keep records of expenses and receipts.....	0	1	2	3	4
98. Keep production records.....	0	1	2	3	4
99. Keep records of materials used.....	0	1	2	3	4
100. Keep employee time records.....	0	1	2	3	4
101. Keep equipment and service records.....	0	1	2	3	4
102. Write receipts.....	0	1	2	3	4
103. Keep inventory and stock records.....	0	1	2	3	4
104. Estimate bill of materials.....	0	1	2	3	4
105. Make budgets.....	0	1	2	3	4
106. Understand basic business operation.....	0	1	2	3	4
107. Sell products and services.....	0	1	2	3	4
108. Mark and tag products.....	0	1	2	3	4
109. Transport, store, and ship products.....	0	1	2	3	4
110. Determine market outlets and trends.....	0	1	2	3	4
111. Obtain product and service information.....	0	1	2	3	4
112. Operate a cash register and handle money.....	0	1	2	3	4

APPENDIX C

GENERAL INFORMATION: PLEASE HAVE A SUPERVISOR FILL OUT THIS SURVEY. PROVIDE THE FOLLOWING INFORMATION:

- * Name of business, dept., agency, etc.: _____
- * Address of the above: _____
- * Telephone number: _____
- * Name and title of person filling out survey: _____

* Area(s) of specialization of your enterprise:(LIST THE PERCENTAGE IN EACH GROUP)

- | | |
|-------------------------------------|---------------------------------|
| 1. Arborist (tree service).._____% | 5. Greenhouse Production _____% |
| 2. Maintenance of Landscapes _____% | 6. Florist-Plant Shop..._____% |
| 3. Landscape Construction..._____% | 7. Garden Center-Nursery _____% |
| 4. Golf Course....._____% | |

* Number of employees in your enterprise:

	<u>Two Years Ago</u>	<u>Present</u>	<u>Anticipated Two Years From Now</u>
Full Time	_____	_____	_____
Part Time	_____	_____	_____

* Family employees: (OF THE ABOVE LISTED EMPLOYEES PRESENTLY EMPLOYED, HOW MANY ARE MEMBERS OF THE OWNERS FAMILY?)

Full Time Family Members _____

Part Time Family Members _____

* List the JOB TITLES of the employees in your horticulture enterprise:

* Are you aware that Utah State University offers a technical program in Vocational Horticulture?

Yes _____ No _____

* If a potential employee had taken a training program in Ornamental Horticulture, would he/she receive preference in applying for a job with your enterprise?

Yes _____ No _____

* Would you be willing to cooperate with vocational horticulture education by providing a cooperative work station? (No obligation implied)

Yes _____ No _____

INSTRUCTIONS: The preceding questions have dealt with your horticulture enterprise. The following questions pertain to skills of your employees necessary for ENTRY into your organization. How important are the following skills for ENTRY into your organization? Please respond by circling the appropriate numbers according to the following scale:

- 0-DOES NOT APPLY
- 1-NOT IMPORTANT
- 2-OF SOME IMPORTANCE
- 3-IMPORTANT
- 4-VERY IMPORTANT

EXAMPLE: Adjust valves on a tractor 0 1 2 3 4

In this example you can see that it is "of some importance" for the entry employee to be able to adjust valves on a tractor

IMPORTANT: PLEASE FILL OUT THE FOLLOWING RATINGS BASED UPON THE MAJOR AREA OF SPECIALIZATION CITED ON THE PREVIOUS PAGE. If you do the major part of your work in one of the 7 areas answer accordingly.

SKILL AREA	RATING SCALE
* Identification of horticultural plants.....	0 1 2 3 4
* Select plant materials according to growth habits & uses.....	0 1 2 3 4
* Propagate by seeds (sexually).....	0 1 2 3 4
* Select seed varieties.....	0 1 2 3 4
* Schedule seeding dates.....	0 1 2 3 4
* Propagate by plant parts (asexually).....	0 1 2 3 4
* Propagate by grafting.....	0 1 2 3 4
* Select and use plant growth substances.....	0 1 2 3 4
* Store and handle seeds, bulbs, and corms.....	0 1 2 3 4
* Apply knowledge of the life cycle of plants.....	0 1 2 3 4
* Apply knowledge of cell and tissue structure of plants.....	0 1 2 3 4
* Apply knowledge of plant parts and their functions (stems, roots, leaves, etc.).....	0 1 2 3 4
* Apply knowledge of irrigation and watering methods.....	0 1 2 3 4
* Apply knowledge of plant processes (photosynthesis, respiration, translocation, transpiration).....	0 1 2 3 4
* Apply knowledge of the effects that the environment has on plant growth (light, moisture, aeration, fertility, temperature)...	0 1 2 3 4
* Apply knowledge of major soil elements (N,P,K).....	0 1 2 3 4
* Apply knowledge of minor soil elements.....	0 1 2 3 4
* Apply knowledge of soil composition and characteristics.....	0 1 2 3 4
* Select fertilizer materials.....	0 1 2 3 4
* Apply fertilizer materials.....	0 1 2 3 4
* Select soil conditioners.....	0 1 2 3 4
* Apply soil conditioners.....	0 1 2 3 4
* Understand the function of living organisms in the soil.....	0 1 2 3 4
* Understand the function of organic matter in the soil.....	0 1 2 3 4
* Recognize common nutrient deficiencies.....	0 1 2 3 4
* Take soil samples for analysis.....	0 1 2 3 4
* Mix soil mixes and other growing media.....	0 1 2 3 4
* Select components for soil mixes and other growing media.....	0 1 2 3 4
* Sterilize soil and growing structures.....	0 1 2 3 4
* Correct poor drainage.....	0 1 2 3 4
* Control erosion.....	0 1 2 3 4
* Apply knowledge of hydroponics.....	0 1 2 3 4
* Recognize plant pest problems.....	0 1 2 3 4
* Select control methods for pest problems.....	0 1 2 3 4
* Apply knowledge of integrated pest management.....	0 1 2 3 4
* Apply knowledge of pest prevention methods.....	0 1 2 3 4
* Mix and handle chemicals safely.....	0 1 2 3 4
* Determine correct rates of application of horticultural products..	0 1 2 3 4
* Ability to climb trees in a safe manner.....	0 1 2 3 4

0-DOES NOT APPLY 1-NOT IMPORTANT 2-OF SOME IMPORTANCE 3-IMPORTANT 4-VERY IMPORTANT

SKILL AREA	RATING SCALE			
* Operate and maintain spray equipment.....	0	1	2	3 4
* Grade a site for turf.....	0	1	2	3 4
* Prepare topsoil for turf seeding.....	0	1	2	3 4
* Seed a lawn (rate, method, plugging, sprigging).....	0	1	2	3 4
* Renovate old turf and turf areas.....	0	1	2	3 4
* Maintain turf.....	0	1	2	3 4
* Aerate and remove thatch.....	0	1	2	3 4
* Maintain golf greens.....	0	1	2	3 4
* Cut and lay sod.....	0	1	2	3 4
* Plant and transplant.....	0	1	2	3 4
* Pruning techniques.....	0	1	2	3 4
* Secure plant materials from other sources.....	0	1	2	3 4
* Culture greenhouse plants.....	0	1	2	3 4
* Operate and service greenhouse equipment.....	0	1	2	3 4
* Apply knowledge of the principles of floral design.....	0	1	2	3 4
* Design displays.....	0	1	2	3 4
* Design floral pieces (weddings, funerals, occasions).....	0	1	2	3 4
* Construct floral arrangements.....	0	1	2	3 4
* Design and construct dish gardens and terrariums.....	0	1	2	3 4
* Cut and grade flowers.....	0	1	2	3 4
* Apply knowledge of landscape design principles.....	0	1	2	3 4
* Measure and prepare the site for landscaping.....	0	1	2	3 4
* Interpret the landscape plan.....	0	1	2	3 4
* Remove trees and shrubs.....	0	1	2	3 4
* Construct non-plant landscape features.....	0	1	2	3 4
* Stake and tie woody plants.....	0	1	2	3 4
* Make simple electrical repairs.....	0	1	2	3 4
* Make simple welding repairs.....	0	1	2	3 4
* Construct wood projects, make wood repairs, apply wood preservatives.....	0	1	2	3 4
* Condition hand tools.....	0	1	2	3 4
* Rebuild power equipment.....	0	1	2	3 4
* Operate and service small power equipment.....	0	1	2	3 4
* Operate and service large power equipment.....	0	1	2	3 4
* Operate and service automatic systems (watering, heating, lighting, ventilating).....	0	1	2	3 4
* Install and maintain sprinkler systems.....	0	1	2	3 4
* Maintain good relations with customers, employers, and fellow employees).....	0	1	2	3 4
* Stimulate others to work effectively.....	0	1	2	3 4
* Understand personal safety and first aid.....	0	1	2	3 4
* Observe things that need to be done.....	0	1	2	3 4
* Keep records of expenses and receipts.....	0	1	2	3 4
* Keep production records.....	0	1	2	3 4
* Keep records of materials used.....	0	1	2	3 4
* Keep employee time records.....	0	1	2	3 4
* Keep equipment and service records.....	0	1	2	3 4
* Write receipts.....	0	1	2	3 4
* Keep inventory and stock records.....	0	1	2	3 4
* Estimate bill of materials.....	0	1	2	3 4
* Make budgets.....	0	1	2	3 4
* Understand basic business operation.....	0	1	2	3 4
* Sell products and services.....	0	1	2	3 4
* Mark and tag products.....	0	1	2	3 4
* Transport, store, and ship products.....	0	1	2	3 4
* Determine market outlets and trends.....	0	1	2	3 4
* Obtain product and service information.....	0	1	2	3 4
* Operate a cash register and handle money.....	0	1	2	3 4

APPENDIX D

SKILL NUMBERS

1. Identification of horticultural plants
2. Select plant materials according to growth habits & uses
3. Propagate by seeds (sexually)
4. Select seed varieties
5. Schedule seeding dates
6. Propagate by plant parts (asexually)
7. Propagate by grafting
8. Select and use plant growth substances
9. Store and handle seeds, bulbs, and corms
10. Apply knowledge of the life cycle of plants
11. Apply knowledge of cell and tissue structure of plants
12. Apply knowledge of plant parts and their functions (stems, roots, leaves, etc.)
13. Apply knowledge of irrigation and watering methods
14. Apply knowledge of plant processes (photosynthesis, respiration, translocation, transpiration)
15. Apply knowledge of the effects that the environment has on plant growth (light, moisture, aeration, fertility, temperature)
16. Apply knowledge of major soil elements (N,P,K)
17. Apply knowledge of minor soil elements
18. Apply knowledge of soil composition and characteristics
19. Select fertilizer materials
20. Apply fertilizer materials
21. Select soil conditioners
22. Apply soil conditioners
23. Understand the function of living organisms in the soil
24. Understand the function of organic matter in the soil
25. Recognize common nutrient deficiencies
26. Take soil samples for analysis
27. Mix soil mixes and other growing media
28. Select components for soil mixes and other growing media
29. Sterilize soil and growing structures
30. Correct poor drainage
31. Control erosion
32. Apply knowledge of hydroponics
33. Recognize plant pest problems
34. Select control methods for pest problems
35. Apply knowledge of integrated pest management
36. Apply knowledge of pest prevention methods
37. Mix and handle chemicals safely
38. Determine correct rates of application of horticultural products
39. Ability to climb trees in a safe manner
40. Operate and maintain spray equipment
41. Grade a site for turf
42. Prepare topsoil for turf seeding
43. Seed a lawn (rate, method, plugging, sprigging)
44. Renovate old turf and turf areas
45. Maintain turf
46. Aerate and remove thatch
47. Maintain golf greens

48. Cut and lay sod
49. Plant and transplant
50. Pruning techniques
51. Secure plant materials from other sources
52. Culture greenhouse plants
53. Operate and service greenhouse equipment
54. Apply knowledge of the principles of floral design
55. Design displays
56. Design floral pieces (weddings, funerals, occasions)
57. Construct floral arrangements
58. Design and construct dish gardens and terrariums
59. Cut and grade flowers
60. Apply knowledge of landscape design principles
61. Measure and prepare the site for landscaping
62. Interpret the landscape plan
63. Remove trees and shrubs
64. Construct non-plant landscape features
65. Stake and tie woody plants
66. Make simple electrical repairs
67. Make simple welding repairs
68. Construct wood projects, make wood repairs, apply wood preservatives
69. Condition hand tools
70. Rebuild power equipment
71. Operate and service small power equipment
72. Operate and service large power equipment
73. Operate and service automatic systems (watering, heating, lighting, ventilating)
74. Install and maintain sprinkler systems
75. Maintain good relations with customers, employers, and fellow employees)
76. Stimulate others to work effectively
77. Understand personal safety and first aid
78. Observe things that need to be done
79. Keep records of expenses and receipts
80. Keep production records
81. Keep records of materials used
82. Keep employee time records
83. Keep equipment and service records
84. Write receipts
85. Keep inventory and stock records
86. Estimate bill of materials
87. Make budgets
88. Understand basic business operation
89. Sell products and services
90. Mark and tag products
91. Transport, store, and ship products
92. Determine market outlets and trends
93. Obtain product and service information
94. Operate a cash register and handle money

APPENDIX E

ORNAMENTAL HORTICULTURE SURVEY COMPETENCY GROUPINGS

AND SKILL NUMBERS*

- I. Identification of ornamental horticulture plant materials
 - a. Identification of horticultural plants (1)
- II. Propagation of ornamental horticulture plant materials
 - a. Propagate by seeds (sexually) (3)
 - b. Select seed varieties (4)
 - c. Propagate by plant parts (asexually) (6)
 - d. Propagate by grafting (7)
- III. Production and use of ornamental horticulture plant materials
 - a. Select plant materials according to growth habits and uses (2)
 - b. Schedule seeding dates (5)
 - c. Select and use plant growth substances (8)
 - d. Apply knowledge of the life cycle of plants (10)
 - e. Apply knowledge of cell and tissue structure of plants (11)
 - f. Apply knowledge of plant parts and their functions (stems, roots, leaves, etc.) (12)
 - g. Apply knowledge of irrigation and watering methods (13)
 - h. Apply knowledge of plant processes (photosynthesis, respiration, translocation, transpiration) (14)
 - i. Apply knowledge of the effects that the environment has on plant growth (light, moisture, aeration, fertility, temperature) (15)
 - j. Apply knowledge of major soil elements (N,P,K) (16)
 - k. Apply knowledge of minor soil elements (17)
 - l. Select fertilizer materials (19)
 - m. Apply fertilizer materials (20)
 - n. Select soil conditioners (21)
 - o. Apply soil conditioners (22)
 - p. Recognize common nutrient deficiencies (25)
 - q. Apply knowledge of hydroponics (32)
 - r. Determine correct rates of application of horticultural products (38)
 - s. Plant and transplant (49)
 - t. Culture greenhouse plants (52)
- IV. Soil and other plant growing media
 - a. Apply knowledge of soil composition and characteristics (18)
 - b. Understand the function of living organisms in the soil (23)
 - c. Understand the function of organic matter in the soil (24)
 - d. Take soil samples for analysis (26)
 - e. Mix soil mixes and other growing media (27)
 - f. Select components for soil mixes and other growing media (28)
 - g. Sterilize soil and growing structures (29)
 - h. Correct poor drainage (30)

*Skill numbers appear in parentheses after the competency

- i. Control erosion (31)
- V. Identification and control of common pests of ornamental horticulture plant materials
 - a. Recognize plant pest problems (33)
 - b. Select control methods for pest problems (34)
 - c. Apply knowledge of integrated pest management (35)
 - d. Apply knowledge of pest prevention methods (36)
 - e. Mix and handle chemicals safely (37)
- VI. Plant growing structures and equipment
 - a. Construct wood projects, make wood repairs, apply wood preservatives (68)
 - b. Condition hand tools (69)
 - c. Operate and service automatic systems (watering, heating, lighting, ventilating) (73)
 - d. Install and maintain sprinkler systems (74)
- VII. Establishment and maintenance of lawns and turf
 - a. Grade a site for turf (41)
 - b. Prepare topsoil for turf seeding (42)
 - c. Seed a lawn (rate, method, plugging, sprigging) (43)
 - d. Renovate old turf and turf areas (44)
 - e. Maintain turf (45)
 - f. Aerate and remove thatch (46)
 - g. Maintain golf greens (47)
 - h. Cut and lay sod (48)
- VIII. Operation and maintenance of machinery and equipment
 - a. Operate and maintain spray equipment (40)
 - b. Operate and service greenhouse equipment (53)
 - c. Make simple electrical repairs (66)
 - d. Make simple welding repairs (67)
 - e. Rebuild power equipment (70)
 - f. Operate and service small power equipment (71)
 - g. Operate and service large power equipment (72)
- IX. Marketing materials and supplies
 - a. Store and handle seeds, bulbs, and corms (9)
 - b. Design displays (55)
 - c. Write receipts (84)
 - d. Estimate bill of materials (86)
 - e. Make budgets (87)
 - f. Understand basic business operations (88)
 - g. Sell products and services (89)
 - h. Mark and tag products (90)
 - i. Transport, store, and ship products (91)
 - j. Determine market outlets and trends (92)
 - k. Operate a cash register and handle money (94)

X. Marketing flower arrangements and potted plants

- a. Apply knowledge of the principles of floral design (54)
- b. Design floral pieces (wedding, funerals, occasions) (56)
- c. Construct floral arrangements (57)
- d. Design and construct dish gardens and terrariums (58)
- e. Cut and grade flowers (59)

XI. Record keeping

- a. Keep records of expenses and receipts (79)
- b. Keep production records (80)
- c. Keep records of materials used (81)
- d. Keep employee time records (82)
- e. Keep equipment and service records (83)
- f. Keep inventory and stock records (85)

XII. Communications and human relations

- a. Secure plant materials from other sources (51)
- b. Maintain good relations with customers, employers, and fellow employees (75)
- c. Stimulate others to work effectively (76)
- d. Observe things that need to be done (78)
- e. Obtain product and service information (93)

XIII. Landscape development and maintenance

- a. Ability to climb trees in a safe manner (39)
- b. Pruning techniques (50)
- c. Apply knowledge of landscape design principles (60)
- d. Measure and prepare the site for landscaping (61)
- e. Interpret the landscape plan (62)
- f. Remove trees and shrubs (63)
- g. Construct non-plant landscape features (64)
- h. Stake and tie woody plants (65)

XIV. Other

- a. Understand personal safety and first aid (77)

APPENDIX F

DEPARTMENT OF
AGRICULTURAL EDUCATION

May 3, 1979

Dear Horticulture Supervisor:

Education is a major topic of discussion in today's society. We hear from some how poorly our educational system is doing. Here is a chance for you to help improve education.

In order to better prepare vocational horticulture employees for employment by you, the Department of Agricultural Education and the Agriculture Experiment Station are conducting this survey to assess the horticulture industry needs. We hope that you will help us in this endeavor by giving us 10-15 minutes of your time to help advance horticulture education.

Will you please fill out the attached survey form and return it to us in the enclosed envelope by May 15.

The information you give us will be utilized in summary form and handled in strict confidence.

We will be pleased to answer any questions concerning the survey, and will be happy to send you a summary of the results if you so desire.

Thank you for your time and effort in helping to advance horticulture education in Utah.

Sincerely,

Gilbert A. Long, Head
Department of Agricultural Education
752-4100 Ext. 7311

Dennis G. Bahen, Research Assistant
Department of Agricultural Education
752-4100 Ext. 7311

enclosure

DEPARTMENT OF
AGRICULTURAL EDUCATION

May 22, 1979

Dear Horticulture Supervisor:

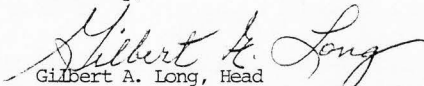
You were recently sent a survey from the Department of Agricultural Education and the Agriculture Experiment Station asking you to identify the importance of various job skills in the horticulture industry in Utah.

This letter is just a reminder to you that we are anxious to receive your response to the survey.

If you have already sent your responses to us, thank you for your help in our effort to improve education in Utah.

Enclosed is another copy for your convenience. Thank you for your time and effort in helping to advance horticulture education in Utah.

Sincerely,



Gilbert A. Long, Head
Department of Agricultural Education
752-4100 Ext. 7311



Dennis G. Bahen, Research Assistant
Department of Agricultural Education
752-4100 Ext. 7311

enclosure

DEPARTMENT OF
AGRICULTURAL EDUCATION

June 22, 1979

Dear Horticulture Supervisor:

Re: Horticulture job skill survey

Thank you for your reply to our telephone survey and your expressed willingness to respond to a job skill survey. Your help in advancing horticulture education in Utah is greatly appreciated by those of us in the Agricultural Experiment Station and the Department of Agricultural Education at Utah State University.

Please fill out the enclosed job skill survey and return it in the self-addressed envelope as soon as possible.

Again, thank you for your help and cooperation in this matter.

Sincerely,



Gilbert A. Long, Head
Department of Agricultural Education
752-4100 ext. 7311



Dennis G. Bahen, Research Assistant
Department of Agricultural Education
752-4100 ext. 7311

enclosure

DEPARTMENT OF
AGRICULTURAL EDUCATION

June 29, 1979

Dear Horticulture Supervisor:

Re: Horticulture job skill survey

You can help us in our efforts to make horticulture education in Utah more meaningful. Those of us in the Department of Agricultural Education and the Agriculture Experiment Station at Utah State University are surveying the horticulture industry to obtain information to make learning more specific and better suited to industry needs.

We hope that this reminder letter will be attended to at your earliest convenience. We are in need of the information in order to complete the study.

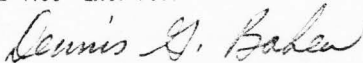
If you have already sent your responses to us, thank you for your help in our efforts to improve education in Utah.

We hope to hear from you soon.

Sincerely,



Gilbert A. Long, Head
Department of Agricultural Education
752-4100 Ext. 7311



Dennis G. Bahen, Research Assistant
Department of Agricultural Education
752-4100 Ext. 7311

enclosure

APPENDIX G

Competency Grouping	Skill Number	\bar{x} scores in areas of specialization* (possible score = 4.0)							\bar{x} for total sample respondents
		1	2	3	4	5	6	7	
I. Plant Identification	1	2.3	2.7	3.0	1.9	2.8	2.8	3.1	2.7
II. Propagation	3	1.5	2.3	2.3	2.2	2.3	2.3	2.0	2.2
	4	1.7	2.2	2.1	2.8	2.3	2.1	2.2	2.3
	6	1.5	2.4	1.5	1.8	3.0	2.2	2.2	2.3
	7	1.8	2.4	1.3	2.3	1.8	1.6	1.8	1.8
	2	1.8	2.6	2.9	2.5	2.7	2.9	3.2	2.7
	5	1.7	2.2	2.1	2.6	2.6	2.5	2.6	2.5
III. Production and Use of Plants	8	2.0	2.8	2.7	2.4	2.6	2.5	2.6	2.5
	10	1.7	2.6	2.3	2.1	2.4	2.2	2.4	2.3
	11	1.5	2.1	1.4	2.2	1.9	2.1	1.8	1.9
	12	2.1	2.6	2.2	2.4	2.6	2.6	2.2	2.4
	13	2.3	3.2	2.8	3.7	3.3	2.5	2.9	3.0
	14	2.0	2.6	2.2	2.2	2.3	2.4	2.4	2.3
	15	2.5	2.7	2.5	2.9	3.1	3.2	2.9	2.9
	16	2.3	2.8	2.7	3.2	2.8	2.6	3.2	2.9
	17	2.3	2.6	2.2	3.3	2.6	2.3	2.8	2.7
	19	2.4	2.9	3.0	3.4	2.8	2.5	3.1	2.9
	20	2.7	3.5	3.2	3.9	2.8	2.7	2.9	3.1
	21	2.0	2.4	2.9	2.9	2.3	2.3	2.8	2.6
	22	2.2	2.6	2.9	3.1	2.4	2.3	2.7	2.7
	25	2.3	3.0	2.8	3.2	2.9	2.9	3.1	3.0
	32	2.5	2.0	2.0	2.5	2.0	1.8	1.8	2.1
38	3.5	3.3	3.3	3.4	3.0	2.6	3.2	3.1	
49	3.4	3.0	3.7	3.4	3.1	2.8	3.2	3.2	
52	1.0	2.2	2.0	1.7	3.2	2.8	2.9	2.6	

Competency Grouping	Skill Number	x scores in areas of specialization							\bar{x} for total sample respondents
		1	2	3	4	5	6	7	
IV. Soils and Growing Media	18	1.9	2.6	2.5	3.1	2.6	2.6	3.0	2.7
	23	2.0	2.6	2.3	2.7	2.2	2.3	2.2	2.4
	24	2.2	2.7	2.7	2.7	2.3	2.6	2.5	2.5
	26	1.5	2.6	2.0	2.8	2.5	2.0	2.1	2.4
	27	1.3	2.4	2.4	2.9	2.9	2.7	2.7	2.7
	28	1.3	2.7	2.2	2.9	2.5	2.2	2.5	2.5
	29	1.8	2.3	2.2	2.8	2.3	1.8	2.4	2.4
	30	2.0	3.0	2.7	3.5	2.3	2.2	2.4	2.7
	31	1.8	2.6	2.9	3.0	1.6	1.9	2.0	2.4
V. Pests Identification and Control	33	3.0	3.3	3.0	3.3	3.3	3.2	3.4	3.2
	34	3.3	3.3	3.3	3.3	2.8	3.1	3.4	3.2
	35	3.0	3.1	2.6	3.1	2.8	2.5	3.0	2.9
	36	3.3	3.1	2.9	3.3	3.1	2.8	3.1	3.0
	37	4.0	3.6	2.8	3.6	3.1	2.6	3.0	3.2
VI. Growing Structures and Equipment	68	2.6	3.0	2.7	2.3	2.2	2.0	1.9	2.3
	69	3.3	3.1	2.7	2.9	1.9	2.2	2.1	2.5
	73	2.8	3.5	2.3	3.4	2.2	2.3	2.2	2.7
	74	3.5	3.4	2.9	3.6	2.1	1.5	2.1	2.9
VII. Turf	41	3.5	2.5	3.4	3.1	2.0	2.5	2.4	2.9
	42	3.8	2.6	3.5	3.3	2.0	2.5	2.6	3.0
	43	4.0	2.4	3.5	3.3	2.3	2.5	2.7	3.0
	44	4.0	3.1	3.2	3.4	1.5	2.5	2.3	3.0
	45	3.0	3.5	2.5	3.8	1.5	2.5	2.5	3.1
	46	3.0	3.2	2.8	3.5	1.5	1.3	2.0	2.8

Competency Grouping	Skill Number	\bar{x} scores in areas of specialization							\bar{x} for total sample respondents
		1	2	3	4	5	6	7	
	47	1.0	2.7	1.6	3.9	1.0	1.0	1.0	2.8
	48	4.0	2.8	3.5	3.4	2.0	1.5	2.2	2.9
VIII. Operation and Maintenance of Machinery and Equipment	40	3.7	3.5	2.6	3.4	2.8	2.7	2.4	3.0
	53	N/A	2.0	1.6	1.4	2.9	2.4	2.5	2.4
	66	2.5	3.0	2.3	2.3	1.9	2.1	1.9	2.3
	67	2.6	2.8	2.1	2.4	2.1	2.0	1.8	2.3
	70	2.4	3.4	2.4	2.5	1.8	2.0	1.6	2.4
	71	3.3	3.1	3.1	3.5	2.0	2.0	2.1	2.8
	72	3.3	3.2	2.9	3.4	2.0	2.3	1.8	2.8
IX. Marketing	9	1.8	2.1	2.0	2.0	2.3	2.3	2.6	2.2
	55	N/A	1.7	2.3	1.3	2.9	3.5	2.1	2.6
	84	2.3	3.0	2.8	3.1	2.9	3.3	2.8	2.9
	86	2.1	3.0	3.0	3.1	2.2	3.0	2.8	2.8
	87	1.7	2.7	2.7	3.3	1.8	2.5	2.5	2.6
	88	2.6	3.2	2.7	3.1	3.1	3.4	3.0	3.0
	89	2.8	3.3	3.4	3.3	3.2	3.4	3.4	3.3
	90	1.8	2.0	2.8	2.6	2.6	3.2	3.1	2.9
	91	2.0	2.4	2.4	2.3	2.6	2.7	2.9	2.6
	92	1.5	2.5	2.4	2.6	2.2	2.6	2.5	2.4
	94	1.7	3.2	3.1	3.5	3.2	3.7	3.5	3.4
X. Marketing Flowers and Potted Plants	54	N/A	2.0	2.3	1.5	3.0	3.4	2.1	2.7
	56	N/A	1.7	1.3	1.0	3.1	3.7	1.9	2.7
	57	N/A	2.0	1.3	1.0	3.1	3.7	2.0	2.8
	58	N/A	2.5	1.8	1.0	3.0	3.7	2.3	2.9
	59	N/A	2.3	1.0	1.5	2.4	3.0	2.3	2.3

Competency Grouping	Skill Number	\bar{x} scores in areas of specialization							\bar{x} for total sample respondents
		1	2	3	4	5	6	7	
XI. Record Keeping	79	3.3	3.2	3.2	3.3	2.9	3.3	2.6	3.1
	80	2.6	2.7	3.3	2.7	2.8	3.0	2.9	2.9
	81	3.3	3.2	3.3	3.3	2.8	3.1	3.1	3.1
	82	2.7	3.0	3.4	3.3	2.7	2.8	3.0	3.0
	83	2.8	3.3	3.4	3.3	2.3	2.6	2.5	2.9
	85	2.0	2.7	2.9	3.2	2.4	2.9	2.8	2.8
XII. Human Relations and Communication	51	2.0	2.5	2.8	2.9	2.2	2.7	2.4	2.5
	75	3.9	3.9	3.8	3.9	3.7	3.8	3.9	3.8
	76	3.6	3.3	3.8	3.7	3.4	3.6	3.5	3.5
	78	3.6	3.5	3.5	3.6	3.5	3.8	3.6	3.6
	93	1.5	2.6	2.7	2.6	2.5	2.4	2.8	2.6
XIII. Landscape	39	3.5	2.7	2.3	2.3	1.3	1.0	1.3	2.4
	50	3.8	3.1	3.2	2.7	2.5	2.1	2.9	2.9
	60	2.8	2.7	3.2	2.0	2.3	1.7	2.8	2.5
	61	3.3	2.5	3.3	2.4	2.0	2.0	2.7	2.7
	62	3.0	2.9	3.3	2.3	2.3	2.5	2.9	2.8
	63	3.8	3.0	3.2	2.6	2.0	2.5	2.3	2.8
	64	2.5	2.8	3.0	2.3	2.0	1.5	2.1	2.5
	65	3.2	3.1	2.8	1.9	2.2	2.1	2.3	2.4
XIV. Safety and First Aid	77	3.5	3.2	3.2	3.7	3.5	3.3	3.3	3.4

* 1 = Arborists, 2 = Maintenance of Landscapes, 3 = Landscape Construction

4 = Golf Course, 5 = Greenhouse Production, 6 = Florist-Plant Shop

7 = Garden Center Nursery

VITA

Dennis George Bahen

Candidate for the Degree of

Master of Science

Thesis: Competencies Needed for Careers in Ornamental Horticulture
in Utah

Major Field: Agricultural Education

Biographical Information:

Personal Data: Born at Riverside, California, December 28,
1942, son of Paul S. and A. Phyllis Flamm; married
Christine Marie Frodsham July 3, 1974; one child--Gary James.

Education: Attended elementary school in Los Angeles and
Escondido, California; graduated from Escondido Union High
School in 1960; graduated from Brigham Young University in
1968 in Communications (B.S.); received Vocational
Horticulture Certificate in 1974 from Utah State University;
graduated from Utah State University in 1976 in Agricultural
Education (B.S., Cum Laude); received M.S. Degree, Magna
Cum Laude, from Utah State University in Agricultural
Education in 1979.

Professional Experience: 4/74-9/75, Greenhouse and Laboratory
Assistant, Plant Science Department, Utah State University;
9/75-12/75, Curriculum/Media Development, Department of
Agricultural Education, Utah State University; 8/76-6/77,
Vocational Horticulture Instructor, Operation Green Thumb,
Portland Public Schools, Portland, Oregon; 8/77-6/78,
Vocational Trainer/Farm Manager, Habilidad Inc., a drug
rehabilitation program, Kaneohe, Hawaii; 9/78-6/79, Research
Assistant/Media Development, Department of Agricultural
Education, Utah State University; 6/79-9/79, Instructional
Product Development, Center for Instructional Product
Development, Department of Instructional Media, Utah State
University.