ABSTRACT

PERCEIVED TECHNICAL ORNAMENTAL HORTICULTURE TRAINING ADEQUACIES AND NEEDS OF SECONDARY VOCATIONAL TEACHERS

By

Ronald Lee Shumack

The primary purpose of the study was to determine the perceived adequacies of and needs for technical ornamental horticulture training for vocational agriculture teachers in Michigan. Researchers in a number of fields have shown that technical training and knowledge of subject matter are important qualities for effective teaching. This has been especially true in vocational areas.

Two groups of teachers were surveyed. All teachers in secondary schools offering ornamental horticulture as a specialized course of instruction made up the first population (n=15). The second group consisted of a random sample of all vocational agriculture teachers in Michigan (n=15). A personal interview was conducted with each teacher. Fifteen industry representatives, each serving on an advisory committee for the ornamental horticulture teachers, were interviewed by telephone.

The data were analyzed by the chi-square statistic to determine tendencies to unanimity or disparity between groups

on all questions. Hypotheses were tested using the multivariate and univariate analysis of variance.

Random sample teachers had been teaching longer than ornamental horticulture teachers but there was little difference in the formal education of the two groups. Ornamental horticulture teachers reported a significantly higher amount of space available for growing plants.

Ornamental horticulture teachers had taken more courses in horticulture and related areas, especially botany and entomology. However, random sample teachers had taken more courses in biological science, agricultural engineering and agricultural economics. Teachers in both groups generally thought courses in horticulture, soils, botany, entomology and agricultural engineering were helpful in qualifying them to teach ornamental horticulture.

The teachers were asked if they taught 53 selected areas and if so, how qualified they felt about teaching each area. Industry representatives were asked how important it was for a teacher to be qualified to teach that area or skill.
A high percentage of ornamental horticulture teachers reported they taught all the areas, while a high percentage of the random sample teachers reported teaching the competency areas and skills in only the soil science area. More ornamental horticulture teachers felt qualified to teach the areas. However, industry representatives thought it was important for teachers to be qualified in most of the areas. More ornamental

horticulture teachers felt qualified to teach specialized subjects primarily in horticulture. However, there was little difference between the groups on the other areas.

Teachers in both groups generally believed that additional courses in horticulture and related areas would help them become better teachers. Courses in all areas were generally considered to be more helpful by random sample teachers than by ornamental horticulture teachers. Both groups perceived the strongest need for additional training in turfgrass management, woody ornamentals and floriculture.

Teachers preferred a major in horticulture with a teaching certificate as the ideal formal education background for a teacher of ornamental horticulture.

Both groups of teachers thought a person should be required to work in an ornamental horticulture business before teaching a specialized program of ornamental horticulture. A higher percentage of ornamental horticulture teachers had worked in a related business before teaching and they thought a longer period of work experience should be required. Ornamental horticulture teachers generally agreed that work experience should be longer than six months; however, random sample teachers considered three to six months adequate.

Random sample teachers stressed that inadequate college training and lack of adequate educational facilities were the primary reasons for not teaching specialized ornamental horticulture courses. However, ornamental horticulture

teachers said subject interest and local school policies were the two most important reasons for teaching ornamental horticulture as a specialized program.

Michigan State University Horticulture Department faculty members and state vocational administrators had been the most helpful of any group in the development of ornamental horticulture teachers curriculums.

Generally, teachers were pleased with their students, educational facilities and instructional materials; however, most agreed that more input into the guidance of students prior to enrollment was needed.

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INTRODUCTION

There has been more public awareness of plants and the environment in recent years. Student awareness has occurred at the high school as well as at the university level. Increased demand for ornamental plants has encouraged many people to examine the entire area of production and marketing of plant material as a livelihood. Plantings in highway beautification, industrial sites, home grounds and the growing popularity of cut flowers, bedding plants and other floriculture crops require knowledgeable personnel. As this trend develops, the demand for ornamental horticulture courses at the high school level has increased.

The most logical teacher group to provide leadership in this area is vocational agriculture teachers. They have been educated in plant related areas and have traditionally taught a small amount of ornamental horticulture at all schools. Even though the vocational agriculture teachers may be best qualified to teach ornamental horticulture at the high school level, their background and training may not be sufficient. The teachers' formal education will usually be broad based if they have graduated from a land-grant university in agricultural education. They may have had courses in almost every

area of agriculture. If this is the case, they may find that students, local school administrators, parents and industry representatives are asking for more ornamental horticulture, while the teachers do not feel competent to expand their efforts in that direction.

Secondary vocational agriculture teachers may be concerned by the fact that area skills center programs being offered are able to develop specialized instruction in a number of agricultural areas. Michigan has 18 skill centers in operation and the State Department of Education has plans for a total of 91 centers as soon as possible (3). These centers will offer forward looking programs in many areas, including ornamental horticulture.

Michigan State University, the only institution in Michigan approved to prepare vocational teachers of agriculture, has a responsibility to educate secondary teachers who are equipped to teach subjects such as ornamental horticulture. Administrators and faculty are probably willing to offer courses that are needed but they are not certain which curriculum changes should be made. Information is needed concerning the educational level of teachers, facilities in use, competencies, and formal education needed by teachers who are presently employed. This, and other pertinent information, would be helpful to the university in evaluating both the pre-service and in-service educational program in horticulture and in related fields.

Objective of The Study

The primary purpose of the study was to determine the perceived adequacies of and needs for technical ornamental horticulture training for vocational agriculture teachers in Michigan. More specifically, the following objectives were sought:

1. To determine if there was a difference in the formal educational background of ornamental horticulture teachers and random sample teachers.
2. To determine if there was a difference in facilities and space for growing ornamental plants between ornamental horticulture teachers and random sample teachers.
3. To determine if there was a difference in the level of perceived adequacy to teach selected ornamental horticulture and related areas between ornamental horticulture teachers and random sample teachers.
4. To determine if there was a difference between all teachers perceptions of their adequacy to teach selected ornamental horticulture and related areas, and the perceptions of selected industry representatives as to the importance of teachers being qualified to teach those areas.
5. To determine if the ornamental horticulture and random sample teacher groups had a different perception of the need for additional formal education.

6. To determine if there was a difference between the ornamental horticulture and random sample teachers commercial work experience and their perceived importance of work experience for a person preparing to teach ornamental horticulture.

7. To determine if the ornamental horticulture and random sample teacher groups had different reasons for teaching or not teaching ornamental horticulture.

Definition of Terms

For the purposes of this study, selected terms will be defined as follows:

1. Ornamental Horticulture Teachers

   Those teachers who taught at least one entire class in ornamental horticulture and had a greenhouse available for use at their high school.

2. Random Sample Teachers

   Those teachers who were randomly selected from the entire list of vocational agriculture teachers after the ornamental horticulture teachers had been removed from the list.

3. Ornamental Horticulture

   Includes the growing of all plants used for ornamental purposes. Trees, shrubs, flowers, sod, Christmas trees and other plants grown for enjoyment are some of the major areas included.

4. Industry Representatives

   Those participants who are actively engaged in some ornamental hortiqulture business and are presently serving on an advisory committee for one of the ornamental horticulture teachers.

LITERATURE REVIEW

This review of literature was designed to give insight into competencies and needs of secondary ornamental horticulture teachers. More specifically, it was designed to show the importance that various researchers have put on the knowledge and use of subject matter by teachers. The first section, Competencies and Needs of All Teachers, provides a review of the literature concerning those competencies and needs of teachers in all areas. The second section, Competencies and Needs of Teachers in Non-Vocational Fields, provides a review of the literature in specific fields such as science, English and mathematics as it relates to the subject. Competencies and Needs of Teachers in Non-Horticultural Vocational Fields is the third section and it points out research findings primarily in the industrial-technical and agriculture areas. The last section, Competencies and Needs of Teachers in Horticultural Fields, include a number of specific competencies researchers have found important for secondary ornamental horticulture teachers. It also points out employment opportunities and student interest in the area.

Competencies and Needs of All Teachers

If teaching is to be improved, then more information must be obtained about competencies which teachers should possess to be effective. Therefore, there is a need to examine the factors which are involved in determining the competences of teachers. Fawcett (22) and Barr (7) found that administrators and teachers both placed a high importance on the knowledge of subject matter. In a similar study, Barr (6) found that a superior knowledge of subject matter was one of the three qualities possessed by all teachers but by none of the poor teachers in his study. Other areas of importance which were reported include desirable personality characteristics (10) and the application of subject matter in the community (11).

Training institutions obviously play an important role in developing teacher competencies, and their interest in assisting teachers to reach their potential cannot be over-emphasized (35). In a rather extensive study, Storm (53) identified factors in the backgrounds of successful teachers by first grouping the teachers into high and low success groups. Some of his findings were: the high success instructors generally attended state universities while members of the low success group were more likely to be the product of other 4-year institutions; the high success teachers had more advanced degrees in Education than the low success group; the average high success instructor earned more per year; but

there was no significant difference between the two groups in their family status, major teaching fields or the age at which they started teaching.

Competencies and Needs of Teachers in Non-Vocational Fields

In an effort to determine possible improvements for a specific education program, competencies of science teachers and the effect of the science curricula upon the development of these abilities have been studied (17). It has been reported that an understanding of science does improve as future teachers progress through the university curriculum (13). Similar positive results have been shown in the improvement of teaching science skills by means of in-service education (13,15). Coffey (15) states that "in-service training programs to change teachers verbal classroom behavior are feasible and can be accomplished by local educational agencies at a modest level of financial support." However, some studies do not support this principle, since it has been shown (46,36) that the training of a teacher in a specific subject area did not result in a more effective teachers. The work of Perkes (46) has shown that the ability of junior high students to recall scientific knowledge was not significantly correlated with the amount of scientific preparation that their science teacher had received in college. He did find, however, that students who scored higher on factual information were taught by teachers who were older, had fewer credits in methods of

teaching science, had lower GPA's in science and had less recently completed a college level science course. Further research has shown that science courses were not considered helpful for teaching home economics by those teachers who had recently graduated (36).

Although teachers in specialized course areas need some of the same competencies as other teachers, they also need those pertaining solely to their area of specialization. For example, in the mathematics area, Watson (57) found that the number of semester hours in mathematics taken by a teacher was a significant predictor of their students' achievement as measured by the SAT-M test. He suggested that a sample of teachers who were teaching a specific mathematics course, such as Algebra I, should be used for the continuation of his work. In a later study, Wetter (58) found that beginning teachers of mathematics were teaching courses that were considerably different from those they took in college or from those taught during their practice teaching experience. The teachers included in his study recognized a need for additional preparation and were making definite plans to obtain this instruction. Other areas where special knowledge of subject matter is essential include teaching the hearing impaired (2) and adult basic education (19). It was reported that eighty-five percent of the instructors in adult basic education expressed a desire for further training in some specific areas of instruction.

Competencies and Needs of Teachers in Non-Horticultural Vocational Fields

In addition to the area of horticulture, a study of the literature of other closely related vocational and agricultural fields is necessary. The perceived competencies and needs of teachers in these areas could easily be applied to the horticulture profession as well. In all areas of vocational education, technical training is considered necessary by the teachers (16). Many of these teachers reported that an increase in both the number and depth of the technical courses is necessary to the improvement of their training (48,37,12). Further research by Larson (34) revealed that many teachers enrolled in industrial-technical education in Michigan's community junior colleges concluded that too much emphasis had been placed on theory while not enough was given to practical application. In what might be opposition to these teachers' ideas, Jones (26) found a positive significant correlation between the teachers' knowledge of subject matter and verbal and manual gain in their adult students. He, also, reported a non-significant correlation between the teachers' mental ability, age, years of teaching experience, adult student satisfaction, persistence; and verbal or manual gain. However, other studies have concluded that it is often difficult to show a necessity for long employment in occupations or a training program specifically for various vocational educators (31,50). The results suggest that vocational teacher preparatory programs should place greater emphasis

on the individualization of instruction, teaching at individual learning rates, writing of performance objectives, evaluation of instruction, and interpreting the goals and objectives of vocational education.

Likewise, the research in agricultural fields revealed that teachers were in need of more competencies. In a recent study, Cardozier (14) gathered data on 188 teachers concerning their academic achievement in college and their teaching performance as rated by principals and district supervisors. He found a significant positive correlation between teaching performance and student teaching; but, there was a non-significant difference in the variation of teaching performance according to undergraduate achievement. Other studies (32, 54) have supported the idea that many undergraduate courses were of little benefit to the vocational agriculture teacher. However, in an earlier study, White (59) established the fact that the number of credits earned in animal husbandry by teachers was associated with both the manipulative and managerial abilities possessed by those teachers in beef cattle and swine enterprises. He thus concluded that teachers of vocational agriculture should be encouraged to take more credits in animal husbandry in an effort to acquire more manipulative and managerial abilities. Additional training through in-service technical education has been shown to be desired by vocational agriculture teachers (9).

In addition to their function in technical schools, an important aspect of vocational and agricultural training are

the programs that are conducted in high schools throughout the country. It has been suggested that vocational instruction at the secondary level is needed to help students to develop basic skills and competencies to be used after their graduation (43). If students are to develop these skills and competencies, teachers must feel that they are well prepared in the areas which they are teaching (3). Judkins (28) said, in a 1965 speech, that superior teachers must have a knowledge of the subject being taught if information is to be disseminated and constructively evaluated. In that same speech, he continued: "The teacher's knowledge should involve related subject matter areas to insure that the interpretations and applications being considered in a particular course are relevant to current thought in the broad sweep of human knowledge."

Competencies and Needs of Teachers in Horticultural Fields

To determine some of the competencies needed by teachers of high school ornamental horticulture courses, Bass (8) surveyed twenty-two specialists in horticulture and agricultural education. In addition to identifying competencies needed, he asked the respondents to identify what the general purposes of a program in high school ornamental horticulture should be. Almost unanimous agreement was found among the respondents on the following items: (1) contribute to the educational objectives of American education, and (2) fit

students for gainful employment. The specialists unanimously agreed that high school ornamental horticulture courses should include (1) floriculture, (2) landscape management, (3) nursery management, and (4) turf management. Many of the competency areas included in Bass's study were also included in "Ornamental Horticulture: A Curriculum Guide for Agricultural Education" (44). The work of Oen (42) concluded that many competencies are desirable, but not necessarily required, for a high school student to know or have developed in order to obtain a job. However, he emphasized the fact that to advance within a firm, to trouble-shoot, or become a specialist, practically all of the competencies for a given area would have to be obtained and/or developed by the employee (42). In a similar study, Parsons (45) found that two-thirds of the greenhouse managers whom he interviewed considered that the knowledge of basic plant parts, basic growth processes and plant names was essential for the greenhouse grower. Eighty-nine percent or more of the managers stated that the following competency areas were essential for the greenhouse grower: soil sterilization (steam and chemical); plant propagation (seeds and cuttings); seedling planting and transplanting; potting; soil preparation; fertilization; insect, diseases and virus identification and control; and watering. In addition, Judge (27) suggested that workers should be trained in some kind of technical ornamental horticultural programs.

In a 1967 study, Dunbar (21) found that the Michigan floriculture industry needed 314 additional employees that year.

Fifty percent of the flower growers and 16 percent of the retailers needed help. All of the wholesalers and retailers and 66 percent of the growers indicated that by 1972 they would need 1980 additional employees. While employers varied in their educational requirements expected in their employees, most indicted; however, that a high school education was desired for the majority of the positions.

There seems to be little doubt that more competencies will be needed by workers in the ornamental horticulture industry. White and Woodin (60) found that the number of positions as technicians in ornamental horticulture would increase nearly threefold from 1966 to 1972. Such expected increases are well documented for the state of Michigan also (38,41,23). This demand is not only in urban areas, but seems to be characteristic of all sections of the country. A study by Mondart and Curtis (40) concluded that a surprisingly large number of firms were engaged in ornamental horticulture for the rural state of Louisiana. As jobs continue to increase in this area (4), student interest in ornamental horticulture as a profession may also show an increase. Mohr (39) documented such an interest when he found that fifty universities across the United States expected enrollments in floriculture, ornamental horticulture and landscaping to increase by 78 percent from 1968 to 1985. To determine student interest at the high school level, Altmen and Smith (1) surveyed students following a program about ornamental horticulture which was

conducted in their school. Some of their findings were: 64 percent indicated that they would like to study plants "not for a job, but for pleasure," (2) 11 percent intended to use such knowledge in future employment, and (3) 61 percent indicated an intention to enroll in ornamental horticulture in high school.

Experts seem convinced that horticulture will be a growing field in the future. Part of this growth may take place in the non-vocational area, such as through the appreciation of indoor plants and flowers (56). According to Widmoyer (61), "Through horticultural education, we aspire to develop men and women with ability to make wise, independent decisions based upon facts, clear reasoning and understanding. Many levels of education undoubtedly will be expanded because of need, change, interest, and publicity,... Today, we are considering those individuals who derive enjoyment from horticultural plants but who depend upon another vocation for their livelihood." Many of the problems resulting from the change in a traditional vocational agriculture program to a horticulture teaching program were described by Kahler in 1972 (30). It appears obvious that this transition will be difficult for many teachers, and that they must be given the assistance and knowledge to move ahead with the times (52,24).

Self-Concept Studies

The entire area of self-concept is one that has been researched and discussed in great detail by communicators,

sociologists, psychologists and other educators. In fact, Diggory (20) suggested that there is a fundamental "drive" to evaluate ourselves. According to him, "there may be a universal upward push with respect to abilities which biases our evaluations toward the favorable end of the scale in spite of possible evidence that they ought to be lower." In 1963, Super (55) said "A self concept is the individual's picture of himself, the perceived self with accrued meanings. Since the person cannot ascribe meanings to himself in a vacuum, the concept of self is generally a picture of the self in some role, some situation, a position, performing some set of functions, or in some web of relationships."

A number of educators have recognized the importance of teachers evaluating themselves. "Teacher self-evaluation is almost unanimously recommended by teacher organizations and professional experts on teacher improvements" (49). Researchers have found self-evaluation to be a reliable effective method of determining competencies and needs (51,47, 18). Kruskop (33) attempted to assess the ability of vocational agriculture teachers to evaluate themselves. He first asked a panel of the Iowa Vocational Agriculture Teachers Association to evaluate the teachers. All teachers were ranked in A, B, C and D groups. Even though there were some inconsistencies, group D tended to indicate need for a higher degree of competence. A correlation of .93 was obtained between groups A and D for mean competency needed scores,

indicating a strong tendency of the two groups of instructors to rate their needs similarly. In a somewhat similar study, Judy (29) asked extension agents to estimate their knowledge of soil science, then administered a test to determine specified knowledge. Science Specialists were also asked to estimate the soils knowledge of each agent. It was concluded that the District Director or the Soils Science Specialist were the best estimators of agents' soil science knowledge. The highest correlation of any grouping or category was obtained by comparing an average of the agent's, director's and specialist's estimates of the agent's knowledge with his test score. Of the 105 agents in the sample, 48 estimated their knowledge accurately, 19 estimated one category too high, 25 under-estimated one category, 10 over-estimated two categories and three under-estimated their knowledge in two categories. There is not a group of supervisors or specialists who work this closely with vocational agriculture teachers in Michigan.

METHODS OF THE STUDY

The collection and analysis of data for this study were preceded by the development of an interview instrument, procedures for conducting the interview, identification of teachers to be interviewed and preparation of plans for analysis of the data.

Development of the Interview Instrument

A number of other surveys were studied in detail prior to the development of the instrument used in this study. The reviewing of these studies helped to determine the competencies which are considered important for both teachers and students in the ornamental horticulture area. After the detailed instrument was developed, it was reviewed by Michigan State University faculty members in the department of Horticulture and of Agricultural Education, and by the state coordinator for vocational agriculture. From this review suggested corrections were made to the instrument and it was then tested with the assistance of a vocational agriculture teacher and horticulture graduate students. One of the recommendations which resulted from this test was that the interview was too long, therefore it was shortened.

The interview instrument (Appendix A) was divided into six sections. These sections were: General Information, Competency Areas and Skills Taught, Undergraduate Training, Formal Education, Occupational Experience and Other Perceptions. At the beginning of each interview, the overall purpose of the study and a general introduction was given. A short introduction was given prior to each new section. The entire interview was administered in person by the author to all teachers who were a part of both the random sample group and the ornamental horticulture group. Section II, Competency Areas and Skills Taught, was revised and used as the basis for interviewing the industry leaders. These leaders were asked how important they considered it to be that a teacher be qualified in each area or skill. It was stressed that they should consider vocational agriculture teachers in general and not an individual teacher.

Population and Sample Interviewed

The target population consisted of all vocational agriculture teachers in Michigan. The sampling frame for teachers consisted of two groups (Figure 1). All teachers in secondary schools offering ornamental horticulture as a specialized course of instruction made up the first group. The second group consisted of a random sample of vocational agriculture teachers in Michigan remaining after the ornamental horticulture teachers had been selected. The random

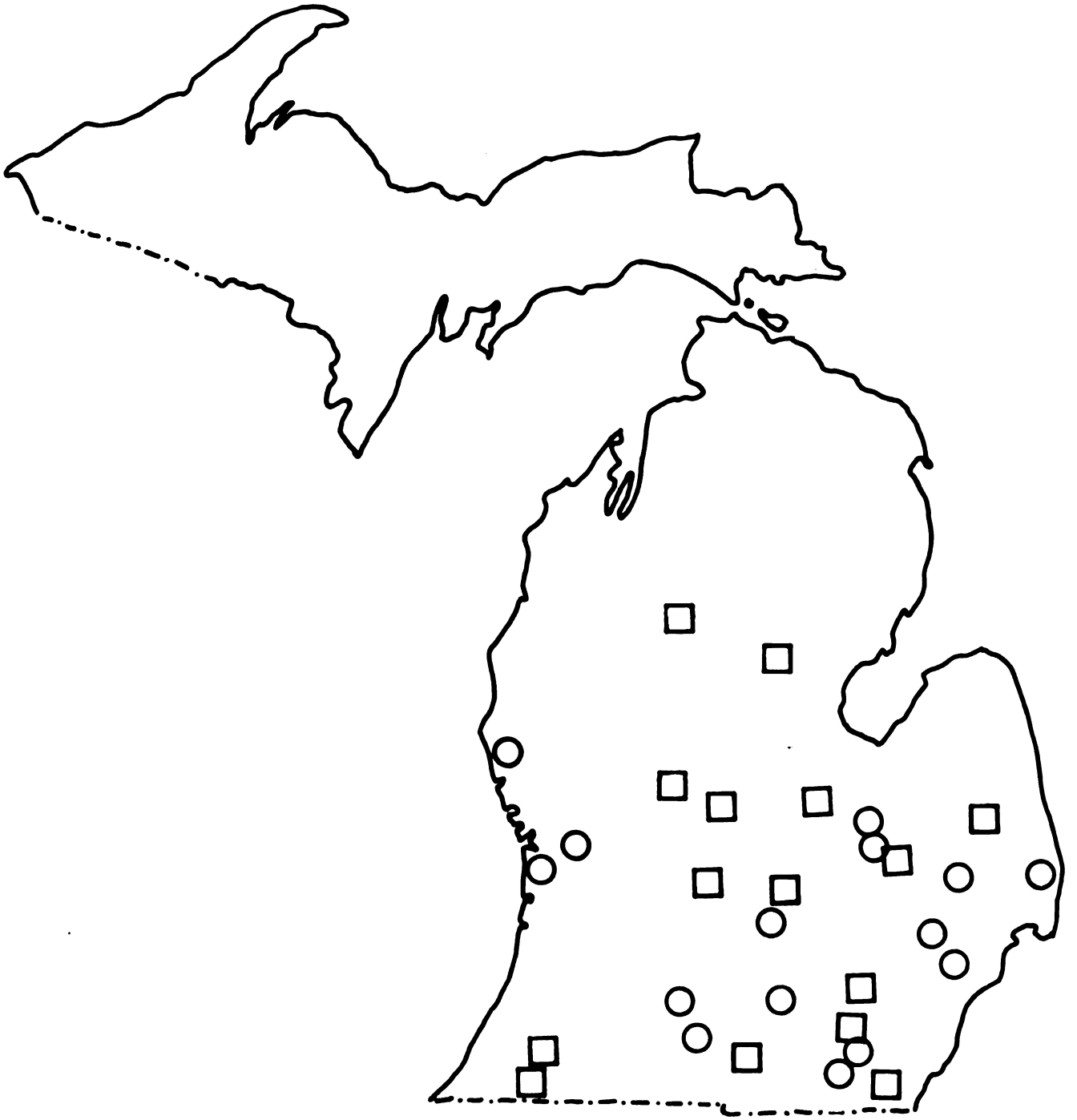

Figure 1. Location of ornamental horticulture teachers (O) and random sample teachers (□) who were interviewed.

sample was determined by numbering all teachers of vocational agriculture and then using these numbers to select participants from a table of random numbers. Vocational agriculture teachers were selected because they taught some ornamental horticulture and had some technical training in horticulture or horticulture related fields. To qualify as an ornamental horticulture teacher, one had to teach at least one class of ornamental horticulture for the entire year and have a greenhouse at the high school. These fifteen teachers were included in the sample because of their special interest in and presumed knowledge of ornamental horticulture.

Various methods were used to determine those teachers who were actually teaching ornamental horticulture. The supervisor of the Post-Secondary Unit of the Michigan Department of Education was contacted in the spring of 1971 and asked to provide a list of ornamental horticulture teachers. When his list was checked, however, it was determined that all of the teachers did not meet the desired criteria. Therefore, a revised list was developed by contacting members of the agriculture education faculty and vocational agriculture teachers in various areas of Michigan. The list was constantly updated and revised as interviews were made. Included in this group were four teachers at area skill centers. These centers offer specialized high school courses of study that might be different from the average school; however it was decided that they should be a part of the

survey since these teachers were considered high school teachers in Michigan.

Administration of the Interview to Teachers

About one week before the desired date of an interview, each teacher was contacted by telephone and asked if he would participate in the survey. During the interview, after getting acquainted and establishing a favorable rapport with the teachers, the overall purpose of the survey was explained. The general information was completed first. This gave the teacher a chance to feel somewhat more at ease by first giving information that did not require his opinion.

The second section to be completed was Competency Areas and Skills Taught. A stack of cards containing 53 competency areas or skills was handed to the teacher, and a small box was placed in front of him with notations over compartments indicating the following: Do Not Teach, Well Qualified, Qualified, Poorly Qualified and Not Qualified. It was then explained to the teacher that each card listed one competency area that might be taught at a high school. If the area was taught in his school, the teacher was asked to indicate how qualified he felt he would be to teach that area by placing the card in one of the remaining compartments. After completing the interview, the researcher recorded the responses on the instrument.

The third section was Undergraduate Training. A stack of 31 cards, each with the title of an undergraduate course in horticulture or a related field printed on it, was handed to the teacher and a box was placed in front of him. This box was marked with the following notations above the compartments: Was Not Taken, Very Important, Important, No Opinion, Not Important and Time Wasted. If he had taken the course, he was asked to indicate, by placing the card in one of the remaining compartments, how important that course was in qualifying him to teach ornamental horticulture. He was instructed to disregard name changes in courses. If he had a course that was similar to one listed, he was asked to assume that the course was the same. If there were courses he remembered taking that were not a part of the list, these were recorded under "other", along with the importance of each.

The fourth section was entitled Formal Education. It included eight questions about both the undergraduate and the graduate formal training and needs. Most of these questions could be answered with Very Helpful, Somewhat Helpful, No Opinion, Probably Not Helpful and Waste of Time. Teachers were asked to look at the questionnaire and respond after each question.

The fifth section was Occupational Experience. The first question in this section was used as a filter question. If a teacher answered that he had not had any experience working in a commercial ornamental horticulture business, the

next four questions were omitted. However, the remainder of this section was answered by all participants.

The sixth section was Other Perceptions. The first part of this section was used to determine how important the teachers' reasons were for teaching or not teaching ornamental horticulture as a specislized class. Included in this section were two open-ended questions concerning changes that the teacher was planning and those that he would like to see made. Additional or probing questions were used to encourage the teacher to talk further or explain in more detail.

After completion of the interview, each teacher was given a packet of mimeographs from the Horticulture Department and thanked for participating in the project. About one week after the interview, a letter was mailed to the teacher thanking him for his participation (Appendix B).

Administration of the Interview to Industry Participants

All of the teachers who were teaching a specialized program of ornamental horticulture were asked to give the names of one to three industry people who served as members of the department's advisory committee. Several teachers did not have an active advisory committee, therefore no industry names were recorded for their department. From the total of all departments, 17 industry leaders were suggested. From these 17, fifteen were selected as a sample group. All industry leaders who were contacted agreed to participate.

The questionnaire was then mailed to each leader with an explanation of the study and a notation saying that they would be called for answers during the next few days (Appendices C and D). Five days after the questionnaire was mailed, each person was called and asked to give his responses by the phone. He was encouraged to ask for clarification anytime a question was unclear. The telephone interviews ranged from 15 to 45 minutes.

Analysis of Data

Research specialists in the Educational Research Service, College of Education, were utilized to determine possible analysis and treatment of the data.

After all of the interviews were completed, the questions were coded and computer cards were punched. When possible the most positive response was given the highest number and the least positive response was given number one. There were primarily four types of responses: (a) yes/no questions which were coded 2 for yes and 1 for no; (b) qualification questions which were coded 4, very qualified; 3, qualified; 2, somewhat unqualified and 1, unqualified; (c) importance questions which were coded 5, very important; 4, somewhat important; 3, no opinion; 2, little importance and 1, not important; and (d) helpfulness questions which were coded 5, very helpful; 4, somewhat helpful; 3, no opinion; 2, probably not helpful and 1, waste of time.

A chi-square distribution was calculated on the first computer analysis of data. Because of the small sample size, it was concluded that this statistic would not be a valid test for the hypotheses (see statement of null hypotheses in Results and Discussion). However, it did provide an indication of disparity and unanimity, cell frequencies and cell percentages.

The statistical approach selected for the tests of the hypotheses was the multivariate analysis of variance. The computer program for the multivariate analysis of variance developed by Finn (25) yields a multivariate F ratio, and a univariate F ratio. The multivariate F ratio indicates whether the five dependent variables--teaching experience and plant growing facilities, perceived competencies to teach ornamental horticulture and related areas or skills, perceived need for additional formal education, importance of occupational experience, and reasons for teaching or not teaching ornamental horticulture as a specialized program--were simultaneously statistically significant at a given level of significance examined.

The multivariate analysis of variance program also yielded a probability level for each F ratio. An alpha level of .10 was selected for the overall test. However, the .02 level of significance was used for the multivariate analysis since the overall test was split into five sections. The level of significance varied between sections since the number

of dependent variables were not the same. In order to be significant, the probability for rejecting each of the dependent variables in the section with seven variables would need to be less than .0018. The section with 41 variables would require a probability of less than .00049 to be significant. Other sections varied according to the number of variables.

RESULTS AND DISCUSSION

General Information

A majority of teachers in both groups had received their Bachelor's and Master's degree in agricultural education (Table 1). None of the random sample teachers (n=15) had received either a Bachelor's or Master's degree in horticulture. However, a small percentage of ornamental horticulture teachers (n=15) had received a Bachelor's or Master's degree in horticulture. Some teachers in both groups had degrees in other areas for both Bachelor's and Master's degrees, but random sample teachers had the highest percentage of Bachelor's degrees in other fields. A possible explanation of the large number of ornamental horticulture teachers with agricultural education degrees is that a number of these teachers had previously taught vocational agriculture and then changed the emphasis in their instruction to ornamental horticulture. Most of the degrees other than agricultural education or horticulture that were reported were in agriculture disciplines such as animal husbandry and soil science.

Teachers in the random sample group had been teaching longer in their present position than the ornamental horticulture teachers. Random sample teachers had been in their

Table 1. Comparison of Ornamental Horticulture Teachers[1] (O.H.T.) and Random Sample Teachers[2] (R.S.T.) Bachelor's Degree Major and Master's Degree Major

		Horti-culture	Agri-cultural Education	Other Agri-culture[3]
Bachelor's Degree				
O.H.T.	n	3	9	2
	%	21	64	14
R.S.T.	n	0	9	6
	%	0	60	40
Master's Degree				
O.H.T.	n	1	6	2
	%	11	67	22
R.S.T.	n	0	7	2
	%	0	78	22

[1]n = 15

[2]n = 15

[3]Includes one major in speech

present position an average of 10.3 years, while the ornamental horticulture teachers had been in their present positions an average of only 7.4 years. The relatively new ornamental horticulture programs at some schools, especially at the area skill centers, probably accounts for this difference. However, there was very little difference in the average total years in the teaching profession. The average was 12.3 years for the ornamental horticulture group. Ornamental horticulture teachers reported a larger average number of students per class than did the random sample teachers. The number of students per class was 20.4 for the random sample group and 23.5 for the ornamental horticulture group.

As was expected, ornamental horticulture teachers had a higher average of greenhouse space (1123 square feet) than the random sample teachers (165 square feet). Similar differences appeared when ornamental horticulture teachers reported an average of 4.9 acres of nursery space while random sample teachers reported an average of only .12 acres of nursery space. An average of 42.3 square feet of classroom growing space was reported by the ornamental horticulture teachers while 23.3 square feet was reported by the random sample teachers. Many of the random sample teachers with little or no space for growing plants reported that they were seriously considering adding to or expanding their growing facilities.

Only one teacher from each group reported using a plant growth chamber. It was a small area and was reported to be

used very seldom. Only five teachers reported the use of cold frames for growing plants and none reported the use of hotbeds.

Undergraduate Training

The undergraduate preparation of the teachers, as represented by the kinds of agricultural courses taken, was quite varied. Ornamental horticulture teachers had taken the highest percentage of horticulture courses (Table 2). However, a majority of both groups had taken Basic Horticulture. A majority of random sample teachers had not taken any other horticulture course. A low percentage (27% and 33%) had taken Landscape Plants I and Principles of Plant Propagation. Only 33% of the ornamental horticulture teachers had taken Indoor Plants and Flowers.

A higher percentage of teachers had taken courses in soils science than any other area. Ninety-three percent of all teachers had taken Fundamentals of Soil Science. Soil Management was taken by about the same number in each group, however more of the ornamental horticulture teachers had taken Turfgrass Management.

A large number of teachers in both groups had taken three of the biological science courses. The largest number in both groups had taken General Biology 211 and General Biology 212. Ornamental horticulture teachers had taken more botany courses than random sample teachers. None of the random sample

teachers had taken either of the two advanced plant physiology courses.

Two of three courses in agricultural engineering had been taken by a majority of teachers in both groups. Teaching Agricultural Mechanics was taken by 100% of the random sample teachers but by only 53% of the ornamental horticulture teachers.

Random sample teachers had taken more agricultural economics than ornamental horticulture teachers. Agriculture in The Economy and Farm Management were taken by more teachers in both groups than any other courses. Land Economics was the course in agricultural economics which had been taken by the smallest number of teachers.

Teachers in both groups thought soil science, botany and horticulture courses were very important in preparing them to teach ornamental horticulture. Even though all horticulture courses were perceived as important, Basic Horticulture was rated lower than any of the others. All of the other courses were perceived as very important or somewhat important by all teachers. Soils courses were rated almost as high. Almost all of the teachers rated them in one or the other of the top two categories.

Teachers did not perceive biological science courses to be as important as courses in the other areas. Both groups of teachers felt about the same way about the courses in this area. Only 13% of the ornamental horticulture teachers and

8% of the random sample teachers thought General Biology 211 was very important in preparing them to teach ornamental horticulture. About the same percentage in each group thought that course was of little importance. This entire area is one that teachers may have felt they have not had an opportunity to use since leaving college.[1] However, they may have helped the teacher to build a competency in plant growing by providing him with a background which helped him in later courses.

Botany was also perceived as important. Elementary Plant Physiology was considered very important by 75% of the ornamental horticulture teachers and 33% of the random sample teachers. Other courses in botany were rated about the same.

There was a tendency for both groups of teachers to rate agricultural economics and agricultural engineering courses as somewhat important; however, random sample teachers tended to rate them higher.

Competency Areas and Skills Taught

Some of the 53 competency areas were taught by all of the teachers while others were taught by only a few (Table 3). Seventy-five percent of the areas were taught by all of the ornamental horticulture teachers; however, only 15% were

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[1]The biological science courses and several other courses were part of a teaching minor in Biological Science. Some teachers may have used the courses for their teaching assignments in biology, general science or other science courses.

Table 2. Comparisons of Formal Courses Taken in Horticulture and Related Fields by Ornamental Horticulture Teachers[1] (O.H.T.) and Random Sample Teachers[2] (R.S.T.) and the Importance Placed on Those Courses for Preparing Them To Teach Ornamental Horticulture

Percent			Percent[3]				
Didn't Take	Took		Very Important	Somewhat Important	No Opinion	Little Importance	Not Important
Horticulture							
Basic Horticulture							
27	73	O.H.T.	73	9	0	18	0
40	60	R.S.T.	33	44	11	11	0
Landscape Plants I							
53	47	O.H.T.	57	43	0	0	0
73	27	R.S.T.	75	25	0	0	0
Landscape Plants II							
53	47	O.H.T.	57	43	0	0	0
100	0	R.S.T.	0	0	0	0	0
Indoor Plants and Flowers							
67	33	O.H.T.	100	0	0	0	0
93	7	R.S.T.	100	0	0	0	0
Ornamental Plant Management							
60	40	O.H.T.	67	33	0	0	0
93	7	R.S.T.	100	0	0	0	0
Controlled Plant Environment							
47	53	O.H.T.	88	13	0	0	0
93	7	R.S.T.	100	0	0	0	0

continued

Table 2--Continued

Percent			Percent				
Didn't Take	Took		Very Important	Somewhat Important	No Opinion	Little Importance	Not Important
Horticulture (continued)							
Principles of Plant Propagation							
47	53	O.H.T.	63	38	0	0	0
67	33	R.S.T.	80	20	0	0	0
Nursery Management							
53	47	O.H.T.	29	71	0	0	0
93	7	R.S.T.	0	100	0	0	0
Soils							
Fundamentals of Soil Science							
7	93	O.H.T.	71	29	0	0	0
0	100	R.S.T.	73	20	7	0	0
Soil Management							
33	67	O.H.T.	70	29	0	0	0
27	73	R.S.T.	55	27	9	9	0
Turfgrass Management							
67	33	O.H.T.	60	40	0	0	0
93	7	R.S.T.	0	100	0	0	0
Soil Fertility and Fertilizers							
40	60	O.H.T.	78	22	0	0	0
47	53	R.S.T.	88	13	0	0	0

continued

Table 2--Continued

Percent			Percent				
Didn't Take	Took		Very Important	Somewhat Important	No Opinion	Little Importance	Not Important
Biological Science							
Foundations of Biological Science							
60	40	O.H.T.	17	67	0	17	0
73	27	R.S.T.	25	25	0	50	0
General Biology (211)							
47	53	O.H.T.	13	76	0	13	0
13	87	R.S.T.	8	54	15	15	8
General Biology (212)							
53	47	O.H.T.	14	71	0	14	0
13	87	R.S.T.	8	54	15	15	8
Biological Science for Teachers							
93	7	O.H.T.	100	0	0	0	0
93	7	R.S.T.	100	0	0	0	0
Botany							
Elementary Plant Physiology							
47	53	O.H.T.	75	25	0	0	0
80	20	R.S.T.	33	67	0	0	0
Plant World							
73	28	O.H.T.	75	0	0	25	0
93	7	R.S.T.	100	0	0	0	0

continued

Table 2--Continued

Percent			Percent				
Didn't Take	Took		Very Important	Somewhat Important	No Opinion	Little Importance	Not Important
Botany (continued)							
Introductory Plant Pathology							
80	20	O.H.T.	67	33	0	0	0
100	13	R.S.T.	50	50	0	0	0
Plant Physiology: Metabolism							
80	20	O.H.T.	67	33	0	0	0
100	0	R.S.T.	0	0	0	0	0
Plant Physiology: Growth							
73	27	O.H.T.	75	25	0	0	0
100	0	R.S.T.	0	0	0	0	0
Entomology							
General Entomology							
40	60	O.H.T.	44	44	0	11	0
60	40	R.S.T.	33	17	33	17	0
Agricultural Engineering							
Engineering Principles Applied to Agriculture							
20	80	O.H.T.	17	42	17	17	8
27	73	R.S.T.	36	27	27	0	9
Teaching Agricultural Mechanics							
47	53	O.H.T.	0	75	13	13	0
0	100	R.S.T.	40	40	13	0	7

continued

Table 2--Continued

Percent			Percent				
Didn't Take	Took		Very Important	Somewhat Important	No Opinion	Little Importance	Not Important
Agricultural Engineering (continued)							
Internal Combustion Engines							
60	40	O.H.T.	17	83	0	0	0
13	87	R.S.T.	46	23	23	0	8
Agricultural Economics							
Agriculture in The Economy							
40	60	O.H.T.	0	56	11	11	22
13	87	R.S.T.	38	38	8	15	0
Production Economics and Management							
60	40	O.H.T.	0	67	0	17	17
47	53	R.S.T.	25	63	0	0	13
Farm Finance and Appraisal							
80	20	O.H.T.	0	33	33	33	0
87	13	R.S.T.	50	50	0	0	0
Land Economics							
87	13	O.H.T.	0	50	0	50	0
93	7	R.S.T.	100	0	0	0	0
Agricultural Prices and Marketing							
87	13	O.H.T.	0	50	50	0	0
67	33	R.S.T.	20	80	0	0	0

continued

Table 2--Continued

Percent			Percent				
Didn't Take	Took		Very Important	Somewhat Important	No Opinion	Little Importance	Not Important
Agricultural Economics (continued)							
Farm Management							
47	53	O.H.T.	0	63	0	24	13
20	80	R.S.T.	0	63	0	24	13

[1]n = 15

[2]n = 15

[3]Based on opinions of only those teachers who reported they had taken the courses.

Table 3. Comparison of Areas or Skills Taught by Ornamental Horticulture Teachers[1] (O.H.T.) and Random Sample Teachers[2] (R.S.T.)

Area or Skill	Percent Who Taught O.H.T.	R.S.T.
1. Identifying ornamental plants by common names.	100	100
2. Identifying ornamental plants by scientific names.	73	47
3. Characteristics of more than five plant families.	93	67
4. Taking soil samples.	100	100
5. Testing soil samples.	93	87
6. Interpreting soil test results.	100	100
7. The effects of soil structure and texture on plants.	100	100
8. Sterilizing soil: With steam.	93	40
9. Sterilizing soil: With chemicals.	93	60
10. Changing soil pH: Raising the soil pH.	100	100
11. Changing soil pH: Lowering the soil pH.	100	87
12. Soil mixtures for potting.	100	80
13. Understanding the use of mulches.	100	93
14. The use of trace elements.	100	93
15. Planning the proper use of growth regulators.	100	80
16. Understanding how plant nutrients become available in the soil.	100	100
17. Making fertilizer recommendations for specific plants.	100	93
18. Mixing fertilizers for a specific ratio.	100	80
19. Identifying nutrient deficiencies in plants.	100	100
20. Proper handling of agricultural chemicals.	100	100
21. Insects affecting ornamental plants: Identification of at least ten insects.	100	80
22. Insects affecting ornamental plants: Making recommendations for control.	100	93

continued

Table 3--Continued

Area or Skill	Percent Who Taught O.H.T.	R.S.T.
23. Diseases affecting ornamental plants: Identification of at least five diseases.	100	77
24. Diseases affecting ornamental plants: Making recommendations for control.	100	77
25. Controlling the greenhouse environment: Regulation of light.	100	67
26. Controlling the greenhouse environment: Regulation of moisture.	100	67
27. Controlling the greenhouse environment: Regulation of temperature.	100	67
28. Understanding the cultural requirements of ornamental plants: Greenhouse crops.	100	67
29. Understanding the cultural requirements of ornamental plants: Nursery crops.	100	80
30. Understanding the cultural requirements of ornamental plants: Plants in landscape plantings.	100	93
31. Growing annual bedding plants: Sowing the seed.	100	93
32. Growing annual bedding plants: Transplanting seedlings.	100	87
33. Growing annual bedding plants: Growing the plants.	100	87
34. Cut flowers: Cutting the stems.	100	60
35. Cut flowers: Care of the flowers after harvest.	100	60
36. Flower arranging: A knowledge of basic principles of design.	93	53
37. Flower arranging: Arranging the flowers.	93	53
38. Flower arranging: Pricing.	87	53
39. Propagating plants by: Grafting.	100	80
40. Propagating plants by: Cuttings.	100	80

continued

Table 3--Continued

Area or Skill	Percent Who Taught O.H.T.	R.S.T.
41. Propagating plants by: Budding.	93	80
42. Propagating plants by: Layering.	100	73
43. Pruning ornamental plants.	100	87
44. Balling and burlapping ornamental plants.	100	87
45. Performing annual maintenance of lawns and landscapes.	100	93
46. Advising customers concerning: Desirable varieties.	100	80
47. Advising customers concerning: Costs of plants.	93	73
48. Advising customers concerning: Proper planting procedure.	100	87
49. Advising customers concerning: Care after planting.	100	87
50. Estimating the costs of caring for mechanical landscaping equipment.	87	60
51. Caring for mechanical landscaping equipment: Repairing.	100	80
52. Caring for mechanical landscaping equipment: Maintaining.	100	80
53. Caring for mechanical landscaping equipment: Adjusting.	100	80

[1]n = 15

[2]n = 15

taught by all of the random sample teachers, most of which were in the soil science area.

The following eight competency areas were reported as being taught by teachers in both groups:

Identifying ornamental plants by common names.

Taking soil samples.

Interpreting soil test results.

Effect of soil structure and texture on plants.

Changing soil pH: Raising the soil pH.

Understanding how plant nutrients become available in the soil.

Identifying nutrient deficiencies in plants.

Proper handling of agricultural chemicals.

It can be noted that six of these areas are related to the soils science area. The reason for a unanimous response on these items could be due to the fact that many of these areas would be taught by a vocational agriculture teacher at any school. It is evident that the entire soils area is closely connected to the growing of all plants.

Even though nearly three-fourths of the ornamental horticulture teachers taught the identification of ornamental plants by scientific names, the area was not taught by as many of the teachers as were the other horticulture areas. A majority of random sample teachers did not teach this area. Data in Table 3 indicate that a higher percentage of both groups of teachers taught characteristics of more than five

plant families, even though fewer of the random sample teachers taught it.

The highest percentage of "Didn't Teach" answers by random sample teachers occurred on the following items:

Cut flowers: Cutting the stems.

Cut flowers: Care of the flowers after harvest.

Flower arranging: A knowledge of basic principles of design.

Flower arranging: Arranging the flowers.

Flower arranging: Pricing.

Estimating the costs of caring for mechanical landscaping equipment.

Other areas where above 30% of the random sample teachers answered in the "Didn't Teach" column included those concerning controlling the greenhouse environment and understanding the cultural requirements of greenhouse crops. Even though random sample teachers did not teach all of the areas, it is evident that they taught a wide range of the competency areas in ornamental horticulture.

Ornamental horticulture teachers felt somewhat more qualified to teach the identification of ornamental plants than did random sample teachers. However, both groups felt more qualified to teach identification by common than by scientific names. All of the industry representatives except one, thought it was more important for a teacher to be qualified to teach the identification of ornamental plants by common names than by scientific names. Table 4 shows eight areas or skills that tend to show disagreement between the

Table 4. Comparison of Ornamental Horticulture Teachers[1] (O.H.T.) and Random Sample Teachers[2] (R.S.T.) Perception of Their Qualification to Teach Selected Areas or Skills, and the Importance Industry Representatives[3] Placed on Being Qualified to Teach Those Areas or Skills

		Percent			
		Very Qualified/ Important	Qualified/ Important	Somewhat Unqualified/ Unimportant	Unqualified/ Unimportant
Identifying ornamental plants by common names.	O.H.T.	67	33	0	0
	R.S.T.	13	67	20	0
	I.R.	93	7	0	0
Identifying ornamental plants by scientific names.	O.H.T.	3	27	13	27
	R.S.T.	7	20	13	60
	I.R.	13	47	33	7
Diseases affecting ornamental plants: Identification of at least five diseases.	O.H.T.	40	33	27	0
	R.S.T.	0	33	27	40
	I.R.	87	13	0	0
Controlling the greenhouse environment: Regulation of light.	O.H.T.	53	40	7	0
	R.S.T.	7	20	27	47
	I.R.	80	13	7	0
Understanding the cultural requirements of ornamental plants: Greenhouse crops.	O.H.T.	40	53	7	0
	R.S.T.	0	40	13	47
	I.R.	73	13	13	0
Cut flowers: Care of cut flowers after harvest.	O.H.T.	40	27	33	0
	R.S.T.	0	7	47	47
	I.R.	40	53	7	0
Flower arranging: A knowledge of basic principles of design.	O.H.T.	20	27	33	20
	R.S.T.	0	7	20	73
	I.R.	33	47	20	0

[1]n = 15; [2]n = 15; [3]n = 15

three groups. Appendix E, Table 1 includes a complete listing of responses to the 53 items in this section.

Both tables presented in this section include responses from the industry representatives about the importance that they place on a teacher being qualified to teach that area or skill. The reader is also reminded that the "unqualified" category includes those teachers who said that they did not teach an area of skill.

Ornamental horticulture teachers thought that their best students would know how to identify more ornamental plants than did the random sample teachers. Table 5 reveals that both groups taught fewer scientific names than common names. All teachers taught some identification of ornamental plants by common name but several in each group did not teach any scientific names.

Table 5. Comparison of the Average Number of Common and Scientific Names Students Should Know After High School Graduation According to Teacher Groups

	Average Number of Common Names	Average Number of Scientific Names
Ornamental Horticulture Teachers	101	63
Random Sample Teachers	26	4
Total	64	34

Industry representatives thought it was very important that teachers be qualified to teach the identification of at least five diseases, however neither teacher group felt highly qualified in that area. More than half of the ornamental horticulture teachers felt very qualified to teach the regulation of light as part of controlling the greenhouse environment. However, random sample teachers tended to feel unqualified to teach this area and many did not have a greenhouse at their school. However, industry representatives thought it was important that a teacher be qualified to teach this area. Only two representatives did not respond to one of the top two categories.

More of the ornamental horticulture teachers thought they were qualified than did random sample teachers to teach the care of cut flowers after harvest. Industry representatives did not feel that this area was as important as some of the other areas. All three groups responded much the same way to a knowledge of basic principles of flower arranging as they did to the care of cut flowers after harvest. More of the ornamental horticulture teachers tended to feel qualified to teach these areas than did random sample teachers, however, both groups rated this area low. Industry representatives also rated this area lower than many of the others.

There were some areas where all three groups tended to show agreement. Table 6 is used to show four of these areas. Random sample teachers felt more qualified to teach the

Table 6. Comparison of Ornamental Horticulture Teachers[1] (O.H.T.) and Random Sample Teachers[2] (R.S.T.) Perception of Their Qualification to Teach Selected Areas of Skills, and the Importance Industry Representatives[3] Placed on Being Qualified to Teach Those Areas or Skills

		Percent			
		Very Qualified/ Important	Qualified/ Important	Somewhat Unqualified/ Unimportant	Unqualified/ Unimportant
Interpreting soil test results.	O.H.T.	40	60	0	0
	R.S.T.	60	33	7	0
	I.R.	67	27	7	0
Changing soil pH: Raising the soil pH.	O.H.T.	73	27	0	0
	R.S.T.	53	47	0	0
	I.R.	90	20	20	0
The use of trace elements.	O.H.T.	13	53	33	0
	R.S.T.	20	53	20	7
	I.R.	13	60	27	0
Mixing fertilizers for a specific ratio.	O.H.T.	27	53	13	7
	R.S.T.	40	33	7	20
	I.R.	20	33	33	13

[1]n = 15

[2]n = 15

[3]n = 15

interpretation of soil test results than techniques for raising the soil pH.

There was very little difference between the three groups in their response to teaching the use of trace elements. Most of the teachers felt qualified to teach that area. About the same percentage of industry representatives responded to the importance of teaching the use of trace elements. Teachers in the ornamental horticulture group felt more qualified to teach mixing fertilizers for a specific ratio than felt they were qualified to teach the use of trace elements.

Formal Education Needed

Both ornamental horticulture teachers and random sample teachers thought more formal courses would help them be better teachers of ornamental horticulture (Table 7). Courses in woody ornamentals and turfgrass management were perceived as being more helpful than any of the others included in the interview. Ninety-three percent of the random sample teachers felt more training in turfgrass management would be very helpful. Both floriculture and soil science courses were perceived as areas where training would be very helpful. A higher percentage of random sample teachers than ornamental horticulture teachers felt a need for additional training in this area. Both groups rated the need for soil science training about the same.

More random sample teachers perceived that additional training in botany would be helpful than ornamental

Table 7. Comparison of Ornamental Horticulture Teachers[1] (O.H.T.) and Random Sample Teachers[2] (R.S.T.) Perceived Need for Additional Formal Training in Selected Areas

Area		Percent				
		Very Helpful	Somewhat Helpful	No Opinion	Probably Not Helpful	Waste of Time
Floriculture:	O.H.T.	53	27	0	13	7
	R.S.T.	73	20	0	0	7
Woody Ornamentals:	O.H.T.	73	12	0	7	7
	R.S.T.	80	20	0	0	0
Botany:	O.H.T.	13	47	7	20	13
	R.S.T.	13	60	13	13	0
Plant Physiology:	O.H.T.	13	53	0	20	13
	R.S.T.	7	80	13	0	0
Turfgrass Management:	O.H.T.	60	27	0	7	7
	R.S.T.	93	7	0	0	0
Entomology:	O.H.T.	40	53	7	0	0
	R.S.T.	20	67	13	0	0
Pathology:	O.H.T.	40	53	0	0	7
	R.S.T.	20	60	20	0	0
Soil Science:	O.H.T.	47	27	0	20	7
	R.S.T.	60	20	0	13	7

[1]n = 15

[2]n = 15

horticulture teachers. However, only a slight majority in both groups responded to the top two categories. A majority of teachers in both groups thought additional training in plant physiology, entomology and plant pathology would be somewhat helpful. There were differences in their responses, however. Eighty percent of the random sample teachers and 53% of the ornamental horticulture teachers thought more training in plant physiology would be somewhat helpful. A higher percentage of random sample teachers rated additional training in both entomology and plant pathology as somewhat helpful. A reversal occurred in the very helpful category on those two items.

A majority of both groups of teachers thought cultural requirements of greenhouse crops and controlling the greenhouse environment would be very helpful floriculture courses in their teaching program (Table 8). Ornamental horticulture teachers responses were slightly higher for cultural requirements of greenhouse crops but random sample teachers responded higher for controlling the greenhouse environment. More random sample teachers also thought a course in indoor plant culture would be helpful than ornamental horticulture teachers. However, both groups thought it would be helpful. Even though teachers thought more training in flower arranging would be helpful, a larger number rated it in the lower two categories of importance than either of the other floriculture areas. This is one of the areas teachers did not feel as highly

Table 8. Comparison of Ornamental Horticulture Teachers[1] (O.H.T.) and Random Sample Teachers[2] (R.S.T.) Perceived Need for Additional Formal Training in Floriculture

Area		Percent				
		Very Helpful	Somewhat Helpful	No Opinion	Probably Not Helpful	Waste of Time
Cultural Requirements of Greenhouse Crops:	O.H.T.	73	7	0	13	7
	R.S.T.	67	20	0	7	7
Controlling the Greenhouse Environment:	O.H.T.	60	20	0	13	7
	R.S.T.	73	13	0	7	7
Flower Arranging:	O.H.T.	60	7	0	20	13
	R.S.T.	40	33	7	0	20
Indoor Plant Culture:	O.H.T.	47	27	0	20	7
	R.S.T.	73	20	0	0	7

[1]n = 15

[2]n = 15

qualified in as some of the others (see Competency Areas and Skills Taught). Therefore, they must feel that this area is not as important to their teaching program as some of the others.

More than 50% of the teachers in both groups thought additional training in identification and characteristics of plants, nursery management and landscape design would be very helpful (Table 9). Eighty percent of the random sample teachers and 67% of the ornamental horticulture teachers thought more training in landscape design would be very helpful.

More random sample teachers rated additional training in identification and characteristics of ornamental plants, and landscape maintenance as helpful than ornamental horticulture teachers. A large majority of random sample teachers thought training in landscape maintenance would be very helpful but 47% of the ornamental horticulture teachers rated it in the top category. Teachers in both groups rated training in garden center management slightly lower than the other areas in woody ornamentals. Forty percent of the teachers in both groups thought garden center management training would be very helpful and 40% thought it would be somewhat helpful.

There was a strong tendency for teachers to prefer a major in horticulture with a teaching certificate as the ideal formal education background for a teacher of ornamental horticulture in high school. Seventy-three percent of the

Table 9. Comparison of Ornamental Horticulture[1] (O.H.T.) and Random Sample Teachers[2] (R.S.T.) Perceived Need for Additional Formal Training in Woody Ornamentals

Area		Percent				
		Very Helpful	Somewhat Helpful	No Opinion	Probably Not Helpful	Waste of Time
Identification and Characteristics of Plants:	O.H.T.	53	20	0	13	13
	R.S.T.	73	27	0	0	0
Nursery Management, Including Plant Propagation:	O.H.T.	60	20	0	7	13
	R.S.T.	60	40	0	0	0
Landscape Maintenance:	O.H.T.	47	33	0	7	13
	R.S.T.	73	27	0	0	0
Landscape Design:	O.H.T.	67	20	0	7	7
	R.S.T.	80	20	0	0	0
Garden Center Management--Sales:	O.H.T.	40	40	0	13	7
	R.S.T.	40	40	0	20	0

[1]n = 15

[2]n = 15

ornamental horticulture teachers and 87% of the random sample teachers thought a major in horticulture with a teaching certificate would be ideal. Only 7% from each group thought a major in agricultural education would be the ideal background. None of the ornamental horticulture teachers and 7% of the random sample teachers thought a major in horticulture with no teaching certificate would be ideal. Seven percent of the ornamental horticulture teachers thought some other degree would be ideal and 13% thought the area the degree is in would make no difference.

Most of the random sample teachers would not recommend their kind and amount of formal education for other teachers before they begin teaching ornamental horticulture. However, slightly more than one-half of the ornamental horticulture teachers would recommend their training. Fifty-three percent said they would recommend their training to other teachers whereas 47% said they would not. Only 13% of the random sample teachers would recommend their training.

Teachers in both groups placed a great deal of importance on in-service training meetings, physical facilities, interested students, instructional materials and formal courses for improving their overall ornamental horticulture teaching program (Appendix E, Table 2). They placed less importance on formal courses than any of the others. Even though a majority of the random sample teachers thought more formal courses was very important, only 40% of the ornamental horticulture teachers thought it was very important and 20%

thought it was not important.

Teachers generally thought courses in animal husbandry, dairy science and poultry science had been of little help to them in teaching ornamental horticulture (Appendix E, Table 3). However, courses in crop science, agricultural economics, forestry, fisheries and wildlife, and agricultural engineering were thought to be helpful. They tended to rate animal husbandry, dairy science and poultry science as probably not helpful but somewhat helpful was the most frequently reported category for the other courses.

Occupational Experience

Eighty percent of the random sample teachers and 47% of the ornamental horticulture teachers did not have work experience in a commercial ornamental horticulture business before teaching. However, all of those who had work experience thought it had been very helpful to them in their teaching program. The ornamental horticulture teachers work experience was varied, but all random sample teachers with occupational experience had worked in greenhouse firms. Twenty-five percent of the ornamental horticulture teachers had worked with greenhouses, 38% with nurseries, 25% with landscape construction and maintenance firms and 13% with garden centers.

A majority of the teachers in both groups thought work experience in a greenhouse, nursery or garden center would be very helpful for a person preparing to teach ornamental

horticulture (Table 10). They rated nursery experience the most preferred of any in the group. About one-half of the teachers in each group said work experience in a florist shop would be somewhat helpful. However, 20% of the ornamental horticulture teachers and 13% of the random sample teachers thought it would be probably not helpful. Random sample teachers thought work experience in farming would be more helpful than did ornamental horticulture teachers. Twenty percent of the ornamental horticulture teachers said it would be time wasted. None of the random sample teachers thought it would be time wasted.

More of the ornamental horticulture teachers than random sample teachers felt that work experience in an ornamental horticulture business should be required before a person begins teaching ornamental horticulture. All of the ornamental horticulture teachers said work experience should be required and 80% of the random sample teachers agreed.

Teacher's perception of the length work experience should be, varied according to groups (Table 11). Random sample teachers tended to think work experience should be less than 6 months, however ornamental horticulture teachers thought more than 6 months should be required. This is possibly a reflection on the fact that a higher percentage of ornamental horticulture teachers had work experience before teaching than random sample teachers.

Table 10. Comparison of the Importance Ornamental Horticulture Teachers[1] (O.H.T.) and Random Sample Teachers[2] (R.S.T.) Placed on Work Experience in Selected Businesses for a Person Preparing to Teach Ornamental Horticulture

Area of Experience		Percent				
		Very Helpful	Somewhat Helpful	No Opinion	Probably Not Helpful	Time Wasted
Greenhouse:	O.H.T.	87	13	0	0	0
	R.S.T.	80	20	0	0	0
Florist Shop:	O.H.T.	33	47	0	20	0
	R.S.T.	27	47	7	13	7
Nursery:	O.H.T.	93	7	0	0	0
	R.S.T.	93	7	0	0	0
Garden Center:	O.H.T.	80	7	0	13	0
	R.S.T.	73	27	0	0	0
Farming:	O.H.T.	7	53	7	20	13
	R.S.T.	7	87	0	7	0

[1]n = 15

[2]n = 15

Table 11. Comparison of Ornamental Horticulture Teachers (O.H.T.) and Random Sample Teachers (R.S.T.) Perception of How Long Work Experience Should Be Before Teaching Ornamental Horticulture

		Percent		
		Less than 6 months	Sixth months to 1 year	More than 1 year
O.H.T.	(n=15)	13	47	40
R.S.T.	(n=15)	60	27	13

Other Perceptions

There was lack of agreement among random sample teachers concerning the importance of reasons why they did not teach ornamental horticulture as a specialized program (Table 13). They placed the most importance on lack of facilities and insufficient college training. Even though a majority did not think the job market was too limited, 33% thought it was important. Generally, they did not think ornamental horticulture should be the responsibility of the area skill centers or that local industry representatives were encouraging them not to teach ornamental horticulture. The subject was of interest to them.

Ornamental horticulture teachers felt differently about why they taught ornamental horticulture on several items than random sample teachers (Table 12). Student interest, job availability, interesting subject and encouragement by local policies were the items a high proportion of the ornamental

Table 12. The Importance Ornamental Horticulture Teachers Placed on Possible Reasons Why They Taught Ornamental Horticulture as a Specialized Program

Reasons for Teaching	Percent				
	5[1]	4	3	2	1
College training in this area.	47	13	0	13	27
Students are interested.	53	40	0	7	0
Jobs are available.	53	40	0	7	0
General agriculture not as important as knowledge in a specific area.	20	40	13	20	7
Subject is interesting to you.	93	7	0	0	0
Local school policies encourage me to teach it.	67	0	0	20	27
Facilities were here and should be used.	53	0	0	20	27
Local industry representatives encourage you to teach it.	33	27	0	7	33

[1]5=very important; 4=important; 3=no opinion; 2=little importance; 1=not important.

Table 13. The Importance Random Sample Teachers Placed on Possible Reasons for Not Teaching Ornamental Horticulture as a Specialized Program

Reasons for Not Teaching	Percent				
	5[1]	4	3	2	1
College training of teachers is insufficient.	40	27	0	20	13
Students not interested.	13	33	0	33	20
Job market too linited.	0	33	7	27	33
General horticulture should be responsibility of area skill centers.	7	20	33	0	40
Ornamental horticulture should be responsibility of area skill centers.	0	7	27	0	67
Subject is not of interest to you.	20	0	0	13	67
Local school policies do not permit.	13	7	7	7	67
Facilities are not available.	53	20	0	20	7
Local industry representatives encourage you not to teach it.	13	7	7	0	73

[1]5= very important; 4=important; 3=no opinion, 2=little importance, 1=not important.

horticulture teachers thought were most important as reasons why they were teaching ornamental horticulture. Even though almost one-half thought their college training was very important, 40% apparently felt their college training was not an important reason. A surprisingly large number did not place high importance on industry encouragement. Apparently industry representatives were not viewed by the teachers as positive factors in the development of ornamental horticulture programs.

While 27% of the ornamental horticulture teachers described last year's overall ornamental horticulture teaching program as "excellent", none of the random sample teachers thought their ornamental horticulture program was "excellent". In addition, the "good" category was also reported by 54% of the ornamental teachers and by 23% of the random sample teachers. However, 54% of the random sample teachers rated their program fair and 23% rated it poor. Eighteen percent of the ornamental horticulture teachers rated their program fair, but none rated it poor.

Ornamental horticulture teachers thought Michigan State University Horticulture Department faculty members and state vocational education administrators had been the most helpful in developing an ornamental horticulture curriculum (Table 14). They rated the county agricultural agent and local school administrators as the least helpful resourse persons. Many of the teachers felt that they had developed their programs

Table 14. Ornamental Horticulture Teachers' Perception of The Helpfulness of Specified Resource Persons in Developing an Ornamental Horticulture Curriculum.

	Percent				
Resource Persons	5[1]	4	3	2	1
Other vocational agriculture teachers.	33	27	7	13	20
Industry Representatives.	27	40	0	20	13
Local School Administrators.	13	47	7	20	13
State Vocational Administrators.	33	40	7	0	20
Michigan State University Horticulture Department Faculty Members.	47	40	0	0	13
Local Advisory Group.	27	33	0	20	20
County Agricultural Agent.	27	13	7	33	20

[1]5=very helpful; 4=somewhat helpful; 3=no opinion; 2=probably not helpful; 1=time wasted.

with very little specific help from any group of persons. They often mentioned that other vocational agriculture teachers are becoming a better source of information and ideas since more programs are in operation.

Random sample teachers planned to make more changes in their teaching program than did ornamental horticulture teachers. Most random sample teachers planned to teach more ornamental horticulture next year. The changes they indicated were often of a more extensive nature than the changes indicated by ornamental horticulture teachers.

Teachers in both groups generally thought they were getting treated fairly in terms of students, facilities and instructional materials. They felt that student interest was high and would continue that way; however, they felt that better vocational guidance and screening would strengthen their program. Ornamental horticulture teachers indicated a need for better screening techniques more often than did random sample teachers. Several random sample teachers said that they had too many students to do a good job. Only one teacher expressed real concern that his good students were going to the area skills center.

Almost every teacher in both groups said they needed more and better facilities. They did, however, feel that they would get better facilities as they showed the need.

All teachers indicated that good instructional materials were important to their ornamental horticulture program. Random sample teachers often mentioned that Michigan should have teaching materials available such as Ohio and other states. There was much agreement that materials were available if they would take the initiative to get them. Teachers reported the use of pamphlets, booklets, reprints and other periodicals as their primary source of instructional materials. They said they bought books for reference purposes rather than buying a copy for each student.

Tests of Hypotheses

The hypotheses were tested using the multivariate analysis of variance method outlined in Chapter III. For purposes of the test, an overall alpha level of .10 was partitioned among five categories of questions and each was analyzed separately. The partitioning determined the probability level required to assume the significance of .10.

Ho:1 There is no difference in the space available for growing ornamental plants between ornamental horticulture teachers and random sample teachers. Ho:1 is rejected.

There was an observed significant difference between the ornamental horticulture teachers and random sample teachers according to the availability of space for growing ornamental plants. Having rejected the multivariate null hypothesis, using an alpha level of .017, subsequent univariate analysis of variance were conducted to determine on which specific items the groups differed. Appendix E, Table 4 is used to show the mean scores for each group and Table 15 is the multivariate and univariate analysis of variance table.

A large difference in the number of years teaching ornamental horticulture as a specialized program was expected since teachers were selected for the two groups using that variable. There was a highly significant difference between the two groups in the amount of greenhouse space available. Even though not as large, a difference was also evident in the amount of nursery space available. Other variables listed in this section did not show highly significant differences.

Table 15. Multivariate Analysis of Variance (25) for Teacher Groups Using the Dependent Variables of Teaching Experience, Student/Teacher Ratio and Space Available for Growing Plants

df = 7 and 22	F=7.3537	Probability less than 0.0002	
Variable	Between M.S.	Univariate F	Probability less than
1. Years in present position	64.53	0.93	0.343
2. Total years in the teaching profession	6.53	0.07	0.795
3. Years teaching ornamental horticulture as a specialized program	120.00	30.55	0.0001
4. Average student/teacher ratio[1]	71.46	1.11	0.302
5. Square feet of greenhouse space	6875568.13	14.85	0.0007
6. Acres of nursery space	172.18	4.26	0.049
7. Square feet of classroom space used for growing plants	2707.50	0.40	0.531

[1]The total number of students taught by the teacher divided by the number of classes taught by that teacher.

Ho:2 There is no difference in the average of both teacher groups perceptions of their adequacy to teach selected ornamental horticulture and related areas, and selected industry representatives perceptions of how important they considered it that a teacher be qualified to teach those areas. Ho:2 was not rejected.

Since no overall significant difference was observed at an alpha level of .02, subsequent analyses cannot be taken as tests of hypotheses. However, a univariate analysis of variance was conducted in order to rank the questions according to the degree of differentiation between the groups. Appendix E, Table 5 is used to show the mean scores of both groups tested and Table 16 is used to show the results of the multivariate and univariate analysis of variance tests.

The following questions represent the quartile accounting for the greatest differences:

1. Identifying ornamental plants by common names.
2. Proper handling of agricultural chemicals.
3. Insects affecting ornamental plants: Identification of at least ten insects.
4. Insects affecting ornamental plants: Making recommendations for control.
5. Diseases affecting ornamental plants: Identification of at least ten diseases.
6. Controlling the greenhouse environment: Regulation of light.
7. Understanding the cultural requirements of ornamental plants: Greenhouse crops.
8. Cut flowers: Care of the flowers after harvest.
9. Flower arranging: A knowledge of basic principles of design.

Table 16. Multivariate Analysis of Variance (25) for the Average Perceived Competencies of the Teacher Groups and Perceived Importance of Qualification Industry Representatives Placed on the Dependent Variables of Selected Areas or Skills

df=41 and 2	F=3.7653	Probability less than 0.232	
Variable	Between M.S.	Univariate F	Probability less than
1. Identifying ornamental plants by common names	4.01	18.31	0.0002
2. Identifying ornamental plants by scientific names	2.18	2.01	0.164
3. Characteristics of more than 5 plant families	0.71	0.81	0.375
4. Testing soil samples	1.60	1.72	0.197
5. Interpreting soil test results	0.18	0.50	0.484
6. The effects of soil structure and texture on plants	1.11	3.47	0.069
7. Sterilizing soil: With steam	2.50	2.50	0.121
8. Sterilizing soil: With chemicals	3.21	3.07	0.087
9. Changing soil pH: Raising the soil pH	0.54	1.41	0.243
10. Changing soil pH: Lowering the soil pH	0.28	0.39	0.532
11. Soil mixtures for potting	0.90	1.20	0.280
12. Understanding the use of mulches	0.54	0.74	0.396
13. The use of trace elements	0.01	0.02	0.885
14. Planning the proper use of growth regulators	3.21	3.92	0.054
15. Understanding how plant nutrients become available in the soil	0.90	2.78	0.103

continued

Table 16--Continued

df=41 and 2	F=3.7653		Probability less than 0.232
Variable	Between M.S.	Univariate F	Probability less than
16. Making fertilizer recommendations for specific plants	3.21	8.57	0.005
17. Mixing fertilizers for a specific ratio	1.34	1.33	0.256
18. Identifying nutrient deficiencies in plants	3.21	8.43	0.006
19. Proper handling of agricultural chemicals	3.21	14.05	0.0006
20. Insects affecting ornamental plants: Identification of at least ten insects	10.00	19.09	0.0001
21. Insects affecting ornamental plants: Making recommendations for control	6.94	16.20	0.0003
22. Diseases affecting ornamental plants: Identification of at least five diseases	17.78	33.33	0.0001
23. Controlling the greenhouse environment: Regulation of light	11.38	19.58	0.0001
24. Understanding the cultural requirements of ornamental plants: Greenhouse crops	9.34	15.17	0.0004
25. Understanding the cultural requirements of ornamental plants: Nursery crops	8.10	12.51	0.0011
26. Understanding the cultural requirements of ornamental plants: Plants in landscape plantings	4.01	8.09	0.0069
27. Growing annual bedding plants: Transplanting seedlings	1.11	1.89	0.176

continued

Table 16--Continued

df=41 and 2	F=2.7653		Probability less than 0.232
Variable	Between M.S.	Univariate F	Probability less than
28. Cut flowers: Care of the flowers after harvest	10.00	19.21	0.0001
29. Flower arranging: A knowledge of basic principles of design	15.21	22.18	0.0001
30. Flower arranging: Pricing	22.50	37.70	0.0001
31. Propagating plants by: Grafting	1.60	2.14	0.151
32. Propagating plants by: Budding	5.88	7.15	0.011
33. Propagating plants by: Layering	1.88	2.33	0.135
34. Pruning ornamental plants	3.21	5.08	0.029
35. Balling and burlapping ornamental plants	0.90	1.17	0.285
36. Advising customers concerning: desirable varieties	0.04	0.08	0.774
37. Advising customers concerning: Costs of plants	6.40	9.33	0.004
38. Advising customers concerning: Care after planting	1.60	2.51	0.121
39. Estimating the costs of caring for the mechanical landscaping equipment	12.84	16.38	0.0003
40. Caring for mechanical landscaping equipment: Repairing	2.50	3.98	0.053
41. Caring for mechanical landscaping equipment: Maintaining	0.40	0.64	0.428

10. Flower arranging: Pricing.
11. Estimating the costs of caring for the mechanical landscaping equipment.

Items in this group tend to be related to the technical side of ornamental horticulture. Industry representatives felt that teachers should be well qualified in these areas, however teachers did not feel that highly qualified.

There were some items in which there was little difference in the importance that industry representatives placed on being qualified in that area, and the qualification that the teachers felt for teaching the area. The following questions represent the quartile accounting for the smallest significant differences between the groups:

1. Characteristics of more than 5 plant families.
2. Interpreting soil test results.
3. Changing soil pH: Raising the soil pH.
4. Changing soil pH: Lowering the soil pH.
5. Soil mixtures for potting.
6. Understanding the use of mulches.
7. The use of trace elements.
8. Mixing fertilizers for a specific ratio.
9. Balling and burlapping ornamental plants.
10. Advising customers concerning: Desirable varieties.
11. Caring for mechanical landscaping equipment: Maintaining.

These areas or skills are predominantly in the soils science area. Out of the eleven, only four are in other areas.

Possibly the earlier section on undergraduate training gives clues for the closeness of responses on soils science areas. Teachers in both groups tended to have taken more than one of the courses listed and they thought the courses were important for qualifying them to teach ornamental horticulture. Also, the soils science knowledge can be utilized in many areas of general agriculture and not just in ornamental horticulture. Industry representatives did not think being qualified to teach the characteristics of more than 5 plant families was highly important and teachers did not feel highly qualified in that area. The other areas where all three groups tended to agree were in the ornamental horticulture area or in one that is closely related.

Ho:3 There is no difference between ornamental horticulture teachers and random sample teachers perceptions of their adequacy to teach selected ornamental horticulture and related areas. Ho:3 is not rejected.

Even though subsequent analyses cannot be taken as tests of hypotheses, a univariate analysis of variance was conducted in order to rank the questions according to the degree of differentiation between the groups. Appendix E, Table 6 is used to show the mean scores of both groups tested. Table 17 is used to show the results of the multivariate and univariate analysis of variance tests.

The following areas represent the quartile accounting for the greatest differences between the groups:

Table 17. Multivariate Analysis of Variance (25) for Teacher Groups Using the Dependent Variables of Perceived Competencies to Teach Selected Areas or Skills

df=41 and 2	F=1.8812	Probability less than 0.4084	
Variable	Between M.S.	Univariate F	Probability less than
1. Identifying ornamental plants by common names	4.03	18.41	0.0002
2. Identifying ornamental plants by scientific names	6.53	6.02	0.018
3. Characteristics of more than 5 plant families	8.53	0.67	0.003
4. Testing soil samples	0.53	0.57	0.453
5. Interpreting soil test results	0.13	0.38	0.5436
6. The effects of soil structure and texture on plants	0.53	1.66	0.204
7. Sterilizing soil: With steam	14.70	14.70	0.0005
8. Sterilizing soil: With chemicals	7.50	7.18	0.010
9. Changing soil pH: Raising the soil pH	0.30	0.77	0.384
10. Changing soil pH: Lowering the soil pH	1.63	2.34	0.134
11. Soil mixtures for potting	20.83	27.81	0.0001
12. Understanding the use of mulches	4.03	5.45	0.024
13. The use of trace elements	0.03	0.06	0.802
14. Planning the proper use of growth regulators	5.63	6.88	0.012
15. Understanding how plant nutrients become available in the soil	0.30	0.93	0.341
16. Making fertilizer recommendations for specific plants	0.30	0.80	0.376
17. Mixing fertilizers for a specific ratio	0.03	0.03	0.857

continued

Table 17--Continued

df=41 and 2 F=1.8812	Probability less than 0.4084		
Variable	Between M.S.	Univariate F	Probability less than
18. Identifying nutrient deficiencies in plants	0.03	0.08	0.769
19. Proper handling of agricultural chemicals	0.30	1.31	0.259
20. Insects affecting ornamental plants: Identification of at least ten insects	4.80	9.16	0.004
21. Insects affecting ornamental plants: Making recommendations for control	2.70	6.30	0.016
22. Diseases affecting ornamental plants: Identification of at least five diseases	10.80	20.25	0.0001
23. Controlling the greenhouse environment: Regulation of light	19.20	33.05	0.0001
24. Understanding the cultural requirements of ornamental plants: Greenhouse crops	14.70	23.87	0.0001
25. Understanding the cultural requirements of ornamental plants: Nursery crops	7.50	11.58	0.0015
26. Understanding the cultural requirements of ornamental plants: Plants in landscape plantings	5.63	11.38	0.001
27. Growing annual bedding plants: Transplanting seedlings	10.80	18.39	0.0002
28. Cut flowers: Care of the flowers after harvest	16.13	30.99	0.0001
29. Flower arranging: A knowledge of basic principles of design	9.63	14.05	0.0006

continued

Table 17--Continued

df=41 and 2	F=1.8812	Probability less than 0.4084	
Variable	Between M.S.	Univariate F	Probability less than
30. Flower arranging: Pricing	5.63	9.44	0.0038
31. Propagating plants by: Grafting	2.13	2.85	0.099
32. Propagating plants by: Budding	2.70	3.28	0.077
33. Propagating plants by: Layering	12.03	14.92	0.0004
34. Pruning ornamental plants	7.50	11.87	0.0014
35. Balling and Burlapping ornamental plants	5.63	7.33	0.0098
36. Advising customers concerning: Desirable varieties	4.80	9.00	0.0046
37. Advising customers concerning: Costs of plants	10.80	15.75	0.0003
38. Advising customers concerning: Care after planting	4.80	7.52	0.009
39. Estimating the costs of caring for the mechanical landscaping equipment	3.33	4.25	0.045
40. Caring for mechanical landscaping equipment: Repairing	0.30	0.47	0.49
41. Caring for mechanical landscaping equipment: Maintaining	2.13	3.41	0.072

1. Identifying ornamental plants by common names.
2. Sterilizing soil: With steam.
3. Soil mixtures for potting.
4. Diseases affecting ornamental plants: Identification of at least five diseases.
5. Controlling the greenhouse environment: Regulation of light.
6. Understanding the cultural requirements of ornamental plants: Greenhouse crops.
7. Growing annual bedding plants: Transplanting seedlings.
8. Cut flowers: Care of the flowers after harvest.
9. Flower arranging: A knowledge of basic principles of design.
10. Propagating plants by: Layering.
11. Advising customers concerning: Costs of plants.

In all of the above areas, the ornamental horticulture teachers felt more qualified to teach that area or skill than did the random sample teachers. Two of the areas are in the soils science field; however, they are closely tied to ornamental horticulture. Most of these areas would more likely be taught by an ornamental horticulture teacher than by a random sample teacher.

However, there were some areas where teachers in both groups tended to agree. The following list is the quartile showing the greatest tendency to agree:

1. Testing soil samples.
2. Interpreting soil test results.
3. The effects of soil structure and texture on plants.

4. Changing soil pH: Raising the soil pH.
5. The use of trace elements.
6. Understanding how plant nutrients become available in the soil.
7. Making fertilizer recommendations for specific plants.
8. Mixing fertilizers for a specific ratio.
9. Identifying nutrient deficiencies in plants.
10. Proper handling of agricultural chemicals.
11. Caring for mechanical landscaping equipment: Repairing.

All of the above areas, except the last one, is in the soil science area. Even though no statistical analysis was conducted, there is a possible relationship between the number of teachers taking soil science courses and the perceived adequacy to teach areas in the soil science area. A high percentage of both groups had taken courses in soil science, and they felt those courses were important in qualifying them to teach ornamental horticulture. The number taking horticulture and related courses was not as high as the number taking soil science (see Table 2).

Ho:4 There is no difference between ornamental horticulture teachers and random sample teachers perceptions of the need for additional formal education. Ho:4 was not rejected.

Since no overall significant difference was observed at an alpha level of .02, subsequent analyses cannot be taken as tests of hypotheses. However, a univariate analysis of variance was conducted in order to rank the questions according

to the degree of differentiation between the groups. Mean scores of both groups is shown in Appendix E, Table 7. Table 18 is used to show the results of the multivariate and univariate analysis of variance.

Even though random sample teachers tended to show less perceived competency in selected ornamental horticulture areas, they tended to show a greater need for additional formal training than did ornamental horticulture teachers. The following variables accounted for the quartile showing the greatest differentiation between the two groups.

1. Helpfulness of more formal courses in ornamental horticulture and related fields.
2. More formal training in: Turfgrass management.
3. More ornamental training in: Landscape Maintenance.
4. More ornamental training in: Identification and characteristics of plants.
5. Recommend your kind and amount of formal education.
6. Importance of physical facilities.

In all of the areas except "Recommend your kind and amount of formal education," the random sample teacher's mean score was higher than the ornamental horticulture teacher's score. The ornamental horticulture teachers tended to recommend their kind and amount of formal education more highly than did random sample teachers. The following variables account for the quartile representing the least difference between the two groups:

1. More formal training in: Pathology.
2. More formal training in: Soil Science.

Table 18. Multivariate Analysis of Variance (25) for Teacher Groups Using the Dependent Variables of Perceived Need for Additional Formal Education in Specific Areas

df=25 and 4	F=1.1578	Probability less than 0.5008	
Variable	Between M.S.	Univariate F	Probability less than
1. Helpfulness of more formal courses in ornamental horticulture and related fields.	1.63	4.04	0.054
2. More formal training in: Floriculture.	1.63	1.13	0.298
3. More formal training in: Woody ornamentals.	1.20	1.40	0.247
4. More formal training in: Botany.	1.63	1.28	0.268
5. More formal training in: Plant physiology.	2.70	2.67	0.113
6. More formal training in: Turfgrass Management.	3.33	4.27	0.048
7. More formal training in: Entomology.	0.53	1.45	0.238
8. More formal training in: Pathology.	0.30	0.41	0.526
9. More formal training in: Soil Science	0.53	0.28	0.601
10. More floriculture training in: Cultural requirements of greenhouse crops.	0.03	0.02	0.890
11. More floriculture training in: Controlling the greenhouse environment.	0.53	0.32	0.579
12. More floriculture training in: Flower arranging.	0.03	0.01	0.909
13. More floriculture training in: Indoor Plant Culture.	3.33	2.15	0.154
14. More ornamental training in: Landscape maintenance.	4.80	4.22	0.049

continued

Table 18--Continued

df=25 and 4	F=1.1578	Probability less than 0.5008		
Variable		Between M.S.	Univariate F	Probability less than
15. More ornamental training in:	Landscape design.	1.63	1.93	0.176
16. More ornamental training in:	Identification and characteristics of plants.	4.80	3.63	0.067
17. More ornamental training in:	Nursery management.	2.I3	1.73	0.199
18. More ornamental training in:	Garden center management.	0.03	0.02	0.881
19. Best formal education background		1.20	2.00	0.168
20. Recommend your kind and amount of formal education.		1.20	6.15	0.019
21. Importance of formal courses.		3.33	1.84	0.186
22. Importance of in-service training meetings.		0.53	0.80	0.379
23. Importance of physical facilities.		4.03	3.43	0.075
24. Importance of interested students.		1.20	0.85	0.365
25. Importance of instructional materials.		0.83	0.76	0.390

3. More floriculture training in: Cultural requirements of greenhouse crops.

4. More floriculture training in: Controlling the greenhouse environment.

5. More floriculture training in: Flower arranging.

6. More ornamental training in: Garden center management.

One-half of the variables in the quartile representing the least difference between the groups were in the floriculture area. There was a strong indication that both groups wanted training in these areas.

Ho:5 There is no difference between the ornamental horticulture teachers and random sample teachers perception of how helpful occupational experience in specific areas would be for a person preparing to teach ornamental horticulture. Ho:5 was not rejected.

Even though further analysis cannot be taken as tests of hypotheses, Appendix E, Table 8 and Table 19 are presented to show differentiation between the groups on specific items. Ornamental horticulture teachers tended to think work experience in a greenhouse and florist shop would be more helpful than did random sample teachers. Random sample teachers tended to rate work experience in garden center and farming slightly higher than did ornamental horticulture teachers. There was a tendency for ornamental horticulture teachers to think work experience should be for a longer period than random sample teachers.

Table 19. Multivariate Analysis of Variance (25) for Teacher Groups Using the Dependent Variables of Perception of How Helpful Occupational Experience in Specific Areas Would Be for a Person Preparing to Teach Ornamental Horticulture

df=7 and 22	F=I.9280	Probability less than 0.1132		
Variable		Between M.S.	Univariate F	Probability less than
1. Work experience in:	Greenhouse.	0.30	3.50	0.072
2. Work experience in:	Florist Shop.	0.30	0.22	0.641
3. Work experience in:	Nursery Production	0.00	0.00	1.0001
4. Work experience in:	Garden Center	0.13	0.20	0.66
5. Work experience in:	Farming	4.03	4.13	0.052
6. Should work experience in an ornamental horticulture business be required before teaching.		0.30	3.50	0.072
7. Length of work experience.		6.53	10.02	0.0038

SUMMARY OF FINDINGS AND CONCLUSIONS

The primary purpose of the study was to determine the perceived adequacies of and needs for technical ornamental horticulture training for vocational agriculture teachers in Michigan. More specifically, the following objectives were sought:

1. To determine if there was a difference in the formal education background of ornamental horticulture teachers and random sample teachers.
2. To determine if there was a difference in space available for growing ornamental plants between ornamental horticulture teachers and random sample teachers.
3. To determine if there was a difference between ornamental horticulture teachers and random sample teachers in the level of perceived adequacy to teach selected ornamental horticulture and related areas.
4. To determine if there was a difference between all teachers perceptions of their adequacy to teach selected ornamental horticulture and related areas, and selected industry representatives perceptions of

how important they considered it for a teacher to be qualified to teach those areas.

5. To determine if the ornamental horticulture and random sample teacher groups had a different perception of the need for additional formal education.
6. To determine if there was a difference between the ornamental horticulture and random sample teachers commercial work experience and perceived importance of work experience for a person preparing to teach ornamental horticulture.
7. To determine if the ornamental horticulture and random sample teacher groups had different reasons for teaching or not teaching ornamental horticulture.

Findings

Teachers in both groups tended to have their Bachelor's degrees in agricultural education, with about the same percentage in both groups holding Master's degrees. Random sample teachers had been teaching longer than ornamental horticulture teachers.

In general, ornamental horticulture teachers had taken more of the horticulture and related courses than random sample teachers. This was especially evident in the horticulture, botany and entomology areas. However, random sample teachers reported more courses in biological science, agricultural engineering and agricultural economics.

Teachers in both groups generally thought courses in horticulture, soils, botany, entomology and agricultural engineering were helpful in qualifying them to teach ornamental horticulture. They did not think biological science and agricultural economics were as important as the others. There was a tendency for ornamental horticulture teachers to place less importance on agricultural engineering and agricultural economics than for random sample teachers. But, the ornamental horticulture teachers thought botany courses were more important.

Teacher groups varied in the areas or skills taught in their program. A high percentage of the ornamental horticulture teachers consistently taught all the 53 subjects asked about, while a high percentage of the random sample teachers taught the competencies and skills only in the soil science area. Fewer of the random sample teachers taught areas dealing with cut flowers and flower arranging than any of the other areas.

Ornamental horticulture teachers generally felt more highly qualified to teach ornamental horticulture and related areas than random sample teachers. However, industry representatives thought it was important for teachers to be qualified in most of the 53 areas included in the survey. More of the ornamental horticulture teachers felt qualified to teach specialized horticulture subjects than did random sample teachers, however, there was little difference between the

groups on the other areas. All three groups tended to agree on qualification for teaching soils science areas. The teacher groups felt qualified and industry representatives thought it was important that teachers be qualified in those areas.

Teachers of both groups generally believed courses in horticulture and related areas would help them be better teachers. Courses in woody ornamentals, turfgrass management and floriculture were perceived as being the most helpful. There was a tendency for random sample teachers to think all of the courses would be more helpful than ornamental horticulture teachers. Courses in botany, plant physiology and soil science were perceived as those that would be least helpful.

Even though both groups of teachers perceived a relatively low competency level in flower arranging, they said training in that area would be less helpful than any of the other areas of floriculture. However, both groups thought floriculture training would be helpful. They felt a slightly stronger need for more training in woody ornamentals, but random sample teachers thought it would be the most helpful. All teachers thought training in landscape design would be very helpful.

Teachers in both groups preferred a major in horticulture with a teaching certificate as the ideal formal education background for a teacher of ornamental horticulture in high school. A majority of ornamental horticulture teachers would recommend

their kind and amount of formal education for other teachers before they begin teaching; however, random sample teachers would not recommend their training. General agriculture courses in animal husbandry, dairy science and poultry science were perceived to have been of little help in preparing teachers to teach ornamental horticulture.

All of the participants thought formal courses, in-service training meetings, physical facilities, interested students and instructional materials would be important for improving their overall ornamental horticulture teaching program.

Even though teachers in both groups thought occupational experience would be very helpful before teaching ornamental horticulture, a higher percentage of ornamental horticulture teachers had work experience before teaching. They thought work experience in a greenhouse, nursery or garden center would be very helpful. Work experience in a florist shop was not perceived as being as helpful as other types of ornamental horticulture businesses. Most of the teachers thought that work experience should be required before a person begins teaching ornamental horticulture but they disagreed on how long that experience should be. Ornamental horticulture teachers tended to think it should be longer than six months, while random sample teachers tended to think three to six months was adequate.

Responses varied when teachers were asked why they taught or didn't teach ornamental horticulture. Random sample

teachers placed high importance on the lack of college training and their high school facilities available for growing plants as reasons why they did not teach the subject. However, ornamental horticulture teachers placed the most importance on interest of the subject and local school policies for teaching ornamental horticulture.

Ornamental horticulture teachers did not think any one group of persons had been extremely helpful to them in the development of their curriculum. But, they thought Michigan State University Horticulture Department faculty members and state vocational education administrators had been the most helpful of any group.

Teachers tended to be pleased with their students, facilities and instructional materials, however they thought they needed more input into the guidance of students prior to enrollment. Almost all of the teachers in both groups said they could use better facilities. However, ornamental horticulture teachers reported an average of more space available for growing plants.

Conclusions

On the basis of findings of this study, the following conclusions seem to be justified:

1. There is little difference in the formal education background of ornamental horticulture teachers and random sample teachers.

2. There is a difference in space available for growing ornamental plants between ornamental horticulture teachers and random sample teachers.

3. There was not a significant overall difference in the level of perceived adequacy to teach selected areas of skills between ornamental horticulture teachers and random sample teachers. Specific areas, primarily in the horticulture area, did show significant differences, however.

4. There was not a significant overall difference between all teachers perceptions of their adequacy to teach selected areas or skills, and the perceptions of selected industry representatives as to the importance of teachers being qualified to teach those areas. However, a significantly higher number of industry representatives thought it was important for teachers to be qualified in a number of horticulture, entomology, botany and agricultural engineering areas, while a large number of teachers did not feel qualified in those areas.

5. There was no significant difference in the perception of the need for additional formal education between ornamental horticulture teachers and random sample teachers. Random sample teachers tended to show a slightly greater need for additional formal education.

6. There was no significant difference in the perceived importance of commercial work experience for a person preparing to teach ornamental horticulture between ornamental horticulture teachers and random sample teachers. Both groups thought a person should be required to work before teaching ornamental horticulture in high school.
7. There was a tendency for random sample teachers and ornamental horticulture teachers to have different reasons for teaching or not teaching ornamental horticulture.

Implications

The following comments are presented as possible ideas for improvement of teaching ornamental horticulture in the secondary schools of Michigan. They are based on the data from the study, general observations made by the researcher while collecting the data, and previous experiences of the researcher as an extension specialist.

Plant growing facilities in Michigan schools should be thoroughly reviewed. Even the largest greenhouses were barely large enough to conduct an adequate ornamental horticulture program. Nursery space was usually available but often poorly developed. Teachers need instruction on how to effectively construct and utilize growing space in the greenhouse, hotbeds and classroom.

Information on lighting and plants adapted for growing under artificial lights should also be made available.

The agricultural education curriculum at Michigan State University should be altered to permit more horticulture courses. Even though teachers indicated they are teaching more ornamental horticulture each year, potential teachers of vocational agriculture are apparently taking a relatively small amount of horticulture. Students showing a strong interest in horticulture should be encouraged to major in horticulture and obtain a teaching certificate. In addition, the horticulture department should make some of their present courses more relevant to the problems of prospective vocational agriculture teachers.

In-service training is needed in a number of areas. All teachers should receive further training in the following areas: cultural requirements of nursery crops and plants in landscape plantings, flower arranging, plant propagation, desirable varieties, sterilizing soil with chemicals, making fertilizer recommendations for specific plants, and identification and control of diseases. In all of these areas, industry representatives thought it was important for teachers to be qualified but teachers in neither group felt highly qualified. There are many others, especially for the general vocational agriculture teacher. Teachers should receive comprehensive formal training in the areas of turfgrass management, floriculture and woody ornamentals. This training could

be divided into a basic and advanced level group. A series of three meetings might be held each year for all teachers. The subject matter for the first group would include identification of ornamental plants and other horticultural topics. The advanced group might discuss areas in which they were deficient, such as disease identification and control. At the end of a two year period, the series could be evaluated and teachers could be placed in new groups before beginning a new series.

Before a person begins teaching ornamental horticulture in high school, at least six months of work experience in an ornamental horticulture business should be required. Ideally, this training would be in a firm that includes a wide range of ornamentals, and could provide a breadth of experiences in the areas for instruction in high school. However, business experience of any kind would be helpful.

An effort should be made to work with counselor-educators at the state level and counselors at the local level concerning student placement in ornamental horticulture and vocational agriculture programs. They should become acquainted with the purposes and potential of the program.

A continuing effort should be made to help teachers utilize the instructional materials that are available in the ornamental horticulture area. Information is apparently available but teachers need help and encouragement to incorporate the information into their instructional programs.

Recommendations for Further Study

1. A study concerning teachers perception of ideal facilities to teach ornamental horticulture would be meaningful. Experienced teachers should have excellent suggestions based on their experience.

2. Detailed recommendations for a Bachelor's curriculum designed for potential ornamental horticulture teachers should be made. This could be done by surveying other university curriculums, teachers of ornamental horticulture and industry representatives.

3. Students of vocational agriculture should be surveyed concerning (a) their competencies for entering and advancing in ornamental horticulture careers, and (b) the strengths and weaknesses of the instruction they received in high school to prepare them for their career.

4. Teachers and students should be asked what the role of a youth organization such as the FFA should be in an ornamental horticulture high school program.

5. An updated study of the opportunities for employment in the Michigan ornamental horticulture industry should be conducted.

6. A study should be conducted to measure the performance competencies of teachers of agriculture for providing instruction in ornamental horticultural occupations to high school students.

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APPENDICES

APPENDIX A

TEACHERS INTERVIEW INSTRUMENT

APPENDIX A

TECHNICAL ORNAMENTAL HORTICULTURE TRAINING ADEQUACIES AND NEEDS OF SECONDARY VOCATIONAL TEACHERS

This questionnaire was prepared to determine the competencies needed by teachers at the secondary level for conducting occupational programs in the area of ornamental horticulture. These occupations include the general areas of floriculture, landscape, horticulture and ornamental plant material. Research has been conducted to determine needs felt by various industry leaders; however, teachers have not been asked to point out their own adequacies and needs. We would like to use your answers about your competencies and needs to make suggestions for formal training at Michigan State University for future teachers and for the training of teachers who are already in the field. If a question is not clear, please ask for a clarification.

I. General Information

A. Demographic Data

Name _____

Name of School Where You Teach _____

Year received Bachelor's degree _____

Name of institution _____

What was your major? _____

Year received Master's degree _____

Name of institution _____

What was your major? _____

Years in present position _____

Total years in the teaching profession _____

If you are presently teaching ornamental horticulture, how long? _____

How many students are enrolled in your ornamental horticulture classes for the 1971-1972 school year? Please specify class and number enrolled in each. _____

_____

B. Teaching Facilities

Indicate the facilities you have for growing plants.

Square feet of greenhouse space _____

Square feet (or acreage) of nursery space presently utilized _____

Square feet of classroom space used for growing space _____

Square feet of laboratory space used for teaching ornamental horticulture _____

Number of plant growth chambers _____

Special growing facilities _____

II. Competency Areas and Skills Taught

The following is a list of competency areas and skills in ornamental horticulture that might be taught at your

school. Competency areas, such as interpreting soil test results, require only that the student can perform the task. Skills, such as taking soil samples, require only that the student can perform the task. Your answers should reflect areas and skills taught to students enrolling in the maximum ornamental horticulture at your school. First, indicate by a check under either yes or no if you teach the area or skill. Second, indicate how qualified you think you are to teach that area of skill.

		Qualification			
	Does Not Teach	Very Qualified	Qualified	Somewhat Unqualified	Unqualified
1. Identifying ornamental plants by common names. If yes, how many? _____					
2. Identifying ornamental plants by scientific names. If yes, how many? _____					
3. Characteristics of more than five plant families.					
4. Taking soil samples.					
5. Testing soil samples.					
6. Interpreting soil test results.					
7. The effects of soil structure and texture on plants.					

	Qualification				
	Does Not Teach	Very Qualified	Qualified	Somewhat Unqualified	Unqualified
8. Sterilizing soil: a. with steam b. with chemicals					
9. Changing soil pH: a. Raising the soil pH b. Lowering the soil pH					
10. Soil mixtures for potting.					
11. Understanding the use of mulches.					
12. The use of trace elements.					
13. Planning the proper use of growth regulators.					
14. Understanding how plant nutrients become available in the soil.					
15. Making fertilizer recommendations for specific plants.					
16. Mixing fertilizers for a specific ratio.					
17. Identifying nutrient deficiencies in plants.					
18. Proper handling of agricultural chemicals.					
19. Insects affecting ornamental plants: a. Identification of at least ten insects. b. Making recommendations for control.					

	Qualification				
	Does Not Teach	Very Qualified	Qualified	Somewhat Unqualified	Unqualified
20. Diseases affecting ornamental plants:					
a. Identification of at least five diseases.					
b. Making recommendations for control.					
21. Controlling the greenhouse environment:					
a. Regulation of light.					
b. Regulation of moisture.					
c. Regulation of temperature.					
22. Understanding the cultural requirements of ornamental plants:					
a. Greenhouse crops.					
b. Nursery crops.					
c. Plants in landscape plantings.					
23. Growing annual bedding plants:					
a. Sowing the seed.					
b. Transplanting seedling.					
c. Growing the plants.					
24. Cut flowers:					
a. Cutting the stems.					
b. Care of the flowers after harvest.					
25. Flower arranging:					
a. A knowledge of basic principles of design.					
b. Arranging the flowers.					
c. Pricing.					

	Qualification				
	Does Not Teach	Very Qualified	Qualified	Somewhat Unqualified	Unqualified
26. Propagating plants by: a. Grafting. b. Cuttings c. Budding. d. Layering.					
27. Pruning ornamental plants.					
28. Balling and burlapping ornamental plants.					
29. Performing annual maintenance of lawns and landscapes.					
30. Advising customers concerning: a. Desirable varieties. b. Cost of plants. c. Proper planting procedure. d. Care after planting.					
31. Estimating the costs of caring for the mechanical landscaping equipment.					
32. Caring for mechanical landscaping equipment: a. Repairing. b. Maintaining c. Adjusting. d. List kinds of equipment.					

III. Undergraduate Training

First, place a check (✓) in the space provided to the left of the courses which you have taken at M.S.U. (or other institution). Disregard changes in numbers which may be currently used to designate courses in horticulture and related fields. Second, for each course area which you have taken, please indicate how important were those courses for qualifying you to teach skills in ornamental horticulture.

Was taken		Importance				
		5[1]	4	3	2	1
Horticulture						
_____	Basic Horticulture					
_____	Landscape Plants I					
_____	Landscape Plants II					
_____	Indoor Plants and Flowers					
_____	Ornamental Plant Management					
_____	Controlled Plant Environment					
_____	Principles of Plant Propagation					
_____	Nursery Management					
_____	Other, specify					
Soils						
_____	Fundamentalf of Soil Science					
_____	Soil Management					
_____	Turfgrass Management					
_____	Soil Fertility and Fertilizers					
_____	Other, specify					
Biological Science						
_____	Foundations of Biological Science					
_____	General Biology					
_____	General Biology					
_____	Biological Science for Teachers					
_____	Other, specify					
Botany						
_____	Elementary Plant Physiology					
_____	Plant World					
_____	Introductory Plant Pathology					
_____	Plant Physiology: Metabolism					
_____	Plant Physiology: Growth					
_____	Other, specify					

	Importance				
	5[1]	4	3	2	1

Entomology

_____ General Entomology

Agricultural Engineering

_____ Engineering Principles Applied to Agriculture
_____ Teaching Agricultural Mechanics
_____ Internal Combustion Engines
_____ Other, specify

Agricultural Economics

_____ Agriculture in the Economy
_____ Production Economics and Management
_____ Farm Finance and Appraisal
_____ Land Economics
_____ Agricultural Prices and Marketing
_____ Farm Management
_____ Other, specify

[1]5=very important; 4=somewhat important; 3=no opinion, 2=little importance, and 1=not important.

IV. Formal Education and Occupational Experience

Please answer the following questions as they relate to your formal educational training (undergraduate and graduate) and your ideas for training needs.

1. Would more formal courses in ornamental horticulture and related fields help you to be a better teacher of ornamental horticulture?

   _____ a. Very Helpful
   _____ b. Somewhat Helpful
   _____ c. No Opinion
   _____ d. Probably Not Helpful
   _____ e. Waste of Time

2. If you indicated more formal training (undergraduate and graduate) in ornamental horticulture and related fields would be helpful, indicate below how helpful training in each of the following areas would be to you in your teaching program.

	Very Help.	Some-what Help.	No Opin-ion	Probably Not Helpful	Waste of Time
A. Floriculture (pot plants, cut flowers, annual bedding plants, etc.)					
B. Woody ornamentals (land-scaping, shrubbery, trees, etc.)					
C. Botany					
D. Plant physiology					
E. Turfgrass management					
F. Entomology					
G. Pathology					
H. Soil Science					
I. Other, specify _____					

3. If in question 2 you indicated a need for more floriculture courses, how helpful would each of the following be to you in your teaching program?

	Very Help.	Some-what Help.	No Opin-ion	Probably Not Helpful	Waste of Time
a. Cultural requirements of greenhouse crops.					
b. Controlling the green-house environment.					
c. Flower arranging.					
d. Indoor plant culture					
e. Other, specify _____					

4. If in question 2 you indicated a need for more courses in woody ornamentals, how helpful would each of the following be to you in your teaching program?

	Very Help.	Some-what Help.	No Opin-ion	Probably Not Helpful	Waste of Time
a. Landscape Maintenance					
b. Landscape Design					
c. Identification and characteristics of plants.					
d. Nursery management, including plant propagation.					
e. Garden center management--sales.					
f. Other, specify_____					

5. Ideally, which of the following formal education backgrounds would be best for a teacher of ornamental horticulture in high school?

____ a. Major in Agricultural Education.
____ b. Major in Horticulture (no teaching certificate)
____ c. Major in Horticulture with a teaching certificate
____ d. Other, specify_____
____ e. The areas the degree is in does not really matter.

6. Would you recommend your kind and amount of formal education for other teachers before they begin teaching ornamental horticulture?

____ a. Yes
____ b. No

7. Indicate how important each of the following is for improving your overall ornamental horticulture teaching program.

	Very Imp.	Imp.	No Opin-ion	Little Imp.	Not Imp.
a. Formal courses					
b. In-service training meetings					
c. Physical facilities					
d. Interested students					
e. Instructional materials					

Now, we would like your opinion about the formal education program at Michigan State University.

8. How would you describe the courses you took in general agriculture as they relate to your teaching program in ornamental horticulture?

	Very Help.	Somewhat Help.	No Opinion	Probably Not Helpful	Waste of Time
a. Dairy Science					
b. Animal Husbandry					
c. Poultry Science					
d. Crop Science					
e. Agricultural Economics					
f. Forestry					
g. Fisheries and Wildlife					
h. Agricultural Engineering					

V. Occupational Experience

1. Have you worked in commercial ornamental horticulture businesses before teaching vocational agriculture?

_____ a. Yes
_____ b. No

If yes, in what type of business?_____
How long did you work? _____
What type work did you do? _____
Has your work experience been helpful to you in your teaching program?

_____ Very Helpful
_____ Somewhat Helpful
_____ No Opinion
_____ Probably Not Helpful
_____ Time wasted

How important would each of the following be as work experience for a person preparing to teach ornamental horticulture?

Work Experience in:	Very Help.	Somewhat Help.	No Opinion	Probably Not Helpful	Time Wasted
a. Greenhouse					
b. Florist Shop					
c. Nursery Production					
d. Garden Center					
e. Farming					
f. Other, specify_____					

2. Should work experience in an ornamental horticulture business be required before a person begins teaching ornamental horticulture?

____ a. Yes
____ b. No

If yes, for how long?

____ Less than six months
____ Six months to one year
____ More than one year

VI. Other Perceptions

The following section will help us to determine your ideas concerning teaching ornamental horticulture in general.

If you teach ornamental horticulture, omit the following and proceed to the other section of this page.

Listed below are some possible reasons that ornamental horticulture might not be taught at your school.

Please indicate how important you consider each of these factors.

	Very Imp.	Imp.	No Opinion	Little Imp.	Not Imp.
1. College training of teachers is insufficient.					
2. Students not interested.					
3. Job market too limited.					
4. General horticulture should be responsibility of area skill centers.					
5. Ornamental horticulture should be responsibility of area skill centers.					
6. Subject is not of interest to you.					
7. Local school policies do not permit.					

	Very Imp.	Imp.	No Opinion	Little Imp.	Not Imp.
8. Facilities are not available.					
9. Local industry representatives encourage you not to teach it.					
10. Others, specify _____					

Answer this section only if you teach ornamental horticulture.

If you do teach ornamental horticulture, indicate how important each of the following is for you teaching this area.

	Very Imp.	Imp.	No Opinion	Little Imp.	Not Imp.
1. College training in this area.					
2. Students are interested.					
3. Jobs are available.					
4. General agriculture not as important as knowledge in a specific area.					
5. Ornamental horticulture should be the responsibility of local schools as well as the area skill centers.					
6. Subject is interesting to you.					
7. Local school policies encourage me to teach it.					
8. Facilities were here and should be used.					
9. Local industry representative encourage you to teach it.					
10. Others, specify _____					

2. How would you describe your overall ornamental horticulture teaching program this past year?

   ____ a. Excellent
   ____ b. Good
   ____ c. Fair
   ____ d. Poor

3. When you began developing your ornamental horticulture curriculum, indicate how helpful each of the following was to you.

	Very Help.	Somewhat Help.	No Opinion	Probably Not Helpful	Time Wasted
a. Other vocational agriculture teachers.					
b. Industry representatives.					
c. Local school administrators.					
d. State vocational administrators.					
e. Michigan State University horticulture department faculty members.					
f. Local advisory group.					
g. County agricultural agent.					
h. Others, specify _____					

4. Indicate the amount of changes you have scheduled for next year's program.

5. We know that every teacher feels that some parts of his program are very strong and perhaps other parts would be stronger if he could make some changes. We would like to know how you feel about three aspects of your instructional program.

a. Students-

b. Facilities-

c. Instructional materials-

APPENDIX B

LETTER TO TEACHERS

MICHIGAN STATE UNIVERSITY EAST LANSING • MICHIGAN 48823

COLLEGE OF AGRICULTURE AND NATURAL RESOURCES • DEPARTMENT OF HORTICULTURE • HORTICULTURE BUILDING

November 1971

Dear _____:

I want to sincerely thank you for your participation in my recent survey. Your opinions and ideas are important to us and will add much to the overall results. All of the vocational agriculture teachers contacted have been extremely cooperative. All of you participants have not hesitated to take time out of your schedule. It is a real pleasure to work with a group such as this.

I hope that the packet of information will prove to be some help to you and that the study will help us here at Michigan State. We already have plans to analyze and utilize your answers in developing a better educational program in ornamental horticulture.

Thank you again for your cooperation. I hope you have a good school year.

Sincerely yours,

Ronald L Shumack

APPENDIX C

LETTER TO INDUSTRY REPRESENTATIVES

MICHIGAN STATE UNIVERSITY EAST LANSING · MICHIGAN 48823

COLLEGE OF AGRICULTURE AND NATURAL RESOURCES · DEPARTMENT OF HORTICULTURE · HORTICULTURE BUILDING

January 1972

Dear_____:

We appreciate your willingness to give us your recommendations for improving our training program for teachers of ornamental horticulture. As I mentioned during the telephone conversation, we are contacting both industry persons and high school teachers for suggestions. Your local teacher, Mr. suggested you as a person who could offer helpful advice.

When you respond to our questions, please keep in mind that we are concerned with what high school teachers of ornamental horticulture need to know and be able to do. Also, please assume that they are preparing students who may enter the ornamental horticulture industry after graduating from high school (or after post high school training).

We would like to know how important is it that a teacher have certain specific competencies. Try to think of the total ornamental horticulture industry and not just your specific business when you give your opinion. Also keep in mind that we are concerned with the preparation of teachers for schools throughout Michigan.

In a few days I will phone you to ask your responses. If you have a chance to study the list before my call we can complete the call much quicker. It will not be necessary for you to mail anything back to me.

Thank you very much for taking your time to help us. We will make every effort to utilize your ideas effectively.

Sincerely,

Ronald L. Shumack

APPENDIX D

INDUSTRY REPRESENTATIVES INTERVIEW INSTRUMENT

QUESTIONNAIRE FOR INDUSTRY REPRESENTATIVES

The following is a list of areas or skills that might be taught at a high school. Some of these areas such as interpreting soil test results require an understanding of principles; however, skills such as taking soil samples require only that the teachers can show students how to perform the skill. To simplify your responses we have assigned numbers to the four possible responses. You may respond by telling me (during my telephone call) the number which corresponds to how important you consider each of the items.

Very Important - 4
Somewhat Important - 3
Little Importance - 2
Not Important - 1

	Importance			
	4	3	2	1
1. Identifying ornamental plants by common names.				
2. Identifying ornamental plants by scientific names.				
3. Characteristics of more than five plant families.				
4. Taking soil samples.				
5. Testing soil samples.				
6. Interpreting soil test results.				
7. The effects of soil structure and texture on plants.				
8. Sterilizing soil:				
a. with steam				
b. with chemicals				
9. Changing soil pH.				

	Importance			
	4	3	2	1

10. Soil mixtures for potting.

11. Understanding the use of mulches.

12. The use of trace elements.

13. Planning the proper use of growth regulators.

14. Understanding how plant nutrients become available in the soil.

15. Making fertilizer recommendations for specific plants.

16. Mixing fertilizers for a specific ratio.

17. Identifying nutrient deficiencies in plants.

18. Proper handling of agricultural chemicals.

19. Insects affecting ornamental plants:
    a. Identification of at least ten insects.
    b. Making recommendations for control.

20. Diseases affecting ornamental plants:
    a. Identification of at least five diseases.
    b. Making recommendations for control.

21. Controlling the greenhouse environment:
    a. Regulation of light.
    b. Regulation of moisture.
    c. Regulation of temperature.

22. Understanding the cultural requirements of ornamental plants:
    a. Greenhouse crops.
    b. Nursery crops.
    c. Plants in landscape plantings.

23. Growing annual bedding plants:
    a. Sowing the seed.
    b. Transplanting seedlings.
    c. Growing the plants.

24. Cut Flowers:
    a. Cutting the stems.
    b. Care of the flowers after harvest.

	Importance			
	4	3	2	1

25. Flower arranging:
    a. A knowledge of basic principles of design.
    b. Arranging the flowers.
    c. Pricing.

26. Propagating plants by:
    a. Grafting.
    b. Cuttings.
    c. Budding.
    d. Layering.

27. Pruning ornamental plants.

28. Balling and burlapping ornamental plants.

29. Performing annual maintenance of lawns and landscapes.

30. Advising customers concerning:
    a. Desirable varieties
    b. Costs of plants
    c. Proper planting procedure
    d. Care after planting

31. Estimating the costs of caring for the mechanical landscaping equipment.

32. Caring for mechanical landscaping equipment.
    a. Repairing
    b. Maintaining
    c. Adjusting

APPENDIX E

TABLES

Table 1. Comparisons of Perceived Competencies Reported by Ornamental Horticulture Teachers[1] (O.H.T.) and Random Sample Teachers[2] (R.S.T.) with the Importance Placed by Industry Representatives[3] (I.R.) on Being Qualified in Those Horticulture Areas or Skills

Area or Skill		Percent			
		Very Qualified/ Important	Qualified/ Important	Somewhat Unqualified/ Unimportant	Unqualified[4]/ Unimportant
Horticulture					
1. Identifying ornamental plants by common names	O.H.T.	67	33	0	0
	R.S.T.	13	67	20	0
	I.R.	93	7	0	0
2. Identifying ornamental by scientific names	O.H.T.	33	27	13	27
	R.S.T.	7	20	13	60
	I.R.	13	47	33	7
3. Planning the proper use of growth regulators	O.H.T.	20	40	33	7
	R.S.T.	7	13	40	40
	I.R.	27	40	27	7
4. Proper handling of agricultural chemicals	O.H.T.	33	60	7	0
	R.S.T.	47	53	0	0
	I.R.	93	7	0	0
5. Controlling the greenhouse environment: regulation of light.	O.H.T.	53	40	7	0
	R.S.T.	7	20	27	47
	I.R.	80	13	7	0
6. Controlling the greenhouse environment: regulation of moisture	O.H.T.	53	47	0	0
	R.S.T.	7	20	27	27
	I.R.	87	7	7	0

continued

Table 1--Continued

Area or Skill		Percent			
		Very Qualified/ Important	Qualified/ Important	Somewhat Unqualified/ Unimportant	Unqualified Unimportant
7. Controlling the greenhouse environment: regulation of temperature	O.H.T.	67	33	0	0
	R.S.T.	7	20	27	27
	I.R.	87	7	7	0
8. Understanding the cultural requirements of ornamental plants: Greenhouse crops.	O.H.T.	40	53	7	0
	R.S.T.	0	40	13	47
	I.R.	73	13	13	0
9. Understanding the cultural requirements of ornamental plants: Nursery crops.	O.H.T.	27	60	13	0
	R.S.T.	7	33	27	33
	I.R.	67	20	13	0
10. Understanding the cultural requirements of ornamental plants: Plants in landscape plantings.	O.H.T.	40	53	7	0
	R.S.T.	7	47	33	13
	I.R.	60	33	7	0
11. Growing annual bedding plants: sowing the seed.	O.H.T.	93	7	0	0
	R.S.T.	20	40	27	13
	I.R.	60	27	13	0
12. Growing annual bedding plants: Transplanting seedlings.	O.H.T.	87	13	0	0
	R.S.T.	27	33	20	20
	I.R.	67	27	7	0
13. Growing annual bedding plants: Growing the plants.	O.H.T.	67	27	7	0
	R.S.T.	20	40	20	20
	I.R.	67	27	7	0
14. Cut flowers: Cutting the stems.	O.H.T.	40	27	33	0
	R.S.T.	0	27	27	47
	I.R.	40	53	7	0

continued

Table 1--Continued

Area or Skill		Percent			
		Very Qualified/ Important	Qualified/ Important	Somewhat Unqualified/ Unimportant	Unqualified/ Unimportant
15. Cut flowers: Care of the flowers after harvest.	O.H.T.	40	27	33	0
	R.S.T.	0	7	47	47
	I.R.	40	53	7	0
16. Flower arranging: A knowledge of basic principles of design.	O.H.T.	20	27	33	20
	R.S.T.	0	7	20	73
	I.R.	33	47	20	0
17. Flower arranging: Arranging the flowers.	O.H.T.	20	27	27	27
	R.S.T.	0	0	27	73
	I.R.	33	27	33	7
18. Flower arranging: Pricing.	O.H.T.	7	27	33	33
	R.S.T.	0	0	20	80
	I.R.	40	33	27	0
19. Propagating plants by: Grafting.	O.H.T.	13	67	20	0
	R.S.T.	7	47	27	20
	I.R.	47	20	27	7
20. Propagating plants by: Cuttings.	O.H.T.	87	0	13	0
	R.S.T.	20	40	20	20
	I.R.	67	13	20	0
21. Propagating plants by: Budding.	O.H.T.	7	53	33	7
	R.S.T.	7	20	40	33
	I.R.	47	20	28	7
22. Propagating plants by: Layering	O.H.T.	33	60	7	0
	R.S.T.	7	37	27	40
	I.R.	47	20	27	7

continued

Table 1--Continued

Area or Skill		Percent			
		Very Qualified/ Important	Qualified/ Important	Somewhat Unqualified/ Unimportant	Unqualified/ Unimportant
23. Pruning ornamental plants.	O.H.T.	67	27	7	0
	R.S.T.	20	40	20	20
	I.R.	73	20	7	0
24. Balling and burlapping plants.	O.H.T.	47	47	7	0
	R.S.T.	20	33	27	20
	I.R.	53	20	27	0
25. Performing annual maintenance of lawns and landscapes.	O.H.T.	93	0	7	0
	R.S.T.	33	47	13	7
	I.R.	67	20	13	0
26. Advising customers concerning: Desirable varieties.	O.H.T.	33	53	13	0
	R.S.T.	7	33	40	20
	I.R.	60	33	7	0
27. Advising customers concerning: Costs of plants.	O.H.T.	27	53	13	7
	R.S.T.	0	27	27	47
	I.R.	40	40	20	0
28. Advising customers concerning: Proper planting procedure.	O.H.T.	60	27	13	0
	R.S.T.	13	47	20	20
	I.R.	53	40	7	0
29. Advising customers concerning: Care after planting.	O.H.T.	60	27	13	0
	R.S.T.	13	53	20	13
	I.R.	60	27	13	0

continued

Table 1--Continued

Area or Skill		Percent			
		Very Qualified/ Important	Qualified/ Important	Somewhat Unqualified/ Unimportant	Unqualified/ Unimportant
Soil Science					
1. Taking soil samples.	O.H.T.	87	13	0	0
	R.S.T.	100	0	0	0
	I.R.	60	27	13	0
2. Testing soil samples.	O.H.T.	60	33	0	7
	R.S.T.	53	27	7	13
	I.R.	33	33	27	7
3. Interpreting soil test results.	O.H.T.	40	60	0	0
	R.S.T.	60	33	7	0
	I.R.	67	27	7	0
4. The effects of soil structure and texture on plants.	O.H.T.	80	20	0	0
	R.S.T.	53	47	0	0
	I.R.	47	40	13	0
5. Sterilizing soil: with steam.	O.H.T.	40	33	20	7
	R.S.T.	7	13	20	60
	I.R.	33	33	20	13
6. Sterilizing soil: with chemicals.	O.H.T.	27	47	20	7
	R.S.T.	7	33	7	53
	I.R.	40	33	13	13
7. Changing soil pH: raising the soil pH.	O.H.T.	73	27	0	0
	R.S.T.	53	47	0	0
	I.R.	60	20	20	0

continued

Table 1--Continued

Area or Skill		Percent			
		Very Qualified/ Important	Qualified/ Important	Somewhat Unqualified/ Unimportant	Unqualified/ Unimportant
8. Changing soil pH: Lowering the soil pH.	O.H.T.	53	40	7	0
	R.S.T.	33	47	7	13
	I.R.	60	20	20	0
9. Soil Mixtures for potting.	O.H.T.	87	13	0	0
	R.S.T.	20	20	20	40
	I.R.	53	27	20	0
10. Understanding the use of mulches.	O.H.T.	53	47	0	0
	R.S.T.	33	33	13	20
	I.R.	20	60	13	7
11. The use of trace elements.	O.H.T.	13	53	33	0
	R.S.T.	20	53	20	7
	I.R.	13	60	27	0
12. Understanding how plant nutrients become available in the soil.	O.H.T.	27	67	7	0
	R.S.T.	40	60	0	0
	I.R.	67	27	7	0
13. Making fertilizer recommendations for specific plants.	O.H.T.	27	67	7	0
	R.S.T.	20	67	7	7
	I.R.	67	33	0	0
14. Mixing fertilizers for a specific ratio.	O.H.T.	27	53	13	7
	R.S.T.	40	33	7	20
	I.R.	20	33	33	13
15. Identifying nutrient deficiencies in plants.	O.H.T.	33	47	20	0
	R.S.T.	20	67	13	0
	I.R.	67	33	0	0

continued

Table 1--Continued

Area or Skill		Percent: Very Qualified/ Important	Qualified/ Important	Somewhat Unqualified/ Unimportant	Unqualified/ Unimportant
Botany and Plant Pathology					
1. Characteristics of more than five plant families.	O.H.T.	53	20	20	7
	R.S.T.	13	27	20	40
	I.R.	13	67	20	0
2. Diseases affecting ornamental plants: Identification of at least five diseases.	O.H.T.	40	33	27	0
	R.S.T.	0	33	27	40
	I.R.	87	13	0	0
3. Diseases affecting ornamental plants: Making recommendations for control.	O.H.T.	40	40	20	0
	R.S.T.	0	27	33	40
	I.R.	73	27	0	0
Agricultural Engineering					
1. Estimating the costs of caring for the mechanical landscaping equipment.	O.H.T.	20	13	53	13
	R.S.T.	7	7	40	47
	I.R.	40	40	20	0
2. Caring for mechanical landscaping equipment: Repairing.	O.H.T.	13	46	40	0
	R.S.T.	7	60	13	20
	I.R.	33	47	20	0
3. Caring for mechanical landscaping equipment: Maintaining	O.H.T.	33	60	7	0
	R.S.T.	13	67	0	20
	I.R.	40	40	20	0
4. Caring for mechanical landscaping equipment: Adjusting	O.H.T.	33	60	7	0
	R.S.T.	13	60	7	20
	I.R.	33	47	20	0

continued

Table 1--Continued

Area or Skill		Percent			
		Very Qualified/ Important	Qualified/ Important	Somewhat Unqualified/ Unimportant	Unqualified/ Unimportant
Entomology					
1. Insects affecting ornamental plants: Identification of at least ten insects.	O.H.T.	47	40	13	0
	R.S.T.	13	47	20	20
	I.R.	93	7	0	0
2. Insects affecting ornamental plants: Making recommendations for control.	O.H.T.	47	40	13	0
	R.S.T.	13	53	27	7
	I.R.	87	13	0	0

[1]n=15

[2]n=15

[3]n=15

[4]Unqualified includes those teachers who did not teach that skill or area.

Table 2. Comparison of Ornamental Horticulture Teachers[1] (O.H.T.) and Random Sample Teachers[2] (R.S.T.) Perception of How Important Selected Areas Would Be for Improving Their Overall Ornamental Horticulture Teaching Program.

Area		Percent				
		Very Helpful	Somewhat Helpful	No Opinion	Probably Not Helpful	Waste of Time
Formal Courses:	O.H.T.	40	33	0	7	20
	R.S.T.	66	20	0	14	0
In-Service Training Meetings:	O.H.T.	67	27	0	0	7
	R.S.T.	73	27	0	0	0
Physical Facilities:	O.H.T.	53	27	0	7	13
	R.S.T.	73	27	0	0	0
Interested Students:	O.H.T.	53	27	0	7	13
	R.S.T.	53	40	0	7	0
Instructional Materials:	O.H.T.	60	27	0	7	7
	R.S.T.	73	20	0	7	0

[1]n=15

[2]n=15

Table 3. Comparison of Ornamental Horticulture Teachers[1] (O.H.T.) and Random Sample Teachers[2] (R.S.T.) Description of the Helpfulness of Selected Courses in General Agriculture for Teaching Ornamental Horticulture

Course		Percent				
		Very Helpful	Somewhat Helpful	No Opinion	Probably Not Helpful	Waste of Time
Dairy Science:	O.H.T.	0	7	29	26	21
	R.S.T.	0	0	0	73	27
Animal Husbandry:	O.H.T.	0	14	14	43	21
	R.S.T.	0	0	0	73	27
Poultry Science:	O.H.T.	0	7	29	43	14
	R.S.T.	0	0	0	73	27
Crop Science:	O.H.T.	21	43	29	7	0
	R.S.T.	47	53	0	0	0
Agricultural Economics:	O.H.T.	7	64	7	7	14
	R.S.T.	27	47	13	7	7
Forestry:	O.H.T.	29	57	14	0	0
	R.S.T.	13	73	13	0	0
Fisheries and Wildlife:	O.H.T.	14	14	43	21	7
	R.S.T.	7	20	60	13	0
Agricultural Engineering:	O.H.T.	36	43	14	0	7
	R.S.T.	33	53	0	0	13

[1]n=15

[2]n=15

Table 4. Comparison of Mean Scores for Ornamental Horticulture Teachers (O.H.T.) and Random Sample Teachers (R.S.T.) Answers to Questions Concerning Teaching Experience, Student/Teacher Ratio and Space Available for Growing Plants

Dependent Variable	O.H.T. n=15	R.S.T. n=15
1. Years in present position	7.4	10.3
2. Total years in the teaching profession	11.3	12.3
3. Years teaching ornamental horticulture as a specialized program	4.0	0.0
4. Average student/teacher ratio[1]	23.5	20.5
5. Square feet of greenhouse space	1123.2	165.7
6. Acres of nursery space	4.9	0.1
7. Square feet of classroom space used for growing plants	42.3	23.3

[1]The total number of students taught by the teacher divided by the number of classes taught by that teacher.

Table 5. Comparison of Mean Scores for Perceived Competencies of Ornamental Horticulture Teachers (O.H.T.) and Random Sample Teachers (R.S.T.) to the Importance Industry Representatives Placed on Being Qualified to Teach Selected Areas or Skills

Dependent Variable	I.R. (n=15)	Average of O.H.T. and R.S.T. (n=30)
1. Identifying ornamental plants by common names	3.9	3.3
2. Identifying ornamental plants by scientific names	2.7	2.2
3. Characteristics of more than 5 plant families	2.9	2.6
4. Testing soil samples	2.9	3.3
5. Interpreting soil test results	3.6	3.5
6. The effects of soil structure and texture on plants	3.3	3.7
7. Sterilizing soil: With steam	2.9	2.4
8. Sterilizing soil: With chemicals	3.0	2.4
9. Changing soil pH: Raising the soil pH	3.4	3.6
10. Changing soil pH: Lowering the soil pH	3.4	3.3
11. Soil mixtures for potting	3.3	3.0
12. Understanding the use of mulches	2.9	3.1
13. The use of trace elements	2.9	2.8
14. Planning the proper use of growth regulators	2.9	2.3
15. Understanding how plant nutrients become available in the soil	3.6	3.3

continued

Table 5--Continued

Dependent Variable	I.R. (n=15)	Average of O.H.T. and R.S.T. (n=30)
16. Making fertilizer recommendations for specific plants	3.7	3.1
17. Mixing fertilizers for a specific ratio	2.6	3.0
18. Identifying nutrient deficiencies in plants	3.7	3.2
19. Proper handling of agricultural chemicals	3.9	3.3
20. Insects affecting ornamental plants: Identification of at least ten insects	3.9	2.9
21. Insects affecting ornamental plants: Making recommendations for control	3.9	3.0
22. Diseases affecting ornamental plants: Identification of at least five diseases	3.9	2.5
23. Controlling the greenhouse environment: Regulation of light	3.7	2.7
24. Understanding the cultural requirements of ornamental plants: Greenhouse crops	3.6	2.6
25. Understanding the cultural requirements of ornamental plants: Nursery crops	3.5	2.6
26. Understanding the cultural requirements of ornamental plants: Plants in landscape plantings	3.5	2.9
27. Growing annual bedding plants: Transplanting seedlings	3.6	3.3
28. Cut flowers: Care of the flowers after harvest	3.3	2.3

continued

Table 5--Continued

Dependent Variable	I.R. (n=15)	Average of O.H.T. and R.S.T. (n=30)
29. Flower arranging: A knowledge of basic principles of design	3.1	1.9
30. Flower arranging: Pricing	3.1	1.4
31. Propagating plants by: Grafting	3.1	2.6
32. Propagating plants by: Budding	3.1	2.3
33. Propagating plants by: Layering	3.1	2.3
34. Pruning ornamental plants	3.7	3.1
35. Balling and Burlapping ornamental plants	3.3	3.0
36. Advising customers concerning: Desirable varieties	3.5	2.7
37. Advising customers concerning: Costs of plants	3.2	3.1
38. Advising customers concerning: Care after planting	3.5	3.1
39. Estimating the costs of caring for the mechanical landscaping equipment	3.2	2.1
40. Caring for mechanical landscaping equipment: Repairing	3.1	2.6
41. Caring for mechanical landscaping equipment: Maintaining	3.2	3.0

Table 6. Comparison of Mean Scores for Ornamental Horticulture Teachers (O.H.T.) and Random Sample Teachers (R.S.T.) Perceived Competencies to Teach in Selected Areas

Dependent Variable	O.H.T. (n=15)	R.S.T. (n=15)
1. Identifying ornamental plants by common names	3.7	2.9
2. Identifying ornamental plants by scientific names	2.7	1.7
3. Characteristics of more than 5 plant families	3.2	2.1
4. Testing soil samples	3.5	3.2
5. Interpreting soil test results	3.4	3.5
6. The effects of soil structure and texture on plants	3.8	3.5
7. Sterilizing soil: With steam	3.1	1.7
8. Sterilizing soil: With chemicals	2.9	1.9
9. Changing soil pH: Raising the soil pH	3.7	3.5
10. Changing soil pH: Lowering the soil pH	3.5	3.0
11. Soil mixtures for potting	3.9	2.2
12. Understanding the use of mulches	3.5	2.8
13. The use of trace elements	2.8	2.9
14. Planning the proper use of growth regulators	2.7	1.9
15. Understanding how plant nutrients become available in the soil	3.2	3.4
16. Making fertilizer recommendations for specific plants	3.2	3.0

continued

Table 6--Continued

Dependent Variable	O.H.T. (n=15)	R.S.T. (n=15)
17. Mixing fertilizers for a specific ratio	3.0	2.9
18. Identifying nutrient deficiencies in plants	3.1	3.1
19. Proper handling of agricultural chemicals	3.3	3.5
20. Insects affecting ornamental plants: Identification of at least ten insects	3.3	2.5
21. Insects affecting ornamental plants: Making recommendations for control	3.3	2.7
22. Diseases affecting ornamental plants: Identification of at least five diseases	3.1	1.9
23. Controlling the greenhouse environment: Regulation of light	3.5	1.9
24. Understanding the cultural requirements of ornamental plants: Greenhouse crops	3.3	1.9
25. Understanding the cultural requirements of ornamental plants: Nursery crops	3.1	2.1
26. Understanding the cultural requirements of ornamental plants: Plants in landscape plantings	3.3	2.5
27. Growing annual bedding plants: Transplanting seedling	3.9	2.7
28. Cut flowers: Care of the flowers after harvest	3.1	1.6
29. Flower arranging: A knowledge of basic principles of design	2.5	1.3
30. Flower arranging: Pricing	2.1	1.2
31. Propagating plants by: Grafting	2.9	2.4

continued

Table 6--Continued

Dependent Variable	O.H.T. (m=15)	R.S.T. (n=15)
32. Propagating plants by: Budding	2.6	2.0
33. Propagating plants by: Layering	3.3	2.0
34. Pruning ornamental plants	3.6	2.6
35. Balling and Burlapping ornamental plants	3.4	2.5
36. Advising customers concerning: Desirable varieties	3.2	2.3
37. Advising customers concerning: Costs of plants	3.0	1.8
38. Advising customers concerning: Care after planting	3.5	2.7
39. Estimating the costs of caring for the mechanical landscaping equipment	2.4	1.7
40. Caring for mechanical landscaping equipment: Repairing	2.7	2.5
41. Caring for mechanical landscaping equipment: Maintaining	3.3	2.7

Table 7. Comparison of Mean Scores for Ornamental Horticulture Teachers (O.H.T.) and Random Sample Teachers (R.S.T.) Perceived Need for Additional Formal Education

Dependent Variable	O.H.T. (n=15)	R.S.T. (n=15)
1. Helpfulness of more formal courses in ornamental horticulture and related fields	4.4	4.9
2. More formal training in: Floriculture	4.1	4.5
3. More formal training in: Woody Ornamentals	4.4	4.8
4. More formal training in: Botany	3.3	3.7
5. More formal training in: Plant Physiology	3.3	3.9
6. More formal training in: Turfgrass Management	4.3	4.9
7. More formal training in: Entomology	4.3	4.1
8. More formal training in: Pathology	4.2	4.0
9. More formal training in: Soil Science	3.9	4.1
10. More floriculture training in: Cultural requirements of greenhouse crops	4.3	4.3
11. More floriculture training in: Controlling the greenhouse environment	4.1	4.4
12. More floriculture training in: Flower Arranging	3.8	3.7
13. More floriculture training in: Indoor Plant Culture	3.9	4.5
14. More ornamental training in: Landscape maintenance	3.9	4.7
15. More ornamental training in: Landscape design	4.3	4.8

continued

Table 7--Continued

Dependent Variable	O.H.T. (n=15)	R.S.T. (n=15)
16. More ornamental training in: Identification and characteristics of plants	3.9	4.7
17. More ornamental training in: Nursery management	4.1	4.6
18. More ornamental training in: Garden Center management	3.9	4.0
19. Best formal education background	2.8	3.2
20. Recommend your kind and amount of formal education	1.5	1.1
21. Importance of formal courses	3.7	4.3
22. Importance of in-service training meetings	4.5	4.7
23. Importance of physical facilities	4.0	4.7
24. Importance of interested students	4.0	4.4
25. Importance of instructional materials	4.3	4.6

Table 8. Comparison of Mean Scores for Ornamental Horticulture Teachers (O.H.T.) and Random Sample Teachers (R.S.T.) Perception of How Helpful Occupational Experience in Specific Areas Would Be for a Person Preparing to Teach Ornamental Horticulture

Dependent Variable	O.H.T. (n=15)	R.S.T. (n=15)
1. Work experience in: Greenhouse	5.0	4.8
2. Work experience in: Florist shop	3.9	3.7
3. Work experience in: Nursery production	4.9	4.9
4. Work experience in: Garden center	4.5	4.7
5. Work experience in: Farming	3.2	3.9
6. Should work experience in an ornamental horticulture business be required before teaching	2.0	1.8
7. Length of work experience	2.3	1.3