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COMPARISON OF CERTAIN ABILITIES NEEDED BY WORKERS IN LICENSED NURSERIES AND LICENSED ORNAMENTAL HORTICULTURE BUSINESSES.

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THIS STUDY WAS CONDUCTED TO DETERMINE THE EXTENT TO WHICH WORKERS WITH THE JOB TITLES OF GENERAL DIRECTORS, SALESMEN, SUPERVISORS, AND FIELD WORKERS IN LICENSED NURSERIES NEEDED AGRICULTURALLY ORIENTED KNOWLEDGE OF THE SAME KIND AND LEVEL AS WORKERS IN COMPARABLE JOB TITLES IN ORNAMENTAL HORTICULTURE BUSINESSES. DATA WERE COLLECTED BY PERSONAL INTERVIEWS FROM 160 EMPLOYEES OF 20 LICENSED NURSERIES AND 20 LICENSED ORNAMENTAL HORTICULTURE BUSINESSES SUFFICIENTLY LARGE TO EMPLOY ALL FOUR TYPES OF PERSONS IN A FOUR-COUNTY AREA OF NORTHEAST ILLINOIS. IT WAS CONCLUDED THAT SOME BASIC COURSES AND SOME SPECIALIZED COURSES ARE NEEDED FOR THE FOUR TYPES OF JOBS IN BOTH BUSINESSES. BASIC HORTICULTURE 1 AND 2, AGRICULTURAL CHEMICALS 1, AND SOILS 1 WERE RECOMMENDED FOR ALL WORKERS. FOR GENERAL DIRECTORS, SALESMEN, AND SUPERVISORS, HORTICULTURE 3, AGRICULTURAL CHEMICALS 2, FLORICULTURE 1, AND SOILS 2 WERE RECOMMENDED. FOR GENERAL DIRECTORS AND SALESMEN, HORTICULTURE 4, FLORICULTURE 2, AND SOILS 3 WOULD BE ADDED. COURSES IN HORTICULTURE, SOILS, AND FLORICULTURE AT DIFFERENT LEVELS OF SPECIALIZATION WERE RECOMMENDED FOR WORKERS ACCORDING TO POSITION AND FIELD. A BIBLIOGRAPHY, AN EXAMPLE FROM THE QUESTIONNAIRE, AND DATA ARE INCLUDED. THIS IS AN ABRIDGED VERSION OF AN ED.D. THESIS SUBMITTED TO THE UNIVERSITY OF ILLINOIS. THE COMPLETE STUDY IS AVAILABLE AS 65-7090 FOR $3.40 ON MICROFILM AND FOR $11.95 AS XEROXED COPY FROM UNIVERSITY MICROFILMS, INC., 300 NORTH ZEEB ROAD, ANN ARBOR, MICHIGAN 48106. (JM)

REPORT OF A STUDY

COMPARISON OF CERTAIN ABILITIES NEEDED BY WORKERS IN LICENSED NURSERIES AND LICENSED ORNAMENTAL HORTICULTURE BUSINESSES

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FOREWARD

This publication has been prepared to provide interested persons with an abriged version of the original research report. The study, while in technical education in agriculture, has implications in all fields of technical education.

The research was specific in nature. The bulk of the past research to determine educational needs of workers in non-farm agricultural jobs has been global in nature, and has been based on survey procedures which identified rather broad agricultural and technical competencies. The primary emphasis in this study was the extent to which workers with four different job titles in licensed nurseries; namely, general directors, salesmen, supervisors, and field workers, needed agriculturally oriented knowledge of the same kind and level as needed by workers in four comparable job titles in licensed ornamental horticulture businesses. From these kind of data, basic and specialized courses for workers in both types of horticulture businesses can be planned.

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COMPARISON OF CERTAIN ABILITIES NEEDED BY WORKERS IN LICENSED NURSERIES AND LICENSED ORNAMENTAL HORTICULTURE BUSINESSES[1]

By Roy D. Dillon

Statement of the Problem

The purpose of the study was to determine whether separate and specialized agriculture courses are needed:

1. For workers in nurseries and for workers in ornamental horticulture businesses.
2. For workers in each of the primary job titles in nurseries: general director, salesman, supervisor, and field worker.
3. For workers in each of the primary job titles in ornamental horticulture businesses: general director, salesman, supervisor, and field worker.

If separate and specialized courses are needed, an additional purpose was to determine the content of these courses.

Definition of the Problem

Need for the Study

Information obtained from available literature indicated the following trends:

1. The number of nurseries licensed to grow and wholesale nursery plants in Illinois has increased 31.7 per cent during the past five years.
2. The number of dealers licensed to retail nursery stock in Illinois has increased 25 per cent during the past five years.
3. There has been an increase in the number of workers in horticulture firms, and increasing employment opportunities for horticultural workers in park districts, golf courses, in cemeteries, on state highway department staffs, and on institutional staffs.

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[1] Roy D. Dillon, "Comparison of Certain Abilities Needed by Workers in Licensed Nurseries and Licensed Ornamental Horticulture Businesses," Thesis, Ed. D., Library, University of Illinois, Urbana, Illinois, 1965. 255 p.

4. Present and projected manpower utilization data show that people in the 16-24 age group who have appropriate marketable skills in the ornamental horticultural area will be in demand.

According to the study, Technical Education in and for Rural Areas,[2] many horticultural workers need post-nigh school education in horticultural technology. The factor analysis of the data in the Technical Education in and for Rural Areas study revealed that general directors, salesmen, supervisors, and field workers needed ability in the same four general areas of agricultural knowledge: (1) horticulture, (2) agricultural chemicals, (3) floriculture, and (4) soils. Detailed information is needed regarding items of knowledge within these four rather broad areas before educational programs can be planned for present and prospective workers in nurseries and ornamental horticulture businesses.

Hypotheses

The preceeding development of the problem produced the following null-hysotheses:

#1. There is no significant difference in the kind of knowledge needed be workers studied in licensed nurseries and by workers studied in licensed ornamental horticulture businesses in the following four areas:

a) horticulture
b) agricultural chemicals
c) floriculture
d) soils

#2. There is no significant difference among the means of groups of items of knowledge in agriculture for general directors, salesmen, supervisors, and field workers in licensed nurseries in the following four areas:

a) horticulture
b) agricultural chemicals
c) floriculture
d) soils

#3. There is no significant difference among the means of groups of items of knowledge in agriculture for general directors, salesmen, supervisors, field workers in licensed ornamental horticulture businesses in the following four areas:

a) horticulture
b) agricultural chemicals
c) floriculture
d) soils

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2 Lloyd J. Phipps, et al., "Technical Education in and for Rural Areas," Agricultural Education Division, Vocational and Technical Education Department, College of Education, University of Illinois, Urbana, Illinois, 1964. pp. 21-24.

The Procedure for Conducting the Study

The Major Tasks in Conducting the Study

The study involved three major tasks:

1. The development of a list of agricultural knowledges in horticulture, agricultural chemicals, floriculture, and soils.

2. The interviewing of head-workers in the four job titles of general director, salesman, supervisor, and field worker from a random sample of twenty licensed nurseries and from a random sample of twenty licensed ornamental horticulture businesses. Each worker assigned a score to each item of knowledge listed on a questionnaire shown in the appendix. The score was to denote a judgment as to the level of knowledge needed by the worker.

3. The statistical analysis of the data to determine the relationships of the items of knowledge in agriculture:

   a) between workers in licensed nurseries and in licensed ornamental horticulture businesses with comparable job titles.

   b) among workers in licensed nurseries with the following job titles:

      1) general director
      2) salesman
      3) supervisor
      4) field worker

   c) among workers in licensed ornamental horticulture businesses with the following job titles:

      1) general director
      2) salesman
      3) supervisor
      4) field worker

The Dependent Variables

The instrument used in the study contained a list of one-hundred items of knowledge in the areas of (1) horticulture, (2) agricultural chemicals, (3) floriculture, and (4) soils. The individual items of knowledge were developed from the literature and after consultation with post-high school teachers of horticulture, agricultural chemicals, floriculture, and soils. Final selection of the items of knowledge was based on the investigator's judgment of those most relevant to the job titles being studied. Care was taken to build a questionnaire which was readable and concise, and which could be administered. Before the questionnaire was used in the field, it was administered on a trial basis to determine whether the instrument was satisfactory for use in the study.

Each dependent variable was a YES or NO answer judgmentally assigned to each item of knowledge in agriculture. The following instructions were given to each respondent:

1. Indicate whether you need a knowledge of the activity in your job by checking YES or NO in column #1 on the checklists.

2. If you answered YES in column #1, indicate in column #2 the degree of ability you need in performing this activity by checking a, b, c, or d in column #2 on the checklists:

   a) None (a worker who checked a said he needed a basic awareness of this activity but did not perform the activity in his job).

   b) I perform this activity with supervision.

   c) I perform this activity without supervision.

   d) I perform this activity without supervision so well that my performance may be used to instruct others.

As each item of knowledge was treated independently, there was, in fact, a total of one-hundred dependent variables.

In order to test hypothesis #2 and #3, numerical values were assigned to workers' responses for each item of knowledge in agriculture on the following basis:

0 = a no response in column #1 on the checklist.

1 = a yes response in column #1, and a column 2a response on the checklist.

2 = a yes response in column #1, and column 2b response on the checklist.

3 = a yes response in column #1, and a column 2c response on the checklist.

4 = a yes response in column #1, and a column 2d response on the checklist.

The Selection of the Sample

For this study, a four-county area in north-east Illinois, near Chicago, was selected by the investigator. The counties selected were Dupage, Kane, Kankakee, and Will. The four counties were selected because, according to horticultural experts, many large horticulture businesses have become established in and near large population centers. Further, educational leaders in public schools in urban areas are becoming interested in developing curriculums to prepare horticulture workers. The author believed that the data used for this study should be obtained from the area where new curriculums in horticulture are most likely to be offered.

In determining the two populations to sample, the author secured the most recent list of horticulture firms licensed to grow, wholesale, retail, plan landscapes, install, or service the planting and installation of nursery stock in Illinois. This list is prepared annually by the Division of Plant Industry, Illinois Department of Agriculture. From the overall list, two separate lists were developed.

The first major list contained licensed nurseries; all firms licensed to grow and wholesale nursery stock in Illinois. The problem arose of how to obtain licensed nurseries large enough to have workers with all of the four job titles: general director, salesman, supervisor, and field worker. After consultation with a jury from the Division of Plant Industry, Illinois Department of Agriculture, the author decided to include only those licensed nurseries that had four or more acres of land devoted to the growing of nursery stock. From this list of licensed nurseries in Illinois with four or more acres, a sub-list of those in Dupage, Kane, Kankakee, and Will counties was compiled.

The second major list contained licensed ornamental horticulture businesses; all firms licensed in Illinois to retail nursery stock, plan landscapes, and install or service nursery stock. This group of licensed ornamental horticulture businesses was narrowed to include only those in the four county area used for the population universe of licensed nurseries. A jury from the Division of Plant Industry, Illinois Department of Agriculture, designated the ornamental horticulture businesses large enough to contain the job titles of general director, salesman, supervisor, and field worker.

A total of fifty-eight licensed nurseries and thirty-nine licensed ornamental horticulture businesses were located in the region of study. The two lists were checked to determine whether any firms appeared in both lists. The two lists were found to be mutually exclusive. Twenty firms were randomly selected from each of the two types of horticulture businesses, licensed nurseries, and licensed ornamental horticulture businesses.

The Collection of the Data

The data for this study were collected by the investigator through personal interviews with one-hundred sixty individuals in the forty businesses sampled. The investigator contacted the head-worker, or worker with seniority, in each of the job titles of general director, salesman, supervisor, and field worker in the twenty licensed nurseries and in the twenty licensed ornamental horticulture businesses selected for study. The objectives of the study and the instrument being used were explained to each worker. At the time of the interview, the worker was asked to assign scores judgmentally for the items of knowledge according to the directions outlined on the front cover of the instrument.

Analytical Procedures

The facilities of the Statistical Services Unit and the Digital Computer Center at the University of Illinois were available to the investigator for the analysis of the data for all three null-hypotheses. In these analyses, the author made use of the I.B.M. auxillary equipment and I.B.M. 1401 electronic computer, and an I.B.M. 7090 electronic computer.

The procedure for the statistical analysis of the data for each of the three null-hypotheses was:

For #1: A "z" test for difference in proportions was used for null-hypothesis #1 to enable the investigator to determine whether significant differences existed in the kinds or knowledge in agriculture needed by workers with comparable job titles in licensed nurseries and in licensed ornamental horticulture businesses.

For #2: A one-by-four- analysis of variance was used for null-hypothesis #2 to enable the investigator to determine whether significant differences existed among the means of groups of items of knowledge in agriculture across the four job titles of general director, salesman, supervisor, and field worker in licensed nurseries.

For #3: A one-by-four analysis of variance test was used for null-hypothesis #3 to enable the investigator to determine whether significant differences existed among the means of groups of items of knowledge in agriculture across the four job titles of general director, salesman, supervisor, and field worker in licensed ornamental horticulture businesses.

The Analysis of the Data

The author has reported those major findings which he considered to be of major interest, and those which will deplict the research procedure used.[3]

Findings for Null-Hypothesis #1:

1. For general directors the "z" statistic was significant for ten of the one-hundred items of knowledge in agriculture. Table 1 and Table 2 are included to show the method of reporting the "z" scores pertaining to general directors. The same procedure was used for reporting "z" scores pertaining to salesmen, supervisors, and field workers.

2. For salesmen the "z" statistic was significant for twelve of the one-hundred items of knowledge in agriculture.

3. For supervisors the "z" statistic was significant for two of the one-hundred items of knowledge in agriculture.

4. For field workers the "z" statistic was significant for four of the one-hundred items of knowledge in agriculture.

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[3] A complete report of this research is available through the inter-library loan system from the University of Illinois Library and from University Microfilms.

TABLE 1

ITEMS OF KNOWLEDGE IN AGRICULTURE WITH SIGNIFICANT "z" SCORES[a] FOR NULL-HYPOTHESIS #1, AS IT PERTAINS TO GENERAL DIRECTORS IN LICENSED NURSERIES AND IN LICENSED ORNAMENTAL HORTICULTURE BUSINESSES[b]

Item of Knowledge in Agriculture	"z" Score for General Directors[c]	
	Licensed Nurseries	Licensed Ornamental Horticulture Businesses
HORTICULTURE AREA OF KNOWLEDGE:		
1. Performing field experiments with cultural methods, insect, and pest control methods	2.983	-----
2. Establishing and restoring grass on the lawn	-----	1.976
3. Transplanting fruit trees and small fruits	-----	1.976
AGRICULTURAL CHEMICALS AREA OF KNOWLEDGE:		
4. Determining use of granular vs liquid agricultural chemicals for weed control	-----	2.497
5. Planning weed and insect control programs for flowers, trees, and ornamental plants	-----	1.976
6. Applying agricultural chemicals to control diseases and insects on fruits, vegetables, and flowers	-----	2.025
7. Planning seasonal growing schedules for flowers and flowering plants, for customers	-----	2.559
8. Selling flowers and flowering plants ...	-----	2.225
9. Planting flowers and flowering plants for customers	-----	2.860
SOILS AREA OF KNOWLEDGE:		
10. Determining practices needed on woodland, wildlife areas, and recreational areas	-----	1.959

TABLE 1 (continued)

a) The level of significance was .05.

b) For null-hypothesis #1, the sub-hypothesis pertaining to general directors was: there is no significant difference in the kind of knowledge needed by workers studied in licensed nurseries and by workers studied in licensed ornamental horticulture businesses in the following four areas: (1) horticulture, (2) agricultural chemicals, (3) floriculture, (4) soils.

c) The "z" score represents the results of the "z" test for the sub-hypothesis. Each "z" score was based on the number of yes responses of twenty general directors in licensed nurseries and twenty general directors in licensed ornamental horticulture businesses for an item of agricultural knowledge. The "z" score is listed under the type of horticulture business having the highest proportion of yes responses for that item of knowledge.

TABLE 2

ITEMS OF KNOWLEDGE IN AGRICULTURE WITH "z" SCORES NOT SIGNIFICANT[a] FOR NULL-HYPOTHESIS #1, AS IT PERTAINS TO GENERAL DIRECTORS IN LICENSED NURSERIES AND IN LICENSED ORNAMENTAL HORTICULTURE BUSINESS[b]

Item of Knowledge in Agriculture[d]	"z" Score for General Directors[c]	
	Licensed Nurseries	Licensed Ornamental Horticulture Businesses
HORTICULTURE AREA OF KNOWLEDGE:		
1. Identifying fruit and vegetable varieties	-----	.953
2. Identifying varieties of ornamental plants and trees	-----	0.000
3. Identifying diseases, insects, and other pests on fruits and vegetables..	-----	.316
4. Planning sanitation practices, and disease and insect control programs for fruits and vegetables	.316	-----
5. Identifying diseases, insects, and other pests on trees and ornamental plants	-----	.527
6. Planning sanitation practices, and disease and insect control programs for trees and ornamental plants	-----	.395
7. Performing field experiments with new varieties of fruits, vegetables, and ornamental plants	1.416	-----
8. Recognizing plant nutrient deficiency symptoms	.725	-----
9. Planning programs for supplying nutrient needs of fruits and vegetables	-----	.316
10. Planning programs for supplying nutrient needs of trees and ornamental plants	-----	.527
11. Applying fertilizer, limestone and nitrogen materials	-----	.725

TABLE 2 (continued)

Item of Knowledge in Agriculture [d]	"z" Score for General Directors [c]: Licensed Nurseries	Licensed Ornamental Horticulture Businesses
HORTICULTURE AREA OF KNOWLEDGE: (continued)		
12. Supplying organic matter to soils	-----	0.000
13. Planning a landscape design	-----	.757
14. Planning a fruit garden	-----	.984
15. Advising customers on desirable varieties of trees and ornamental shrubs, and their costs	-----	0.000
16. Estimating time and price for landscaping contract jobs	-----	.395
17. Advising customers on landscape planning problems	-----	1.581
18. Selling fruit trees and vegetable plants	-----	.994
19. Selling shrubs, trees, and other ornamental plants	-----	.527
20. Growing and care of sod in the nursery	.345	-----
21. Grading and sodding lawns	-----	0.000
22. Pruning ornamental shrubs and trees	-----	0.000
23. Pruning and grafting fruit trees and small fruits	.994	-----
24. Planting trees and shrubs	-----	.956
25. Removing trees	-----	.633
26. Performing tree surgery	-----	1.266
27. Identifying weeds in the nursery or in the lawn	-----	0.000
28. Controlling weeds in the nursery or in the lawn	-----	0.000

TABLE 2 (continued)

Item of Knowledge in Agriculture [d]	"z" Score for General Directors [c]: Licensed Nurseries	Licensed Ornamental Horticulture Businesses
HORTICULTURE AREA OF KNOWLEDGE: (continued)		
29. Maintaining, adjusting, and caring for mechanical equipment	.527	-----
30. Repairing mechanical equipment	0.000	-----
31. Performing annual care of residential and commercial lawns and landscapes..	-----	.968
32. Performing annual care of small fruits	-----	1.581
33. Determining correct time to plant trees and shrubs	-----	.725
34. Balling and burlapping trees and shrubs	-----	0.000
35. Shipping and storing trees and shrubs	-----	1.581
36. Harvesting and storing fruits and vegetables	-----	.443
37. Growing strawberries	-----	.956

a) The level of significance was .05.

b) For null-hypothesis #1, the sub-hypothesis pertaining to general directors was: there is no significant difference in the kind of knowledge needed by workers studied in licensed nurseries and by workers studied in licensed ornamental horticulture businesses in the following four areas: (1) horticulture, (2) agricultural chemicals, (3) floriculture, (4) soils.

c) The "z" score represents the results of the "z" test for the sub-hypothesis. Each "z" test was based on the number of yes responses of twenty general directors in licensed nurseries and twenty general directors in licensed ornamental horticulture businesses for an item of agricultural knowledge. The "z" score is listed under the type of horticulture business having the highest proportion of yes responses for that item of knowledge.

d) Only the items of knowledge in the horticulture area of knowledge are included in this abridged report.

Groups of Items of Knowledge in Agriculture for Testing Hypotheses #2 and #3

Before testing hypotheses #2 and #3, nineteen groups of items of knowledge in agriculture were developed from the one-hundred items of knowledge in agriculture. The grouping of the items of knowledge was done to: (1) make possible the use of a more powerful statistical test than would have been possible if one item of knowledge had been tested at a time,[4] and (2) facilitate curriculum planning. A statistical "F" test for the job titles of general director, salesman, supervisor, and field worker on one item of knowledge in agriculture would have been weak compared to the same test across a group of items of knowledge in agriculture.[5] In addition, it was considered impractical to test across an entire area of knowledge in agriculture, such as horticulture. Such a hetrogeneous grouping of items of knowledge in agriculture would probably produce some significant results on the "F" test because of errors of chance.[6] In the grouping of items of knowledge an attempt was made to obtain groups as large as possible that empirically would be homogeneous.

The forty items of knowledge in horticulture were divided into seven groups; the twenty-two items of knowledge in agricultural chemicals were divided into three groups; the seventeen items of knowledge in floriculture were divided into five groups; and the twenty-one items of knowledge in soils were divided into four groups. The size of the groups ranged from three to ten items of knowledge per group, the average being five and three-tenths items of agricultural knowledge per group.

In grouping the items of knowledge in agriculture, the investigator and a specialist in agricultural education used a logical approach. The grouping was based on: (1) type of activity, and (2) level of responsibility. The items of knowledge in agriculture were first grouped in terms of the activities they implied. For example, group A in horticulture contained six items of knowledge in agriculture concerning identification. General directors, salesmen, supervisors, and field workers who used part or all of these six items of knowledge would need to understand differences among horticultural plants and be able to point out distinguishing characteristics of the plants being identified. This procedure grouped the items of knowledge in the ways they would be used by the workers. Other activity groupings were related to: (1) planning, (2) selecting, (3) operation, (4) decision-making, and (5) performing.

The groups of items of knowledge which were determined on the basis of the first criteria, were then further inspected to determine whether the groups could be further subdivided on the basis of level of responsibility. Smaller groups were developed only if the items of knowledge in a group could be associated with the responsibility of a certain job title being studied or a certain combination of job titles being studied. For example, group C in horticulture contained five items of knowledge in agriculture dealing with landscape planning. These five items imply the decision-making and planning activities usually associated with general directors and salesmen.

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[4] Allen L. Edwards, Statistical Methods for the Behavioral Sciences, New York: Holt, Rinehart and Winston, 1961. pp. 315-329.

[5] Ibid.

[6] Ibid.

The level of responsibility grouping was based on the rationale that a worker who performs the job of general director, salesman, supervisor, or field worker tends to perform certain tasks special to the particular job. That is, general directors are largely responsible for management, major operating decisions and associated activities; salesmen are largely responsible for sales planning, promotion decisions and associated activities; supervisors are largely responsible for field and greenhouse operation, maintenance decisions and associated activities; and field and greenhouse workers are largely responsible for the operation and performance jobs in the horticulture business.

Findings for Null-Hypothesis #2:

For null-hypothesis #2 the "F: statistic was significant for seventeen of the nineteen groups of items of knowledge in agriculture that were studied. For each group of items of knowledge for which the "F" test was significant, the Duncan's Multiple Range Test was applied to determine which of the job title group means were significantly different.[7] The shortest significant ranges were based on significant studentized ranges for Duncan's New Multiple Range Test with alpha = .01.[8] Table 3 is included to show the procedure for reporting the results of the "F" test for each group of items of knowledge in agriculture for hypothesis #2. The same procedure was used for reporting the results of hypothesis #3.

Findings for Null-Hypothesis #3:

For null-hypothesis #3 the "F" statistic was significant for all of the nineteen groups of agriculture knowledge studied. For each group of items of knowledge for which the "F" test was significant the Duncan's Multiple Range Test was applied to determine which of the job title group means were significantly different.[9] The shortest significant ranges were based on significant studentized ranges for Duncan's New Multiple Range Test with alpha = .01.[10]

The Conclusions

Conclusions for Hypotheses #1:

The conclusions for hypotheses #1 for general directors, salesmen, supervisors, and field workers were based on certain practical decisions as well as statistical results. The purpose of the "z" test was, with an alpha level of .05, to determine whether differences that could not be accounted for by chance existed concerning the items of knowledge in agriculture needed by workers with comparable job titles in licensed nurseries and in licensed ornamental horticulture businesses. Whether or not an item of knowledge was significant, the investigator examined it to determine whether that item of knowledge was needed by one or both groups of workers being studied. It

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[7] Allen L. Edwards, Experimental Design in Psychological Research, Chicago: Holt, Rinehart and Winston, 1963. pp. 136-140

[8] Ibid., p. 374.

[9] Ibid., pp. 136-140.

[10] Ibid., p. 374.

TABLE 3

"F" RATIOS SIGNIFICANT[a] FOR HYPOTHESIS #2[b] FOR GROUPS OF ITEMS OF KNOWLEDGE IN AGRICULTURE AMONG FOUR JOB TITLES[c] IN LICENSED NURSERIES

Group of Items of Knowledge[h]	Job Title Group Means[d]				Critical "F"[e]	"F" Ratio[f]
	General Director	Salesman	Supervisor	Field Worker		
HORTICULTURE AREA OF KNOWLEDGE:						
Group A:						
1. Identifying fruit and vegetable varieties...						
2. Identifying varieties of ornamental plants and trees.....						
3. Identifying diseases, insects and other pests on fruits and vegetables.....						
4. Identifying diseases, insects and other pests on trees and ornamental plants.....	2.791	1.541	1.667	.958	2.620	38.866
5. Recognizing plant nutrient deficiency symptoms.....						
6. Identifying weeds in the nursery or in the lawn.....						
AGRICULTURAL CHEMICALS AREA OF KNOWLEDGE:						
Group A:						
1. Identifying name and function of agricultural chemicals.....						
2. Identifying the toxic effects of some agricultural chemicals on horticultural plants..						
3. Selecting proper weedicides for weed control programs.....	2.583	.975	1.208	.333	2.620	83.704

[g]

TABLE 3 (continued)

Group of Items of Knowledge[h]	Job Title Group Means[d] General Director	Salesman	Supervisor	Field Worker	Critical "F"	"F" Ratio[f]
AGRICULTURAL CHEMICALS AREA OF KNOWLEDGE: (continued)						
4. Selecting proper agricultural chemicals for plant disease control programs.....						
5. Planning weed and insect control programs for flowers, trees, and ornamental plants.....						
6. Planning purchasing programs for securing agricultural chemicals.....						
FLORICULTURE AREA OF KNOWLEDGE:						
Group A:						
1. Identifying varieties of flowers and flowering plants						
2. Identifying diseases, insects, and other pests on flowers and flowering plants....	1.840	.970	.580	.280	2.640	22.168
3. Recognizing plant nutrient deficiency symptoms on flowers and flowering plants						
SOILS AREA OF KNOWLEDGE:						
Group B:						
1. Taking soil samples.	1.438	.688	.838	.488	2.630	10.234
2. Testing soil samples						
3. Testing plant tissue						
4. Reading soil tests..						

[g]

TABLE 3 (continued)

a) The significance point was .05.

b) Hypothesis #2 was: there is no significant difference among the means of groups of items of knowledge in agriculture for general directors, salesmen, supervisors, and field workers in licensed nurseries in the following four areas: (1) horticulture, (2) agricultural chemicals, (3) floriculture, and (4) soils.

c) The job titles were: (1) general director, (2) salesman, (3) supervisor, (4) field worker.

d) The job title group means were the means of the observed scores in each group of items of knowledge in agriculture for the job titles of general director, salesman, supervisor, and field worker. The observed scores within a group of items of knowledge were summed for each job title.

e) The critical "F" was that "F" ratio at the .05 point in the right tail of the "F" curve, to the right of which the "F" ratio was significant. That is, an "F" ratio larger than the Critical "F" was significant.

f) The "F" ratio was the "F" statistic calculated by dividing the mean square between the groups of (1) general directors, (2) salesmen, (d) supervisors, and (4) field workers by the mean square within the same four groups.

g) Those job title group means underlined or connected with a line of dashes were found not to differ significantly at the .01 point, according to Duncan's New Multiple Range Test.

h) The results of the "F" test for only one group of items of knowledge in each of the four areas of knowledge in agriculture are included in this abridged report.

seemed reasonable to the investigator that an item of knowledge should be considered as needed by general directors, salesmen, supervisors, or field workers if as many as six workers in a job group said they needed an item of knowledge, whether there was or was not a significant difference on the "z" test for that item of knowledge.

This criterion of six yes responses out of a possible twenty was adopted after a careful examination of the number of general directors, salesmen, supervisors, and field workers in licensed nurseries and licensed ornamental horticulture businesses who said they needed each item of knowledge in agriculture. From the basic data, histograms were prepared which showed the number of general directors, salesmen, supervisors, and field workers in both types of horticulture businesses who responded yes for each of the one-hundred items of knowledge in agriculture. These histograms indicated that the frequency of yes responses for general directors, salesmen, supervisors, and field workers tended to cluster either above or below six yes responses out of the twenty possible. Further, the investigator observed that the workers interviewed appeared to hold multi-functional jobs in multi-functional horticulture businesses. This indicated that the chances were high that workers used a variety of agricultural knowledge in their jobs.

Because of the foregoing rationale, there appeared to be sufficient justification for considering items of knowledge in agriculture as being needed by all general directors, or salesmen, or supervisors, or field workers, if six or more general directors, or salesmen, or supervisors, or field workers said they needed the item of knowledge, regardless of statistical outcomes. It was believed that this decision would insure that curriculums planned from the data would include the items of knowledge in agriculture that workers require.

A. Conclusions Pertaining to General Directors

Based on the data collected and the practical decisions relating to the need for an item of knowledge, the investigator concluded the following:

1. Eighty-four items of knowledge in agriculture were identified as needed by general directors in both licensed nurseries and licensed ornamental horticulture businesses.

   a) For seventy-six items of knowledge in agriculture for which the "z" scores were not significant, six or more general directors in both licensed nurseries and licensed ornamental horticulture businesses said they needed each of the items of knowledge.

   b) For eight of the ten items of knowledge in agriculture for which the "z" scores were significant, six or more general directors in both licensed nurseries and licensed ornamental horticulture businesses said they needed each of the eight items of knowledge.

2. Six items of knowledge in agriculture were identified as needed by general directors in licensed nurseries but not needed by general directors in licensed ornamental horticulture businesses.

   a) For one item of knowledge in agriculture, the difference between the six or more general directors in licensed nurseries who said they needed the item of knowledge and the five or fewer general directors in licensed ornamental horticulture

businesses who said they needed the item of knowledge was wide enough to be statistically significant.

b) For five items of knowledge in agriculture for which the "z" scores were not significant, six or more general directors in licensed nurseries said they needed each of the items of knowledge while five or fewer general directors in licensed ornamental horticulture businesses said they needed each of the items of knowledge.

3. Two items of knowledge in agriculture were identified as needed by general directors in licensed ornamental horticulture businesses but not needed by general directors in licensed nurseries.

a) For one item of knowledge in agriculture, the difference between the six or more general directors in licensed ornamental horticulture businesses who said they needed the item of knowledge and the five or fewer general directors in licensed nurseries who said they needed the item of knowledge was wide enough to be statistically significant.

b) For one item of knowledge in agriculture for which the "z" score was not significant, six or more general directors in licensed ornamental horticulture businesses said they needed the item of knowledge while five or fewer general directors in licensed nurseries said they needed the item of knowledge.

4. Eight items of knowledge in agriculture were identified as not needed by either of the two groups of general directors studied.

B. Conclusions Pertaining to Salesmen

Based on the data collected and the practical decisions relating to the need for an item of knowledge, the investigator concluded the following:

1. Seventy-six items of knowledge in agriculture were identified as needed by salesmen in both licensed nurseries and licensed ornamental horticulture businesses.

a) For sixty-four items of knowledge in agriculture for which the "z" scores were not significant, six or more salesmen in both licensed nurseries and licensed ornamental horticulture businesses said they needed each of the items of knowledge.

b) For all twelve of the items of knowledge in agriculture for which the "z" scores were significant, six or more salesmen in both licensed nurseries and licensed ornamental horticulture businesses said they needed each of the twelve items of knowledge.

2. Eight items of knowledge in agriculture were identified as needed by salesmen in licensed nurseries but not needed by salesmen in licensed ornamental horticulture businesses. For these eight items of knowledge in agriculture for which the "z" scores were not significant, six or more salesmen in licensed nurseries said they needed each of the items of knowledge while five or fewer salesmen in licensed ornamental horticulture businesses said they needed each of the items of knowledge.

3. Five items of knowledge in agriculture were identified as needed by salesmen in licensed ornamental horticulture businesses but not needed by salesmen in licensed nurseries. For these five items of knowledge in agriculture for which the "z" scores were not significant six or more salesmen in licensed ornamental horticulture businesses said they needed each of the items of knowledge while five or fewer salesmen in licensed nurseries said they needed each of the items of knowledge.

4. Only eleven items of knowledge in agriculture were identified as not needed by either of the two groups of salesmen studied.

C. Conclusions Pertaining to Supervisors

Based on the data collected and the practical decisions relating to the need for an item of knowledge, the investigator concluded the following:

1. Fifty-seven items of knowledge in agriculture were identified as needed by supervisors in both licensed nurseries and licensed ornamental horticulture businesses. That is, for fifty-seven items of knowledge for which the "z" scores were not significant, six or more supervisors in both licensed nurseries and licensed ornamental horticulture businesses said they needed each of the items of knowledge.

2. Sixteen items of knowledge in agriculture were identified as needed by supervisors in licensed nurseries but not needed by supervisors in licensed ornamental horticulture businesses.

   a) For one item of knowledge in agriculture, the difference between the six or more supervisors in licensed nurseries who said they needed the item of knowledge and the five or fewer supervisors in licensed ornamental horticulture businesses who said they needed the item of knowledge was wide enough to be statistically significant.

   b) For fifteen items of knowledge in agriculture for which the "z" scores were not significant, six or more supervisors in licensed nurseries said they needed each of the items of knowledge while five or fewer supervisors in licensed ornamental horticulture businesses said they needed each of the items of knowledge.

3. Six items of knowledge in agriculture were identified as needed by supervisors in licensed ornamental horticulture businesses but not needed by supervisors in licensed nurseries.

   a) For one item of knowledge in agriculture, the difference between the six or more supervisors in licensed ornamental horticulture businesses who said they needed the item of knowledge and the five or fewer supervisors in licensed nurseries who said they needed the item of knowledge was wide enough to be statistically significant.

b) For five items of knowledge in agriculture for which the "z" scores were not significant, six or more supervisors in licensed ornamental horticulture businesses said they needed each of the items of knowledge while five or fewer supervisors in licensed nurseries said they needed each of the items of knowledge.

4. Twenty-one items of knowledge in agriculture were identified as not needed by either of the two groups of supervisors studied.

D. Conclusions Pertaining to Field Workers

Based on the data collected and the practical decisions relating to the need for an item of knowledge, the investigator concluded the following:

1. Thirty-six items of knowledge in agriculture were identified as needed by field workers in both licensed nurseries and licensed ornamental horticulture businesses. That is, for thirty-six items of knowledge in agriculture for which the "z" scores were not significant, six or more field workers in both licensed nurseries and licensed ornamental horticulture businesses said they needed each of the items of knowledge.

2. Four items of knowledge in agriculture were identified as needed by field workers in licensed nurseries but not needed by field workers in licensed ornamental horticulture businesses.

   a) For one item of knowledge in agriculture, the difference between the six or more field workers in licensed nurseries who said they needed the item of knowledge and the five or fewer field workers in licensed ornamental horticulture businesses who said they needed the item of knowledge was wide enough to be statistically significant.

   b) For three items of knowledge in agriculture for which the "z" scores were not significant, six or more field workers in licensed nurseries said they needed each of the items of knowledge while five or fewer field workers in licensed ornamental horticulture businesses said they needed each of the items of knowledge.

3. Nine items of knowledge in agriculture were identified as needed by field workers in licensed ornamental horticulture businesses but not needed by field workers in licensed nurseries.

   a) For three items of knowledge in agriculture, the difference between the six or more field workers in licensed ornamental horticulture businesses who said they needed the items of knowledge and the five or fewer field workers in licensed nurseries who said they needed the items of knowledge was wide enough to be statistically significant.

b) For six items of knowledge in agriculture for which the "z" scores were not significant, six or more field workers in licensed ornamental horticulture businesses said they needed each of the items of knowledge while five or fewer field workers in licensed nurseries said they needed each of the items of knowledge.

4. Fifty-one items of knowledge in agriculture were identified as not needed by either of the two groups of field workers studied.

Summary of Conclusions for Hypotheses #1

The summary conclusions for null-hypotheses #1 that follow, were based on the conclusions in the four preceding sections relating to general directors, salesmen, supervisors, and field workers. The investigator concluded the following from the data collected:

1. Thirty-two items of knowledge in agriculture were needed by workers in all four of the job titles studied in both licensed nurseries and licensed ornamental horticulture businesses.

2. Only one item of knowledge in agriculture was needed by workers in all four job titles studied in licensed nurseries but was not essential for the workers in comparable job titles in licensed ornamental horticulture businesses.

3. Five items of knowledge in agriculture were needed by the general directors in both licensed nurseries and licensed ornamental horticulture businesses but were not essential for the other workers in these two types of horticulture businesses.

4. One item of knowledge in agriculture was needed by the supervisors in both licensed nurseries and licensed ornamental horticulture businesses but was not essential for the other workers in these two types of horticulture businesses.

5. Nineteen items of knowledge in agriculture were needed by general directors, salesmen, and supervisors in both licensed nurseries and licensed ornamental horticulture businesses. These nineteen items of knowledge were not essential for the field workers in either of the two types of horticulture businesses studied.

6. Twenty-three items of knowledge in agriculture were needed by the general directors and salesmen in both licensed nurseries and licensed ornamental horticulture businesses. These twenty-three items of knowledge were not essential for supervisors and field workers in either of the two types of horticultural businesses studied.

7. One item of knowledge in agriculture was needed by the general directors and supervisors in both licensed nurseries and licensed ornamental horticulture businesses. This item of knowledge was not essential for salesmen and field workers in either of the two types of horticultural businesses studied.

8. Only one item of knowledge in agriculture was needed by the salesmen and supervisors in both licensed nurseries and licensed ornamental horticulture businesses. This item of knowledge was not essential for general directors and field workers in either of the two types of horticultural businesses studied.

9. Three items of knowledge in agriculture were needed by general directors, supervisors, and field workers in both licensed nurseries and licensed ornamental horticulture businesses. These three items of knowledge were not essential for salesmen in either of the two types of horticultural businesses studied.

10. Two items of knowledge in agriculture were needed by general directors, salesmen, and supervisors in licensed nurseries. These two items of knowledge were not essential for field workers in either of the two types of horticultural businesses studied or for general directors, salesmen and supervisors in licensed ornamental horticulture businesses.

11. One item of knowledge in agriculture was needed by general directors and supervisors in licensed nurseries. This item of knowledge was not essential for the salesmen or field workers in licensed nurseries or for any of the workers in the four job titles studied in licensed ornamental horticultural businesses.

12. One item of knowledge in agriculture was needed by general directors, supervisors, and field workers in licensed nurseries. This item of knowledge was not essential for salesmen in licensed nurseries or for the workers in the four job titles studied in licensed ornamental horticulture businesses.

13. One item of knowledge in agriculture was needed by salesmen and supervisors in licensed nurseries. This item of knowledge was not essential for general directors and field workers in licensed nurseries or for the workers in the four job titles studied in licensed ornamental horticulture businesses.

14. One item of knowledge in agriculture was needed by general directors and salesmen in licensed ornamental horticulture businesses. This item of knowledge was not essential for supervisors and field workers in licensed ornamental horticulture businesses or for the workers in the four job titles studied in licensed nurseries.

15. One item of knowledge in agriculture was needed by salesmen and field workers in licensed ornamental horticulture businesses. This item of knowledge was not essential for general directors and supervisors in licensed ornamental horticulture businesses or for the workers in the four job titles studied in licensed nurseries.

16. One item of knowledge in agriculture was needed by general directors and field workers in licensed ornamental horticulture businesses. This item of knowledge was not essential for supervisors or salesmen in licensed ornamental horticulture businesses or for workers in the four job titles studied in licensed nurseries.

17. Three items of knowledge in agriculture were needed by supervisors and field workers in licensed ornamental horticulture businesses. These three items of knowledge were not essential for general directors and salesmen in licensed ornamental horticulture businesses or for the workers in the four job titles studied in licensed nurseries.

18. One item of knowledge in agriculture was needed by salesmen, supervisors, and field workers in licensed ornamental horticulture businesses. This item of knowledge was not essential for general directors in licensed ornamental horticulture businesses or for the workers in the four job titles studied in the licensed nurseries.

19. Only one item of knowledge in agriculture was a unique need of general directors in licensed nurseries.

20. Four items of knowledge in agriculture were the unique needs of salesmen in licensed nurseries.

21. Ten items of knowledge in agriculture were the unique needs of supervisors in licensed nurseries.

22. Two items of knowledge in agriculture were the unique needs of field workers in licensed nurseries.

23. Two items of knowledge in agriculture were the unique needs of salesmen in licensed ornamental horticulture businesses.

24. Two items of knowledge in agriculture were the unique needs of supervisors in licensed ornamental horticulture businesses.

25. Three items of knowledge in agriculture were the unique needs of field workers in licensed ornamental horticulture businesses.

Conclusions for Hypothesis #2:

Based on the data collected, the investigator concluded the following:

1. The null-hypothesis was accepted for two groups of items of knowledge in agriculture, group E in floriculture and group A in soils. Acceptance of the null-hypothesis for these two groups of items of knowledge in agriculture indicated it was probable that general directors, salesmen, supervisors, and field workers used the items of knowledge in the groups of items of knowledge in agriculture at the same level of ability.

2. For seventeen groups of items of knowledge in agriculture, the statistical evidence indicated that the means for general directors, salesmen, supervisors, and field workers differed significantly among themselves. The evidence also indicated these four significant means were from different populations, except in the groups of items of knowledge where the Duncan's Multiple Range Test indicated job title means in one or more subsets did not differ significantly. Sixteen of the "F" ratios were significant at the .01 point, and were to the right of the "F" at the .01 point in the right tail of the "F" curve. The seventeenth "F" ratio was significant at the .05 point, and was to the right of the "F" ratio at the .05 point

in the right tail of the "F" curve. The significant differences in the mean levels were indicative of real differences in the level of ability required by general directors, salesmen, supervisors, and field workers in licensed nurseries for the items of knowledge in these seventeen groups of items of knowledge in agriculture.

3. The differences in the level of ability needed by general directors, salesmen, supervisors, and field workers in licensed nurseries probably represented differences due to the way the workers used these knowledges in their positions.

   The general directors with significantly different means for groups of items of knowledge in agriculture probably needed a higher level of ability because their position responsibilities required them to: (1) know the subject matter well, (2) utilize their talents to teach others how to perform activities involving the use of needed items of agricultural knowledge, (3) utilize certain business management and leadership abilities not measured directly by the questionnaire.

   The salesmen with significantly different means for groups of items of knowledge in agriculture probably needed a level of ability in their position which enabled them to: (1) know the subject matter well enough to discuss their products and services with the customers, (2) plan sales programs, (3) sell their products and services.

   The supervisors with significantly different means for groups of items of knowledge in agriculture probably needed a level of ability in their position which enabled them to: (1) know the subject matter well, (2) utilize their talents to teach others how to perform activities involving the use of needed items of agricultural knowledge, (3) utilize certain abilities in the supervision of field workers or greenhouse workers. The abilities needed in order to supervise workers were not measured directly by the instrument.

   The field workers with significantly different means for groups of items of knowledge in agriculture probably needed a level of ability in their position which enabled them to: (1) know the subject matter well enough to perform satisfactorily the activities which involved the use of needed items of agricultural knowledge, (2) follow instructions of supervisors.

4. For these subsets of means for general directors, salesmen, supervisors, or field workers where the Duncan's Multiple Range Test indicated no significant differences, the workers in the job titles represented by the subset means probably needed the same level of ability for the performance of activities involving the use of the items of knowledge in that group of items of knowledge in agriculture.

Conclusions for Hypothesis #3:

Based on the data collected, the investigator concluded the following:

1. The null-hypothesis was rejected for all of the nineteen groups

of items of knowledge in agriculture studied. For all nineteen groups of items of knowledge, the statistical evidence indicated that the means for general directors, salesmen, supervisors, and field workers differed significantly among themselves. The evidence also indicated these four significant means were from different populations, except in the groups of items of knowledge where the Duncan's Multiple Range Test indicated job title means in one or more subsets did not differ significantly. All nineteen of the "F" ratios fell to the right of the .01 point in the right tail of the "F" curve, and were considered significant at the .01 point. Significant differences in the mean levels were indicative of real differences in the level of ability required by general directors, salesmen, supervisors, and field workers in licensed ornamental horticulture businesses for the items of knowledge in the nineteen groups of items of knowledge in agriculture.

2. The differences in the level of ability needed by general directors, salesmen, supervisors, and field workers in licensed ornamental horticulture businesses probably represented differences due to the way they used these knowledges in their positions.

3. For these subsets of means for general directors, salesmen, supervisors or field workers where the Duncan's Multiple Range Test indicated no significant differences, the workers in the job titles represented by the subset means probably needed the same level of ability for the performance of activities involving the use of items of knowledge in that group of items of knowledge in agriculture.

Summary

Based on the data presented for null-hypotheses #1, #2, and #3, the investigator concluded that the three null-hypotheses were rejected for certain items of knowledge and for certain groups of items of knowledge. They were not rejected for certain other items of knowledge and groups of items of knowledge. Therefore, it appeared that some basic courses and some specialized courses are needed for general directors, salesmen, supervisors, and field workers in licensed nurseries and in licensed ornamental horticulture businesses.

Two approaches to the curriculum planned seemed possible:

1. Separate courses for general directors, salesmen, supervisors, and field workers in licensed nurseries, and separate courses for general directors, salesmen, supervisors, and field workers in licensed ornamental horticulture businesses. If this procedure were followed, these two sets of courses would necessitate considerable duplication of subject matter.

2. A series of basic courses for workers in both licensed nurseries and licensed ornamental horticulture businesses. These basic courses would be supplemented with specialized courses as needed.

   a) The basic courses would contain the items of knowledge in agriculture needed by workers in two or more of the job titles studied in both licensed nurseries and licensed ornamental horticulture businesses. This core of basic content would be

supplemented with specialized courses as needed.

b) The specialized courses would contain the items of knowledge in agriculture necessary to meet the unique needs of workers in the job titles studied in either licensed nurseries or in licensed ornamental horticulture businesses.

The recommendations for this study follow the second curriculum planning approach.

The Recommendations

The primary objective of the recommendations will be to indicate how a curriculum practitioner might interpret the foregoing data and conclusions in the development of courses for general directors, salesmen, supervisors, and field workers in licensed nurseries and in licensed ornamental horticulture businesses. There may be other equally valid ways of interpreting the data and organizing courses. The following curriculum suggestions were based on:

1. Conclusions from statistical results.

2. The knowledge gained by the investigator in interviewing general directors, salesmen, supervisors, and field workers in licensed nurseries and in licensed ornamental horticulture businesses.

3. The investigator's understanding of how courses are planned and developed in public schools.

Two types of courses were recommended:

1. Basic courses- courses containing content needed by all the persons preparing to enter horticultural jobs.

2. Specialized courses - courses containing items of knowledge in agriculture needed by workers in one, two, or three job titles, but not needed by all workers in licensed nurseries or licensed ornamental horticulture businesses. These courses will be for persons who: (1) are near the end of a one-year, or two-year curriculum in horticultural technology, or (2) are employed in horticultural jobs and desire to upgrade their abilities in horticultural technology.

The following recommended curriculums were organized so that a person who aspired to hold a general director's position in a licensed nursery or in a licensed ornamental horticulture business, could begin with basic courses and later enroll in the advanced and specialized courses if qualified as a result of successful coursework, job placement, job experience, or promotion. The curriculums also permit a person to enroll in basic courses and some of the specialized courses designed for certain jobs such as salesman, supervisor, or field worker, if the person's goal was one of those jobs.

The length of the courses would vary with (1) the amount of content, (2) the teaching method followed, (3) the frequency of class meetings, (4) the amount of time devoted to job placement experience. Some basic courses might be taught over a period of one year, while other basic units might be grouped together for a one-semester course. Many advanced courses

and specialized courses might be from ten to thirty hours in length, while others might be a semester in length.

Basic Courses

[11]

Four basic courses or units were recommended. These courses or units may be offered in the 11th or 12th year, and are for persons aspiring to positions of general director, salesman, supervisor, or field worker in a licensed nursery or in a licensed ornamental horticulture business. Following completion of these courses, a person should be qualified to take a position as a field worker in a licensed nursery or in a licensed ornamental horticulture business in the geographical region of study. The courses or units are:

BASIC HORTICULTURE 1
BASIC HORTICULTURE 2
BASIC AGRICULTURAL CHEMICALS 1
BASIC SOILS 1

Four advanced basic courses or units were recommended for persons aspiring to the higher level positions of general director, salesman, or supervisor in a licensed nursery or in a licensed ornamental horticulture business in the geographical region of study. After completion of these courses or units, and the previous basic courses or units, a person should be qualified for an entry position as a supervisor in a licensed nursery or in a licensed ornamental horticulture business. These courses or units are:

HORTICULTURE 3
AGRICULTURE CHEMICALS 2
FLORICULTURE 1
SOILS 2

Three advanced basic courses or units were recommended for persons aspiring to positions of salesman or general director in a licensed nursery or in a licensed ornamental horticulture business in the geographical region of study. After completion of these courses, as well as all the foregoing basic courses or units, a person should be qualified for an entry position as a salesman in a licensed nursery or in a licensed ornamental horticulture business.

HORTICULTURE 4
FLORICULTURE 2
SOILS 3

These three advanced courses would probably be taught in the 13th or 14th years.

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[11] The placement of items of knowledge in agriculture in the basic courses was based on the summary conclusions for null-hypothesis #1 presented on pages 21-23 of this report. Items of agricultural knowledge within all basic courses are included in the full report available through University microfilms.

Two advanced basic courses or units were recommended for persons aspiring to the position of general director in a licensed nursery or in a licensed ornamental horticulture business in the geographical region of study. Following completion of the preceding courses or units listed, these advanced courses or units, and appropriate on-job experience, a person should be qualified for an entry position as general director of a horticulture business. These courses would probably be offered in the 14th year, or as in-service courses for appropriate persons employed in a licensed nursery or in a licensed ornamental horticulture business.

ADVANCED HORTICULTURE 5
ADVANCED SOILS 4

Specialized Courses or Units

Two specialized courses or units were recommended as supplementary to the basic courses for persons desiring employment as a field worker, supervisor, salesman, or general director in a licensed nursery.[12] These courses would probably also be offered as adult education for employed workers in licensed nurseries.

SPECIALIZED HORTICULTURE 1
SPECIALIZED SOILS 1

Two specialized courses or units were recommended for persons desiring employment as a field worker, supervisor, salesman, or general director in a licensed ornamental horticulture business. These courses would probably also be offered as adult education for employed workers in licensed ornamental horticulture businesses.

SPECIALIZED HORTICULTURE 2
SPECIALIZED FLORICULTURE 1

Two short specialized units were recommended for persons desiring employment as supervisors in licensed nurseries. These units would probably also be offered as adult education for persons employed in licensed nurseries.

SPECIALIZED HORTICULTURE 3
SPECIALIZED FLORICULTURE 2

Two short specialized units were recommended for persons desiring employment as general directors, supervisors, or salesmen in licensed ornamental horticulture businesses. These units would probably also be offered as adult education for persons employed in licensed ornamental horticulture businesses.

SPECIALIZED HORTICULTURE 4
SPECIALIZED FLORICUTLURE 3

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12 The placement of items of knowledge in agriculture in the specialized courses was based on the summary conclusions for null-hypothesis #1 presented on pages 21-23 of this report. Items of agricultural knowledge within all specialized courses are included in the full report available through University microfilms.

Two specialized units are recommended for persons desiring employment as field workers in licensed ornamental horticulture businesses. These units would probably be offered in the 13th or 14th year, or as adult education.

SPECIALIZED HORTICULTURE 5
SPECIALIZED FLORICULTURE 4

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EXHIBIT A

Check-list for the Ornamental Horticulture and Nursery Occupations

Directions: FOR EACH STATEMENT:

1. Indicate whether you need a knowledge of the activity in your job, by checking YES or NO in column #1 on the check-sheets.

2. If you answered YES in column #1, indicate in column #2 the degree of ability you need in performing this activity, by checking a, b, c, or d in column #2 on the check-sheets.

   a. None (I do not perform this activity in my job).

   b. I perform this activity with supervision.

   c. I perform this activity without supervision.

   d. I perform this activity without supervision so well that my performance may be used to instruct others.

Thus, if you believe you need a basic knowledge and awareness of an activity but do not perform it in your job, you would check YES in column #1, and a (none) in column #2. Below is a sample with the correct response marked:

(EXAMPLE)

Pruning ornamental shrubs and trees.....

#1 Need Knowledge		#2 Ability to Perform			
NO	YES	a	b	c	d
	✓	✓			

If you believe you need a basic knowledge of the activity, and perform the activity without supervision, you would check YES in column #1, and check column 2c. Below is a sample with the correct response marked:

(EXAMPLE) Adjusting agricultural chemical application equipment.....

#1 Need Knowledge		#2 Ability to Perform			
NO	YES	a	b	c	d
	✓			✓	

If you believe you need a basic knowledge of the activity, and can perform it with sufficient ability so that your performance is used to train or instruct others, you would check YES in column #1, and check column 2d. Below is a sample with the correct response marked:

(EXAMPLE) Grading and sodding lawns.....

#1 Need Knowledge		#2 Ability to Perform			
NO	YES	a	b	c	d
	✓				✓

REMEMBER, CHECK COLUMN #1 FOR EVERY STATEMENT. CHECK COLUMN #2 ONLY WHEN YOU HAVE CHECKED YES IN COLUMN #1. SELECT ONLY ONE OF THE FOUR SUB-COLUMNS UNDER COLUMN #2.

Identification Code 1-D 2-TB 3-4 Fl-m 5-JT

HORTICULTURE
(Including fruits, vegetables, turf, and ornamental plants)

	#1 Need Knowledge		#2 Ability to Perform			
	NO	YES	a	b	c	d
11. Identifying fruit and vegetable varieties.....						
12. Identifying varieties of ornamental plants and trees						
13. Identifying diseases, insects, and other pests on fruits and vegetables						
14. Planning sanitation practices, and disease and insect control programs for fruits and vegetables...						
15. Identifying diseases, insects, and other pests on trees and ornamental plants.....						
16. Planning sanitation practices, and disease and insect control programs for trees and ornamental plants.....						
17. Performing field experiments with cultural methods, insect, and pest control methods.....						
18. Performing field experiments with new varieties of fruits, vegetables, and ornamental plants						
19. Recognizing plant nutrient deficiency symptoms.....						
20. Planning programs for supplying nutrient needs of fruits and vegetables.....						
21. Planning programs for supplying nutrient needs of trees and ornamental plants.....						
22. Applying fertilizer, limestone, and nitrogen materials.....						
23. Supplying organic matter to soils.....						
24. Planning a landscape design						
25. Planning a fruit garden.....						
26. Advising customers on desirable varieties of trees and ornamental shrubs, and their costs.....						
27. Estimating time and price for landscaping contract jobs.....						

Identification Code 1-D 2-TB 3-4 Firm 5-JT

(2)

	#1 Need Knowledge		#2 Ability to Perform			
	NO	YES	a	b	c	d
28. Advising customers on landscape planning problems						
29. Selling fruit trees and vegetable plants						
30. Selling shrubs, trees, and other ornamental plants						
31. Growing and care of sod in the nursery						
32. Grading and sodding lawns						
33. Establishing and restoring grass on the lawn.....						
34. Pruning ornamental shrubs and trees						
35. Pruning and grafting fruit trees and small fruits						
36. Planting trees and shrubs.....						
37. Removing trees.....						
38. Performing tree surgery						
39. Identifying weeds in the nursery or in the lawn..						
40. Controlling weeds in the nursery or in the lawn..						
41. Maintaining, adjusting, and caring for mechanical equipment.....						
42. Repairing mechanical equipment.....						
43. Performing annual care of residential and commercial lawns and landscapes.....						
44. Performing annual care of small fruits.....						
45. Determining correct time to plant trees and shrubs.....						
46. Balling and burlapping trees and shrubs.....						
47. Shipping and storing trees and shrubs.....						

Identification Code 1-D 2-TB 3-4 Firm 5-JT

(3)

	#1 Need Knowledge		#2 Ability to Perform			
	NO	YES	a	b	c	d
48. Transplanting fruit trees and small fruits.....						
49. Harvesting and storing fruits and vegetables...						
50. Growing strawberries.....						

Identification Code 1-D 2-TB 3-4 Firm 5-JT

AGRICULTURAL CHEMICALS IN HORTICULTURE

11. Identifying name and function of agricultural chemicals.....						
12. Identifying the toxic effects of some agricultural chemicals on horticultural plants.....						
13. Determining proper use of pre-emergence agricultural chemicals.....						
14. Determing proper use of post-emergence agricultural chemicals.....						
15. Determining the most effective use of new agricultural chemicals.....						
16. Determining use of granular vs liquid agricultural chemicals for weed control.....						
17. Performing field experiments to develop methods of using agricultural chemicals.....						
18. Selecting proper weedicides for weed control programs.....						
19. Selecting proper agricultural chemicals for plant disease control programs.....						
20. Planning weed and insect control programs for flowers, trees, and ornamental plants.....						
21. Planning purchasing programs for securing agricultural chemicals.....						
22. Determining correct rates of application for agricultural chemicals.....						

Identification Code 1-D 2-TB 3-4 Firm 5-JT

(4)

	#1		#2			
	Need Knowledge		Ability to Perform			
	NO	YES	a	b	c	d
23. Applying agricultural chemicals to control diseases and insects on fruits, vegetables and flowers.....						
24. Applying agricultural chemicals to control diseases and insects on trees and ornamental plants.....						
25. Applying agricultural chemicals to control weeds in the nursery or in the lawn.....						
26. Mixing agricultural chemicals for specific jobs.						
27. Handling agricultural chemicals safely.....						
28. Using agricultural chemicals for control of woody plants.....						
29. Adjusting application equipment.....						
30. Maintaining application equipment.....						
31. Operating tractor or power driven equipment to apply agricultural chemicals.....						
32. Operating hand powered equipment to apply agricultural chemicals.....						

Identification Code 1-D 2-TB 3-4 Firm 5-JT

FLORICULTURE
(Including flowers and flowering plants)

	#1		#2			
	Need Knowledge		Ability to Perform			
	NO	YES	a	b	c	d
11. Identifying varieties of flowers and flowering plants.....						
12. Identifying diseases, insects, and other pests on flowers and flowering plants.....						
13. Planning sanitation practices, and disease and insect control programs for flowers and flowering plants.....						
14. Performing greenhouse or field experiments in cultural methods, new varieties, or insect and pest control, with flowers and flowering plants..						

Identification Code 1-D 2-TB 3-4 Firm 5-JT

(5)

	#1 Need Knowledge		#2 Ability to Perform			
	NO	YES	a	b	c	d
15. Recognizing plant nutrient deficiency symptoms on flowers and flowering plants.....						
16. Planning programs for supplying nutrient requirements of flowers and flowering plants.....						
17. Planning flower borders and floricultural landscapes for customers.....						
18. Planning and making floral arrangements.....						
19. Making floral designs and sketches.....						
20. Planning greenhouse schedules for growing flowers and flowering plants.....						
21. Planning seasonal schedules for growing flowers and flowering plants in the nursery.....						
22. Planning seasonal growing schedules for flowers and flowering plants for customers.....						
23. Selling flowers and flowering plants.....						
24. Planting flowers and flowering plants in the greenhouse.....						
25. Planting flowers and flowering plants for customers.....						
26. Potting flowers and flowering plants.....						
27. Growing hothouse and bedding plants.....						

Identification Code 1-D 2-TB 3-4 Firm 5-JT

SOILS IN HORTICULTURE

11. Explaining the origin and development of soils..		
12. Explaining the characteristics of soil (structure and texture).....		
13. Explaining soil acidity, and the function of other major plant nutrients.....		

Identification Code 1-D 2-TB 3-4 Firm 5-JT

(6)

	#1 Need Knowledge		#2 Ability to Perform			
	NO	YES	a	b	c	d
14. Explaining the function of soil bacteria						
15. Taking soil samples.....						
16. Testing soil samples.....						
17. Testing plant tissue.....						
18. Reading soil tests.....						
19. Making fertilizer recommendations.....						
20. Explaining how plant food nutrients become available in soils.....						
21. Planning the use of limestone to correct soil acidity.....						
22. Planning the use of phospherous and potassium fertilizers.....						
23. Planning the use of nitrogen fertilizers.....						
24. Planning soil fertility buildup programs.....						
25. Determining costs of soil fertility buildup programs.....						
26. Planning soil fertility programs to maintain soil nutrient balance.....						
27. Correcting drainage problems.....						
28. Determining factors that influence soil erosion.						
29. Planning land use programs.....						
30. Determining the need for organic matter in soils						
31. Determining practices needed on woodland, wildlife areas, and on recreational areas.....						

EXHIBIT B

THE ANALYSIS OF VARIANCE FOR AGRICULTURAL KNOWLEDGE

GROUP A IN LICENSED NURSERIES

HYPOTHESIS #2

Column	Source of Variation	Sum of Squares	df	Mean Square	F
B	Sum of squares between four job groups.....	211.406	3	70.468	38.866
C	Sum of squares within four job groups.....	863.042	476	1.813	
D	Total sum of squares	1074.448	479		

EXHIBIT C

DUNCAN'S MULTIPLE RANGE TEST

Duncan's Multiple Range Test was applied to each group of items of knowledge in agriculture studied for hypothesis #2 and #3 for which the "F" ratio was significant, to determine which of the job title group means were significantly different. The shortest significant ranges were based on significant studentized ranges for Duncan's New Multiple Range Test with alpha = .01.[1] The individual calculations for the thirty-six significant groups of items of knowledge in agriculture are not given in this report. However, an illustration is given for agricultural knowledge group A in horticulture for hypothesis #2.

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[1] Edwards, Experimental Design in Psychological Research, op. cit., p. 374

EXHIBIT D

DUNCAN'S MULTIPLE RANGE TEST FOR GROUP A IN THE HORTICULTURE AREA OF KNOWLEDGE

HYPOTHESIS #2

	Job Title Group Means						
	(1) Field Worker	(2) Sales-man	(3) Super-visor	(4) General Director	Duncan's Studentized Range[a]	$s_{\bar{x}}$[b]	Shortest Significant Ranges[c]
	.96	1.54	1.67	2.79			
(1) .96	---	.58	.71	1.83	3.64	.122	R_2 = .45
(2) 1.54	---	---	.13	1.25	3.80	.122	R_3 = .47
(3) 1.67	---	---	---	1.12	3.90	.122	R_4 = .48

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a) The studentized range is the tabled range with alpha - .01. Edwards, Experimental Design in Psycholigical Research, op. cit., p. 374.

b) The standard error of the difference is calculated by dividing the square root of the mean square within the four job title group means, by the square root of the number of scores in a job title group.

c) The shortest significant range for two, three, or four means is obtained by multiplying the studentized range by the standard error of the difference. Each difference in the table is significant if it exceeds the corresponding shortest significant range. If it does not, then it is not significant. The only exception is: no difference between two means can be significant if the two means are both contained in a subset of means which has a non-significant range. Since 4-1 is the range of four means, the difference must exceed .48, the shortest significant range for four means; 4-2 is the range of three means, the difference must exceed .47; 4-3 is the range of two means, the difference must exceed .45, the shortest significant range for two means. Ibid., pp. 136-140