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ABSTRACT

This study was conducted to determine if there is a difference between the career advancement of alumni of ornamental horticulture associate degree and non-degree programs. The researcher theorized that there would be a significant difference between the career advancement in favor of graduates from horticultural associate degree programs.

The researcher administered a survey to the alumni of three associate degree and three non-degree training programs. The surveys were constructed using guidelines from career advancement validation research conducted at Alverno College, Milwaukee Wisconsin (Ben-Ur & Rogers, 1994). The programs were chosen from Northeastern United States and Southeastern Canada. Since all six programs used in this study were selected based on their perceived high reputations the most esteemed associate degree programs are compared to the most esteemed non-degree training programs.

Chi-square and t-test analysis were used ($\alpha=.01$ and $\alpha=.05$) to analyze the data collected. The statistical analysis of the data did not support the presupposition that there would be a significant difference between the career advancement in favor of graduates from horticultural associate degree programs. The analysis supported the counter-presupposition that there is no difference in the career advancement of graduates from horticultural associate and non-degree training programs.

Chapter 1

INTRODUCTION

This study was conducted to determine if there is a difference in the career advancement of alumni of ornamental horticulture associate degree programs and non-degree programs. The researcher theorized there will be a significant difference between the career advancement in favor of graduates of horticultural associate degree programs.

Presupposition Of Institutional Hierarchy

In reviewing twenty years of research Pascarella and Terenzini (1991) found that students attending a two-year college had lower levels of career advancement (they called it occupational status) as compared to students attending a four-year college. These two-year college students were less likely to continue their education and complete a bachelors degree program than those students who attended a two-year program at a four-year college. Consequently, Pascarella and Terenzini attributed the difference in career advancement to the lower levels of educational achievement found in the students attending a two-year college.

Based on Pascarella and Terenzini's review, this researcher extended this advancement hierarchy to incorporate students attending non-college institutions working toward a diploma. This researcher put non-college diploma granting institutions at the bottom of the advancement hierarchy. This researcher theorized that students that attend a college and receiving an associate degree are closer to achieving

a bachelors degree than students who attend an non-college institution, and receive a diploma, Since Pascarella and Terenzini found the achievement of a bachelors degree a key factor in career advancement, this researcher believes that students attending non-college programs would have lower career advancement than students attending a four-year and two-year college programs.

Counter-Presupposition To Institutional Hierarchy

Pascarella and Terenzini (1991) indicated that follow-ups to the above studies found that when family socioeconomic status, academic ability, pre-college educational and occupational aspirations, college grades, college major, or actual educational attainment were controlled, there were no statistical differences between students attending a two-year versus a four-year college. These factors were controlled by comparing students with similar socioeconomic status, academic ability, etcetera. These findings indicate that these qualifying factors could also play a role in career advancement. This information also indicates that the presupposition hierarchy may not be valid if any of theses factors are controlled.

Institutional Factors Affecting Career Advancement

Institutions can impact the advancement of its alumni in three major ways: first in the development of cognitive and non-cognitive skills; second in the credentialization of alumni; and third in screening of student candidates. These factors may work together or individually to distinguish associate degree program alumni from non-degree training program alumni.

Development Of Cognitive And Non-Cognitive Skills

One aspect of an academic experience is the development of cognitive and non-cognitive skills.

“Cognitive skills include: oral and written communication skills; abstract reasoning; and critical thinking. Non-cognitive skills include: values; personality characteristics; attitudes; and behavior patterns. It is difficult to attribute all cognitive and non-cognitive skill development to the influence of an academic institution. More likely a portion of the gains can be attributed to the institution. The important attribute of an academic institution that contributes to cognitive development is that salient intellectual, cultural, and interpersonal influences (for example, courses, libraries, laboratories, faculty, and other similarly engaged peers) tend to be concentrated in one place. Given this concentration of influences, evidence supporting a net positive impact of college on a range of general cognitive competencies and skills may not be particularly surprising.” (Pascarella & Terenzini 1991, 156)

Cognitive skills can be further described as general or specific to a field of study.

Pascarella and Terenzini (1991) found evidence in the literature that suggests this selective development of cognitive skills.

“A student’s cognitive growth is greatest on measures where the content is most consistent with his or her academic major or course work emphasis. Thus, for example, science majors tend to outperform others on measures of formal reasoning and critical thinking when these skills are applied to sciencelike tasks or problems. In contrast, when the tasks or problems are presented in the form of social science content, social science majors tend to perform best” (Pascarella & Terenzini 1991, 157-158).

Pascarella and Terenzini also found that a student’s academic major has “little consistent relationship” with general cognitive gains (Pascarella & Terenzini 1991, 158).

Credentialization Of Alumni By An Institution

Another influence can be called credentialization.

“The essence of this explanation is that college has been granted a ‘charter’ or ‘commission’ by the larger society to select, sort, and confer adult status on the individual graduate quite apart from whatever he or she may have learned during college.” (Pascarella & Terenzini 1991, 429)

This indicates that some of the benefit of graduating with a higher degree, or with a degree from a certain school may be directly tied to the perception of that degree or school. This benefit is separate from the any cognitive and/or non-cognitive growth that may have occurred.

Screening Of Students By Institutions

This is a variation on the credentialization concept. The theory focuses on the recruitment of the most talented individuals by a college or school. Completion of a program of study further reinforces these traits. Employers may use a degree as a criterion:

“to screen individuals on the basis of preexisting traits such as ability, ambition and perseverance that are valuable employee traits in many managerial, professional, and technical jobs.” (Pascarella & Terenzini 1991, 430)

It is reasonable to assume that this screening effect could play a role in the comparison of alumni from associate degree programs and non-degree training programs.

The Strategy Used In This Study

In order to demonstrate that associate degree alumni attain a higher level of career advancement relative to non-degree training programs the researcher administered a survey to the alumni of three ornamental horticulture associate degree programs and three non-degree horticultural training programs. The programs were chosen from Northeastern United States and Southeastern Canada and were selected

based on their reputation. This study compares the most esteemed associate degree programs to the most esteemed non-degree training programs. This was done to limit the effects of the credentialization and screening effects mentioned earlier in the chapter. The surveys were constructed using guidelines from career advancement measurement validation research conducted by Alverno College, (Milwaukee, Wisconsin) (Ben-Ur & Rogers, 1994).

Chapter 2

CAREER ADVANCEMENT AND EDUCATION

This chapter is intended to give the reader a broad overview of how career advancement is used in education evaluation. The literature has many references to the use of career advancement as an instrument to study racial, gender, and disability issues, but these have not been included in this overview. It should be noted that there are many equivalent terms for career advancement that have been used in the literature. Some of these are: career achievement; post-graduate achievement; job success; and career mobility.

Accreditation Agencies

Accreditation agencies have recently begun to recommend the use of outcome assessment information as a part of the accreditation process. An outcome has been defined as “the condition of the student at some subsequent point in time after exposure to the educational environment” (Beyond The Head 1994).

In the past accreditation focused on:

“an examination of the institution’s libraries, physical plant, faculty-student ratios, teaching loads, required and elective courses and the academic qualifications of the faculty, such as the percentage with doctoral degrees.” (Astin 1991, 17)

More recently the accreditation agencies have requested information on the outcomes of their students. How many graduates earn advanced degrees, how much money the alumni earn, and what kind of positions they hold are the types of outcomes that

colleges have looked at. Although institutions have been providing this kind of information, it is not always correlated to the previously mentioned criteria. Astin suggested that institutions need to integrate outcome assessment with the other information they collect so that relationships can be found. (Astin 1991).

Evidence from Armstrong's 1983 research on outcome assessment in the accreditation process supports the use of career advancement as one of the possible outcome assessment formats:

"The evidence from this study would, in fact suggest that accrediting agencies should encourage multiple approaches to the assessment of outcomes; data concerning student achievement and performance during the college years and student and alumni self-reports of satisfaction and post-graduate achievement have both provided valuable self-evaluative information." (Armstrong, 1983, 46)

Accreditation agencies are not the only driving force behind the move to outcome assessment. Numerous professional organizations, such as teacher education, construction education, engineering, journalism, and industrial technology are interested in follow-up studies of alumni. (Armstrong 1993)

Academic Institutions

Following the lead of the accrediting agencies, academic institutions are moving toward outcome assessment, specifically career advancement studies. According to a questionnaire sent to colleges and universities in the western region of the United States:

"Career preparation and job success were the outcomes receiving the greatest amount of attention." (Armstrong 1983, 133)

The same survey indicated the move toward outcome assessment has been slow, except for highly focused professional programs.

Resistance to outcome assessment may be due to a basic distrust of the outcome assessment process. Outcome assessment originated in the business world and uses business terminology. Aspinwall made the observation that because of the business terminology, many educators are suspicious of the process. Their concern is that:

“this kind of language implies emphasis on formal accountability, on a product-centered view of the task at hand, and a preoccupation with quantifiable findings, where as educational organizations are not dealing with a product but with a complex process of educating and developing people which cannot be represented in such relatively simple ways.” (Aspinwall 1992, 139)

Alverno College (Milwaukee, Wisconsin), a four year liberal arts college for women, has been a leader in the use of outcome assessment as well as developing instruments to measure career advancement. The Office of Research and Evaluation has developed the Alverno Alumna Career Level Classification (AACLC) scheme to measure alumna career advancement. The motive for the scheme development was the need for:

“an instrument that broadly measures career advancement in paid employment and meets the following specifications:

- It distinguishes typical career advancement from entrance to college to at least five-years post-college.
- It enables descriptions of career advancement that are accessible to a wide range of audiences.
- It reflects the level of responsibilities, autonomy, and abilities inherent to positions.
- It focuses on advancement on these dimensions within each career field, rather than on comparisons among various career areas.

- It is built on faculty expectations, based on their professional expertise in what constitutes college-level positions in their particular field.
- It is feasible for an individual institution to implement.” (Ben-Ur & Rogers 1994, 4)

Ben-Ur and Rogers (1994, 7) found this scheme to have a greater sensitivity to career advancement than the Socio-Economic Index (SEI) which “does not focus on the responsibilities, abilities, or autonomy of position incumbents.” It focuses on the prestige of the occupation and secondarily the position.

Comparisons of Various Educational Experiences

The majority of research relating to career advancement has been conducted at the baccalaureate level. Most of the research has compared people having a bachelors degree to people whose education ends at the secondary school level. These comparisons were quite definitive in their findings that:

“college graduates enjoy significantly higher levels of career mobility. Initial job positioning effects, which place college graduates and those with less education on different career paths, probably account for part of these differences.” (Pascarella & Terenzini 1991, 436)

Research has also been conducted analyzing the effects of having only a secondary school education, graduating from a two-year community college, and graduating from a four-year college. The research indicated that the socioeconomic attainments of community college students, although greater than those whose education ends in secondary school, still do not compare with those attaining a bachelors degree. Research also has indicated that if graduates of two-year colleges transfer and complete a bachelors degree within a reasonable time, these differences are negligible (Pascarella & Terenzini 1991).

No other research was found which compares career advancement between non-degree training programs and associate degree programs.

Chapter 3

METHODS

Subjects And Design

Subject Selection

Subjects were selected based on their successful graduation from an ornamental horticulture associate degree or non-degree training program between 1985 and 1995. The following sections describe how the horticultural programs were selected.

Location Of Programs. Programs were selected from North Carolina, north to Maine, west to Ohio, and Southeastern Canada including parts of Ontario and Quebec, and all of New Brunswick and Nova Scotia. *North American Horticulture: A Reference Guide* (Barrett 1992, 169-192) was used to locate appropriate horticultural programs. The associate degree and non-degree training program lists that were compiled can be found in Appendix A (page 58).

Selection Of Programs. These lists were sent to selected Longwood Gardens' Staff (Helen BeVier, Flower Garden Foreman; Rick Darke, Curator of Plants; Ross Edmunds, Horticulture Department Head; David Foresman, Student Programs Coordinator; Phil Gruszka, Arboriculture and Perimeter Foreman; Mark Nilsson, Greenhouse Production Foreman; Fred Roberts, Director; Bill Thomas, Education Division Manager) and to professors in the Plant and Soils Science

Department at the University of Delaware (Susan Barton, Extension Specialist; John Frett, Associate Professor; David Frey, Associate Professor; Wallace Pill, Professor; Gary Smith, Associate Professor; James Swasey, Coordinator of the Longwood Graduate Program). These people were chosen based on their knowledge of the field of horticulture and of ornamental horticulture educational programs. They were asked to rank their top five associate degree programs and separately, their top five non-degree training programs. Points were given to each program based on its ranking. Five points were given for top choice, 4 points for second choice, 3 for third, and so on. This rank was based on programs with the best reputation for producing quality graduates for the field of ornamental horticulture.

The top three choices in ornamental horticulture associate programs were quite clear. These were in order: Sandhills Community College (29 points); Ohio State University Agricultural Technical Institute (26 points); and State University of New York (SUNY) at Cobleskill Agricultural and Technical College (14 points). The first two choices for non-degree training programs were clear. They were in order: Longwood Gardens' Professional Gardener Training Program (38 points); and Niagara Parks Commission School of Horticulture (33 points). There were three schools with scores so close that they warranted re-evaluation. These were in order: University of Maryland (10 points); Pennsylvania State University (9 points); and New York Botanical Garden School of Horticulture (8 points) respectively. These three programs were re-evaluated by the group surveyed, and ranked first, second, and third (first getting 3 points; second 2 points; and third, 1 point). The result was that New York Botanical Garden School of Horticulture was chosen because it received thirteen

points, which was higher than Pennsylvania State University (11 points) and University of Maryland (9 points).

Program Selection Validity. Quality reputation was used as the criterion for program selection. Reputation has been used as a criterion by *U.S. News & World Report* used it to rank graduate schools in the areas of law, engineering, education, medicine, and business. The report sent reputation surveys to two groups. One survey went to the deans of colleges, the other to appropriate professionals in the field. For example, law schools sent surveys to practicing lawyers, hiring partners and senior judges. Engineering programs sent surveys to all members of the National Academy of Engineering (U.S. News & World Report 1996). This is similar to the process used in this research to rank programs for use in the study. The use of reputation as a criteria may reduce the credentialization effect mentioned in Chapter 1. It may not completely eliminate the effect because there is no indication that the more general categories of associate degrees and non-degree training programs have equal reputations.

Overview Of The Selected Programs

Information in this section for the associate programs comes from each institution's standard application literature. The non-degree program information comes from Mack's research (1988). The three associate programs included in this study are administered by a college or university. The three non-degree training programs included in this study are not administered by a college or a university. The three non-degree training programs were studied and compared by Mack in 1988.

They were chosen by Mack because their training was comprehensive and emphasized work in both public and non-profit horticulture (Mack 1988).

Length Of Programs. The associate programs can be completed in a minimum of two years by a full-time student. The non-degree training programs vary:

- The Longwood Garden's Professional Gardener Training Program's Diploma in Horticulture takes 24 consecutive months, and is the only program selected that operates on a bi-annual basis;
- The Niagara Parks Diploma takes 36 consecutive months; and the
- New York Botanical Garden's Diploma in Horticulture takes 21 consecutive months. (Mack 1988).

Objectives Of The Selected Programs. There seems to be some correlation between the program type and the objectives. There is some indication that the two associate programs (Ohio State and SUNY at Cobleskill) are geared toward positions with higher autonomy, since they mention management specifically. Only one (New York Botanical Garden) of the non-degree programs seems to be geared toward positions with increased autonomy, since it mentions leadership positions, which implies positions with increased autonomy. Table 1 compares the objectives of the associate and non-degree programs.

Table 1: Programs' Objectives

Program	Objective
Niagara Parks Commission	To train apprentice gardeners in the practical and theoretical applications of horticulture.
Longwood Gardens' Professional Gardener Training Program	To train individuals to be gardeners suitable for employment in the fields of public and private ornamental horticulture.
New York Botanical Garden School of Horticulture	To train professional horticulturists who are skilled in the cultivation of plants and who qualify for leadership positions in the field of horticulture.
Ohio State University Agricultural Technical Institute	To prepare students to enter middle management careers in horticulture.
SUNY at Cobleskill	To put students on a career track that can take them directly to successful entry level and middle management positions in horticulture.
Sandhills Community College Landscape Gardening Program	None written.

Scholastic Entry Requirements Of The Selected Programs. The level of education required by all the programs was consistent, but the associate programs either require or recommend some form of pre-testing like the Scholastic Aptitude tests. Table 2 compares the associate and non-degree programs' written scholastic requirements for entry into the respective programs. This information reflects the screening effect of the selection process. The associate screen using standardized test, while the non-degree programs do not.

Table 2: Programs' Scholastic Requirements

Program	Scholastic Requirements
Niagara Parks Commission	An Ontario Secondary School Graduation Diploma or equivalent and an official transcript certifying an average of 60% each in English, Math, Biology, and Chemistry.
Longwood Gardens' Professional Gardener Training Program	An accredited High School Diploma, an official transcript certifying the candidate was in the upper 50% of their graduating class, and English, Math, and Biology.
New York Botanical Garden School of Horticulture	An accredited High School Diploma and transcript to verify having taken at least one course in Math and one in Science.
Ohio State University Agricultural Technical Institute	A high school diploma and the American College Test (ACT) or Scholastic Aptitude test (SAT) for English and Math placement only. The ACT and SAT are usually not required for an admission decision.
SUNY at Cobleskill	Graduation from a fully accredited and approved high school, or qualify for a GED. It is strongly recommended that applicants for admission submit scores from either the SAT or the ACT.
Sandhills Community College Landscape Gardening Program	A high school diploma or High School equivalency certificate and every applicant must take the college placement test

Additional Requirements. Some differences were found in additional requirements of the programs. The non-degree programs all use a letter of recommendation and a personal interview in their screening process. The associate programs do not use this. This information is compared in Table 3:

Table 3: Programs' Additional Requirements

Program	Letter of Recommendation	Personal Interview	Preference to Candidates Having Previous Experience in Horticulture
Niagara Parks Commission	Yes	Yes	Yes
Longwood Gardens' Professional Gardener Training Program	Yes	Yes	Yes
New York Botanical Garden School of Horticulture	Yes	Yes	Yes
Ohio State University Agricultural Technical Institute	No	No	No, but recommended
SUNY at Cobleskill	No	No	No
Sandhills Community College Landscape Gardening Program	No	Yes (Landscape Gardening Program special requirement)	No

The associate programs use standardized tests to screen their candidates and non-degree programs use the personal interview and letters of recommendation to screen their candidates.

Confirmation Of Graduation Granted By Programs. The non-degree training program graduates receive a diploma upon graduation. All three associate programs graduates receive an Associate of Applied Science degree. The Ohio State degree can be specialized into: Floral Design and Marketing; Greenhouse Production and Management; Landscape Construction and Contracting; Nursery Management; and Turfgrass Management. The SUNY degree can be specialized into: Floriculture;

Landscape Development; Nursery Management; Recreation and Sports Area Management; Turf Grass Management; Environmental Studies; Ornamental Horticulture. There are no specializations of the degree at Sandhills, but students select an apprenticeship in an area of interest.

The Number Of Graduates Sent Surveys From The Selected Programs

The associate programs in the study graduated more students during the study period than did the non-degree training programs. The numbers of students who graduated from 1985 to 1995 are as follows: Sandhills Community College, 147; Ohio State University Agricultural and Technical Institute, 715; SUNY at Cobleskill Agricultural and Technical College, 742; Longwood Garden's Professional Gardener Training Program, 92; Niagara Parks Commission School of Horticulture, 104 and; New York Botanical Garden School of Horticulture, 84.

The total number of surveys distributed was 1,884. The total completed and received was 574. This represent a 30.47% return. Of these, 1,604 surveys were distributed to associate program graduates, 458 completed ones were returned, a 28.55% return. Two-hundred-eighty surveys were sent to non-degree training program graduates and 116 were returned. This represents a 41.43% return.

Survey Instrument

A survey was developed and administered to the graduates of the selected programs through the U.S. Postal Service. A self-addressed, stamped envelope was enclosed with the questionnaire. Respondents were instructed not to put their name anywhere on the survey and were reassured of their anonymity. The data collection was in compliance with the rules for exemption from review by the Human Subjects

Review Board (see Appendix B, page 61, for copy of approval). The data from this survey were analyzed using the two sample t-test for parametric (continuous) data, and chi-square analysis for non-parametric (categorical) data (see Appendix D, page 68)

Survey Development

The survey instrument was designed following Ben-Ur & Rogers' 1994 study recommendations. These were adapted to reflect the positions found in the field of ornamental horticulture.

Formulation Of The Job Descriptions. The five job descriptions categories used in the survey (Found in Appendix C, page 63) and their associated examples were formulated by referencing the *Dictionary of Occupational Titles* (U.S. Department of Labor Employment and Training Administration 1991). Titles in the category "Horticultural Specialty Occupations" were used. The researcher used the top five of the six General Education Development code categories to rank and group positions and generate the general job descriptions for each category. The first category was dropped because the only job that fell under this code was Flower Picker. The General Education Development codes:

"embrace those aspects of education (formal and informal) which are required of the worker for the satisfactory job performance. This is education of a general nature which does not have a recognized, fairly specific occupational objective. Ordinarily such education is obtained in elementary, high school, or college, but may be obtained from experience and self study." (U.S. Department of Labor Employment and Training Administration 1991, 1009)

Development Of The Salary Ranges. The salary ranges (used for question 15) were developed by cross referencing the example job titles in the job

description categories to the 1995 American Association of Botanical Gardens and Arboreta Salary Survey (American Association Of Botanical Gardens And Arboreta 1995). The averages were calculated for each group and logical breaks were established.

The researcher's thesis committee reviewed the preliminary survey and made additional recommendations. The survey was then reviewed by Randi Korn of Randi Korn Associates who specializes in collecting data for museums and botanical gardens. Minor modifications were made based on her analysis. The survey was then tested on ten Longwood Gardens' staff members. These staff either had an associates degree or a non-degree diploma. They were asked to fill out the questionnaire, mark the time it took, and add comments pertaining to the questionnaire's clarity. Final modifications were made and the survey design was complete. Because this pilot study was conducted on employed staff, it did not uncover the missing category in question four, which asked employment status. The categories were augmented to include "student" since the many of the study subjects added this response to their questionnaires.

Equalizing United States And Canadian Currency. The salary ranges for the surveys sent to the Niagara Parks Commission School of Horticulture graduates (question 15) were converted using a conversion factor of 1.37 Canadian/U.S. This factor was calculated by averaging the weekly exchange rates for 1995 as listed in *Business Week* (1995). With the exception of one case, all alumni from the Niagara Parks Commission lived in Canada. The answers to question nineteen were also converted for these graduates.

Description Of Statistical Analysis

The ten years studied were grouped into two year intervals (one to two years, three to four years, etc.) for a total of five associate degree groups and five non-degree groups. The groups were compared in these intervals to reduce the confounding time effect of maturation. The two-year interval was selected because it balanced the need for statistically significant numbers in each study cell, with the need to reduce the confounding maturation effect. In questions where maturation was not a problem (e.g., question ten), all ten years were grouped together forming one associate group and one non-degree group.

Categorical data were analyzed using the chi-square test at a .01 and .05 significance level. Continuous data were analyzed using the two-sample t-test at .01 and .05 significance level. Both of these tests were chosen because they work well with small sample sizes (see Appendix D, page 69 for statistical formulas and brief descriptions). The researcher examined the .05 significance level to see how it supported the .01 significance level. If the observed statistic falls below both the critical values found for both .01 and .05, then the researcher feels very comfortable accepting the counter-presupposition that there is no difference. If it falls above the critical values, then the researcher feels equally comfortable rejecting the counter-presupposition. If the observed statistic falls above the .05 critical value but below the .01 significance level the researcher will acknowledge the difference and explain its significance.

Analysis Of Questions. Questions two through twenty were statistically analyzed. Questions two and three concern the type of education acquired by the graduates before and after graduating from their respective programs. These two

questions also asked for the major of study for the degrees acquired. The researcher grouped the majors into four broad categories of: horticulture and related; life sciences; business; and other. These categories were then statistically analyzed.

Data Computerization Process. All data were sorted with Microsoft Access 2.0 for Windows. Mathematical calculations were performed using Microsoft Excel 5.0 for Windows. See Appendix D (page 68) for the mathematical formulas used.

Content Validity And Reliability Of Measurements

As mentioned in Chapter 2, the survey used in this research is based on the Alverno Alumna Career Level Classification (AACLC) scheme. The validation for this survey (sample survey found in Appendix C, page 63) is based on the AACLC scheme's validation which was conducted by Ben-Ur and Rogers (1994). They distinguished three kinds of validation variables: criterion validating; secondary validation; and validation of consistency.

- **Criterion validating variables** capture the underlying dimensions of position autonomy and leadership ability. Examples are autonomy inherent in positions held by alumni just after graduating, position held for majority of career and current position (respectively questions 11, 12, and 13), and graduates' evaluation of their autonomy (question 16).
- **Secondary validation variables** measure additional factors that indirectly reflect or impact autonomy or leadership ability. Examples are: annual salary (question 15); number of employees supervised (question 17); control over a budget

(questions 18 and 19); leadership positions held after graduating (question 20); and advanced education completed after graduation (question three).

- **Validation of consistency variables** measure employment continuity in the career field. Examples are: employment status (questions four, five, and six); career interruptions (questions seven, eight and nine); and number of years in current position (question 14).

Since this is a comparison study the researcher added another category called confounding variables.

- **Confounding variables** test for possible confounding effects of previous education (question two), previous work history (question ten), and education after graduation (question three) . High levels of education or relevant work history could be responsible for career advancement seen. It is important recognize the effects these factors have in on career advancement and their relationship to the effects of graduating from the programs studied in this research.

Chapter 4

RESULTS

Description of Analysis

The data was analyzed following the content validity and reliability of measurement principles. The criterion validating variables were given highest priority in the analysis since they directly measure position autonomy and skill level. As the name implies, the secondary validating variables were considered of secondary importance, since they indirectly measure autonomy and skill levels. The validation of consistency and confounding variables were looked at for possible explanations of or confounding evidence to the criterion and secondary validating variables.

The analysis was performed at both the .01 and .05 significance levels. When the results of the analysis indicated that the observed statistic value was above both the .05 and .01 critical values, the researcher felt very comfortable rejecting the counter-presupposition that there is no difference. If the observed statistic value was below both the .05 and .01 critical values the researcher felt comfortable accepting the counter-presupposition that there is no difference. The observed value fell between the two critical values, the researcher used his judgment to explain the significance of these statistical results.

Summary of the Results

The statistical analysis of the data at the .01 and .05 significance levels did not support the presupposition that there would be a significant difference between the

career advancement in favor of graduates from horticultural associate degree programs over those graduates of non-degree horticultural training programs.

Statistical analysis at both .01 and .05 found a significant difference in the education and position level achieved before entering the respective programs in favor of the non-degree programs. A difference was also found in years spent in a horticultural position (years one to two) in favor of the non-degree programs.

The areas found significant at the .05 level (but not at the .01 level) were: in the first position held after graduating; position held for most of the career (years five to six); number of people supervised (years one to two); difference in leadership position held (years three to four and seven to eight); number of years in spent in a horticulture position since graduating (years three to four and nine to ten); and the highest degree obtained after graduating (years one to two, five to six, and seven to eight). The type of differences found will be discussed in this chapter.

Criterion Validating Variables Do Not Support The Presupposition

Analysis of the criterion validating variable questions at a significance level of .01 indicated that there was no significant difference between programs at any time interval. Some differences were found at the .05 level.

Reported Level of Autonomy in Current Position

The observed chi-statistic fell below both the .01 and .05 level (see Table 4 , page 27). The low values for the observed chi-statistic indicates that the autonomy levels for the two programs was not significantly different at any year interval. This indicates that the associate and non-degree programs have comparable career advancement.

First Horticultural Position Held After Graduation

No significant difference was found for the first horticultural positions held after graduating at the .01 significance level. However, there was a significant difference found at the .05 significance level (see Table 5, page 27). The difference seems to indicate that associate graduates start at lower level positions. The associate programs have a higher representation in the entry level positions, while the non-degree have higher levels at the skilled worker, and supervisory levels. This difference may reflect differences in the types of positions graduates had before entering. The differences will be shown later in this chapter under "Statistical Significance Discovered In the Confounding Variables". This evidence indicates that the first positions obtained by the graduates of both groups were very close in skill level and autonomy. Some advantage to the non-degree graduates may have been present, as indicated by the .05 significance level.

Horticultural Position In Which the Majority of Career Spent Since Graduating From the Program

No difference was found in the position graduates spent most of their career in at the .01 significance level. A difference was indicated at the .05 significance level for years seven to eight (see Table 6, page 28). The major difference found was a substantially higher representation of respondents from the non degree program found in the skilled worker category, and an equally high representation in the supervisory category. The advantage for the associate programs is offset by the 9.09% respondents not having a position in the field of horticulture, as compared to 0.00% found in the non-degree respondents. This does not represent a clear advantage to either group. The researcher concludes that the position levels are equivalent.

Table 4: Level of autonomy in current horticultural position.

Program	Years since graduation	I act according to detailed instructions	I act according to general instructions	I act in the frame of general guidelines	I determine guidelines for my own area of responsibility	I determine policy in the area of my own responsibility	Observed	χ -statistic observed	χ -critical value $\alpha=0.05$ $\alpha=0.01$
Associate	1-2	1.32%	13.16%	30.26%	22.37%	32.89%	76	1.862423	9.49
Non-degree	1-2	0.00%	13.33%	46.67%	13.33%	26.67%	15		13.28
Associate	3-4	1.49%	16.42%	31.34%	14.93%	35.82%	67	5.322301	9.49
Non-degree	3-4	5.56%	11.11%	55.56%	11.11%	16.67%	18		13.28
Associate	5-6	13.10%	5.95%	29.76%	15.48%	35.71%	84	5.195197	9.49
Non-degree	5-6	0.00%	0.00%	26.67%	33.33%	40.00%	15		13.28
Associate	7-8	3.23%	6.45%	30.65%	12.90%	46.77%	62	1.593106	9.49
Non-degree	7-8	0.00%	9.52%	33.33%	19.05%	38.10%	21		13.28
Associate	9-10	1.72%	5.17%	20.69%	20.69%	51.72%	58	1.178872	9.49
Non-degree	9-10	0.00%	3.57%	28.57%	17.86%	50.00%	28		13.28

Table 5: Question 11. First horticultural position held just after graduating from the program.

Program	Years since graduation	A Entry Level	B Skilled Worker	C Super- visory	D Mana- gement	E Top Admini- strator	N No Horticulture Position	Observed	χ -statistic observed	χ -critical value $\alpha=0.05$ $\alpha=0.01$
Associate	1-10	10.50%	32.82%	38.95%	6.78%	6.56%	4.38%	457	12.01542	11.07
Non-degree	1-10	2.56%	41.88%	44.44%	4.27%	4.27%	2.56%	117		15.09

Table 6: Horticultural position in which the majority of career was spent since graduating from the program.

Program	Years since graduation	A Entry Level	B Skilled Worker	C Supervisory	D Management	E Top Administrator	N No Horticulture Position	Observed	χ -statistic observed	χ -critical value $\alpha=0.05$ $\alpha=0.01$
Associate	1-2	5.17%	23.28%	42.24%	9.48%	12.93%	6.90%	116	3.740463	11.07
Non-degree	1-2	5.26%	36.84%	47.37%	5.26%	5.26%	0.00%	19		15.09
Associate	3-4	1.10%	13.19%	48.35%	25.27%	5.49%	6.59%	91	4.733793	11.07
Non-degree	3-4	0.00%	20.00%	60.00%	10.00%	10.00%	0.00%	20		15.09
Associate	5-6	4.04%	14.14%	38.38%	21.21%	13.13%	9.09%	99	13.65485	11.07
Non-degree	5-6	10.53%	42.11%	10.53%	26.32%	10.53%	0.00%	19		15.09
Associate	7-8	6.25%	11.25%	40.00%	15.00%	16.25%	11.25%	80	3.343349	11.07
Non-degree	7-8	0.00%	9.09%	50.00%	22.73%	13.64%	4.55%	22		15.09
Associate	9-10	1.22%	18.29%	32.93%	24.39%	17.07%	6.10%	82	5.305547	11.07
Non-degree	9-10	0.00%	9.68%	51.61%	25.81%	6.45%	6.45%	31		15.09

Current Position

No significant difference was found between the two programs current positions for any year intervals, at level .05 or .01 (see Table 7, page 30). The chi-statistics observed were all low, which strengthens this argument. This further reinforces the belief that there is no difference in the position autonomy and leadership ability between the programs' graduates.

Secondary Validating Variables Do Not Support The Presupposition

Analysis of the secondary validating variable questions at the .01 significance level indicated that there was only a significant difference between the programs' gross earned income for years nine to ten . A significant difference was found in favor of the associate programs for: number of people supervised, years one to two; leadership position held, years three to four and seven to eight; and advanced education completed after graduation years one to two, five to six, and seven to eight at the .05 significance level.

Gross Earned Income In Current Position

In one instance, the salary comparison (question 15) of the nine to ten year range of graduates showed a significant difference. The chi-square analysis indicated there was a statistical difference in this case. The results of this analysis (from Table 24, page 82) are represented graphically in Figure 1 (page 31).

Table 7: Current position.

Program	Years since graduation	A Entry Level	B Skilled Worker	C Supervisory	D Management	E Top Administrator	N No Horticulture Position	Observed	χ^2 -statistic observed	χ^2 -critical value $\alpha=0.05$ $\alpha=0.01$
Associate	1-2	1.30%	12.99%	44.16%	12.99%	24.68%	3.90%	77	4.428745	11.07
Non-degree	1-2	0.00%	26.67%	53.33%	13.33%	6.67%	0.00%	15		15.09
Associate	3-4	1.47%	11.76%	50.00%	14.71%	17.65%	4.41%	68	1.821744	11.07
Non-degree	3-4	0.00%	16.67%	55.56%	16.67%	11.11%	0.00%	18		15.09
Associate	5-6	2.33%	5.81%	37.21%	27.91%	22.09%	4.65%	86	3.118671	11.07
Non-degree	5-6	0.00%	13.33%	33.33%	20.00%	33.33%	0.00%	15		15.09
Associate	7-8	3.17%	6.35%	38.10%	25.40%	26.98%	0.00%	63	3.22886	11.07
Non-degree	7-8	0.00%	0.00%	52.38%	28.57%	19.05%	0.00%	21		15.09
Associate	9-10	1.72%	10.34%	20.69%	32.76%	29.31%	5.17%	58	3.159335	11.07
Non-degree	9-10	0.00%	7.14%	32.14%	32.14%	28.57%	0.00%	28		15.09

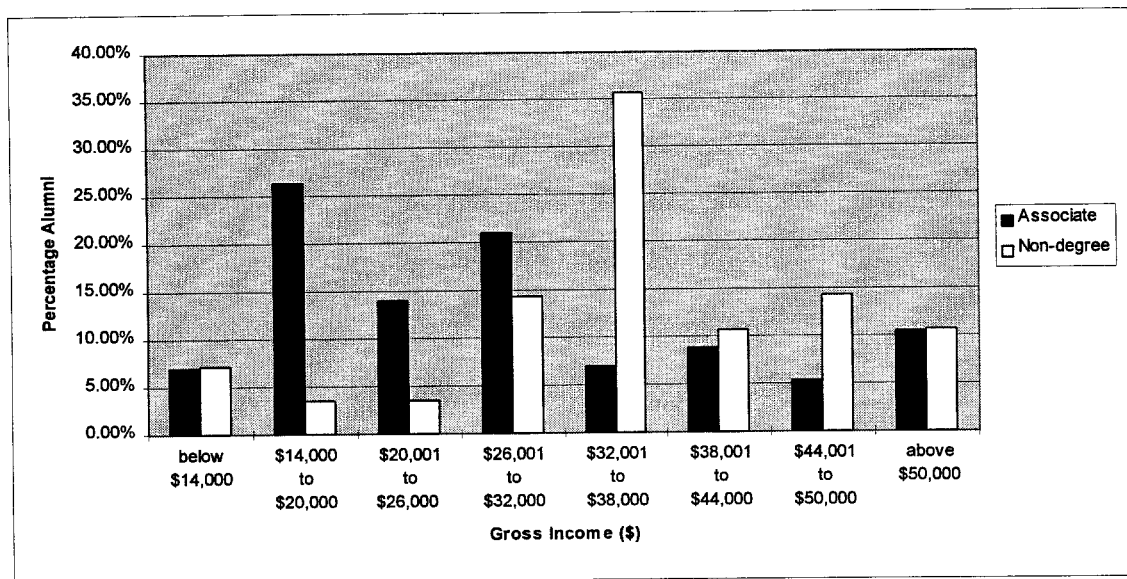


Figure 1: Graduate 1995 Gross Earned Income - Years Nine To Ten

Examination of figure one illustrates the differences. It appears that the percentage of non-degree and associate graduates are roughly equal to each other below \$14,000 and above \$50,000. The non-degree graduates have a larger representation in the higher three brackets (\$32,000 through \$50,000). The associate degree graduates have a greater percentage representation in the lower brackets (\$14,000 through \$32,000). Since the non-degree program graduates are earning higher incomes than the associate degree program graduates, the presupposition is not supported. This actually suggests that the non-degree programs have an earning advantage later in their careers over the associate programs. Studies including alumni of over 10 years would be necessary to see if this difference would persist.

Number of Employees Currently Supervised

No statistical difference was found at the .01 significance level when comparing the number of employees graduates supervised. However, a difference was found for years one to two at the .05 significance level (see Table 8, page 33). The mean for the associate graduates was over 3 points higher than the non-degree. Since this difference did not persist into the later year intervals, and since it is only at the .05 level, this finding does not have enough weight to support the presupposition.

Size of Budget Currently Controlled

No difference was found in control over a budget (Table 9, page 34) and the value of the budgets that were controlled (Table 10, page 35) at either the .05 or .01 significance levels. This data agrees with the criterion validating variables in supporting the counter-presupposition that there is no difference between associate degree and non-degree programs.

Leadership Position

No statistical difference was found for leadership positions held in horticulture at the .01 significance level. Differences were found at the .05 significance level (see Table 11, page 36). Years three to four and seven to eight indicate that more associate graduates hold leadership positions. Years five to six indicate that the non-degree programs hold more leadership positions. Since years one to two and nine to ten are statistically the same, it is not clear if either program has an advantage in holding leadership positions.

Table 8: Number of people supervised in current position.

Program	Years since graduation	Mean	Variance	Observed	Degrees of Freedom	t-statistic observed	t-critical value $\alpha=0.05$ $\alpha=0.01$
Associate	1-2	5.828947	53.21035	76	14	2.040511	1.761
Non-degree	1-2	2.666667	25.52381	15			2.624
Associate	3-4	6.075758	50.68648	66	16	0.136138	1.746
Non-degree	3-4	5.764706	75.69118	17			2.583
Associate	5-6	6.675676	60.41392	74	14	0.354837	1.761
Non-degree	5-6	6.0	42.14286	15			2.624
Associate	7-8	9.190476	119.4793	63	20	1.641558	1.725
Non-degree	7-8	6.0	39.5	21			2.528
Associate	9-10	7.568966	93.05656	58	27	0.567568	1.703
Non-degree	9-10	6.464286	61.14683	28			2.473

Table 9: Budget administered.

Program	Years since graduation	Yes	No	Observed	χ -statistic observed	χ -critical value $\alpha=0.05$ $\alpha=0.01$
Associate	1-2	29.33%	70.67%	75	1.636364	3.84
Non-degree	1-2	13.33%	86.67%	15		6.63
Associate	3-4	40.30%	59.70%	67	0.947545	3.84
Non-degree	3-4	27.78%	72.22%	18		6.63
Associate	5-6	44.59%	55.41%	74	0.370693	3.84
Non-degree	5-6	36.84%	63.16%	19		6.63
Associate	7-8	52.38%	47.62%	63	0	3.84
Non-degree	7-8	52.38%	47.62%	21		6.63
Associate	9-10	50.88%	49.12%	57	0.295879	3.84
Non-degree	9-10	57.14%	42.86%	28		6.63

Table 10: Value of the budget controlled in 1995 (U.S. dollars).

Program	Years since graduation	Mean	Variance	Observed	Degrees of Freedom	t-statistic observed	t-critical value $\alpha=0.05$ $\alpha=0.01$
Associate	1-2	242263.2	1.03E+11	19	1	2.793298	6.314
Non-degree	1-2	26000	1.15E+09	2			31.82
Associate	3-4	321366.7	2.17E+11	21	4	0.718392	2.132
Non-degree	3-4	217452.3	5.29E+10	5			3.747
Associate	5-6	183900	3.71E+10	30	4	-1.68204	2.132
Non-degree	5-6	1066791	1.37E+12	5			3.747
Associate	7-8	260642.9	1.19E+11	28	10	-0.447	1.812
Non-degree	7-8	346034.9	3.55E+11	11			2.764
Associate	9-10	295812	3.54E+11	25	14	-1.46716	1.761
Non-degree	9-10	2878097	4.63E+13	15			2.624

Table 11: Leadership position held in a horticultural organization of any type.

Program	Years since graduation	Yes	No	Observed	χ -statistic observed	χ -critical value	
						$\alpha=0.05$	$\alpha=0.01$
Associate	1-2	55.26%	44.74%	76	1.170915	3.84	3.84
Non-degree	1-2	40.00%	60.00%	15		6.63	6.63
Associate	3-4	39.66%	60.34%	58	3.84	3.84	3.84
Non-degree	3-4	16.67%	83.33%	18		6.63	6.63
Associate	5-6	32.43%	67.57%	74	6.191453	3.84	3.84
Non-degree	5-6	66.67%	33.33%	15		6.63	6.63
Associate	7-8	50.79%	49.21%	63	4.653249	3.84	3.84
Non-degree	7-8	23.81%	76.19%	21		6.63	6.63
Associate	9-10	36.84%	63.16%	57	1.342105	3.84	3.84
Non-degree	9-10	50.00%	50.00%	28		6.63	6.63

Highest Education Completed After Graduating

No significant difference was found at a significance level of .01. A significant difference was found in years one to two, five to six, and seven to eight (see Table 12, page 38). This difference indicates that in these years, the associate program graduates were more likely to complete a bachelors degree. This supports the idea that associate graduates are more likely to continue their education to a bachelors degree than the non-degree students. As Pascarella and Terenzini (1991) indicated, achieving a bachelors can have a very positive influence on career advancement.

Validation Of Consistency Variables

A statistically significant difference was found in the years spent in a horticulture position after completing the program for years one through two, in favor of the non-degree training program graduates at both the .05 and .01 significance level. Significance was also found at the .05 significance level for both years three to four and nine to ten in favor of the non-degree programs. A difference was also found in the number of years the respondents were in their current position, for years seven to eight, at the .05 significance level.

Employment Status

No significant differences were found in the employment status of the graduates at any time interval (see Table 13, page 39). The majority of respondents reported that they were employed full time during the 1995 calendar year. Having a full-time position positively influences career advancement.

Table 12: Highest degree completed after graduating from the program.

Program	Years since graduation	Associates Degree	Bachelors Degree	Masters Degree	Doctorate	Other	None	Observed	χ^2 -statistic observed	χ^2 -critical value $\alpha=0.05$ $\alpha=0.01$
Associate	1-2	5.17%	14.66%	0.00%	0.00%	0.00%	80.17%	116	15.02824	11.07
Non-degree	1-2	5.26%	0.00%	0.00%	0.00%	10.53%	84.21%	19		15.09
Associate	3-4	6.17%	18.52%	0.00%	0.00%	0.00%	75.31%	81	6.157598	11.07
Non-degree	3-4	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	20		15.09
Associate	5-6	0.00%	23.23%	3.03%	0.00%	1.01%	72.73%	99	11.40478	11.07
Non-degree	5-6	5.26%	0.00%	0.00%	0.00%	0.00%	94.74%	19		15.09
Associate	7-8	0.00%	22.78%	2.53%	0.00%	0.00%	74.68%	79	14.48768	11.07
Non-degree	7-8	4.55%	4.55%	0.00%	0.00%	9.09%	81.82%	22		15.09
Associate	9-10	8.54%	19.51%	1.22%	0.00%	2.44%	68.29%	82	7.879275	11.07
Non-degree	9-10	2.78%	2.78%	2.78%	0.00%	2.78%	88.89%	36		15.09

Table 13: Status of employment throughout the full calendar year of 1995.

Program	Years since graduation	Full-time	Part-time	Part-time temporary	Unemployed	Student	Observed	χ -statistic observed	χ -critical value $\alpha=0.05$ $\alpha=0.01$
Associate	1-2	56.03%	24.14%	11.21%	4.31%	4.31%	116	6.081136	9.49
Non-degree	1-2	78.95%	5.26%	15.79%	0.00%	0.00%	19		13.28
Associate	3-4	83.95%	13.58%	0.00%	1.23%	1.23%	81	0.96903	9.49
Non-degree	3-4	80.00%	20.00%	0.00%	0.00%	0.00%	20		13.28
Associate	5-6	91.92%	5.05%	2.02%	1.01%	0.00%	99	2.466505	9.49
Non-degree	5-6	84.21%	5.26%	5.26%	5.26%	0.00%	19		13.28
Associate	7-8	86.25%	5.00%	1.25%	6.25%	1.25%	80	3.096617	9.49
Non-degree	7-8	86.36%	9.09%	4.55%	0.00%	0.00%	22		13.28
Associate	9-10	81.71%	10.98%	2.44%	2.44%	2.44%	82	4.696444	9.49
Non-degree	9-10	78.38%	8.11%	2.70%	10.81%	0.00%	37		13.28

Employment in the Field of Horticulture

No significant differences were found in the number of graduates employed in the field of horticulture in 1995 (see Table 14, page 41). The majority of respondents answered that they were working in the field of horticulture.

Years Spent in Horticulture Since Graduating

Significance was found at both .05 and .01 for years spent in horticulture since graduating, in favor of the non-degree programs, years one to two. The difference in the means was 0.451714 years. The same type of significance was found in years three to four and nine to ten at the .05 level (see Table 15, page 42). The difference in the means for years three to four was 0.397785 years. The difference for years nine to ten was 0.933091 years. Again, both of these favored the non-degree programs. This could indicate that non-degree programs have an edge in the time it takes to land their first job. This could be because graduates in the non-degree programs are more likely to return to jobs they had, or companies they worked for prior to entering the program. As will be shown later in the chapter (section titled "Work History"), non-degree graduates had higher position levels than associates, prior to entering the program.

Career Interruption Since Graduating

No significant difference was found in the number of respondents having career interruptions (see Table 16, page 43). The majority of the respondents in both groups did not have any career interruptions. Career interruptions can adversely affect career advancement.

Table 14: Employment in the field of horticulture throughout the full calendar year of 1995.

Program	Years since graduation	Yes	No	Observed	χ -statistic observed	χ -critical value $\alpha=0.05$ $\alpha=0.01$
Associate	1-2	65.52%	34.48%	116	1.340329	3.84
Non-degree	1-2	78.95%	21.05%	19		6.63
Associate	3-4	85.19%	14.81%	81	0.311421	3.84
Non-degree	3-4	90.00%	10.00%	20		6.63
Associate	5-6	75.76%	24.24%	99	0.089618	3.84
Non-degree	5-6	78.95%	21.05%	19		6.63
Associate	7-8	78.75%	21.25%	80	3.313068	3.84
Non-degree	7-8	95.45%	4.55%	22		6.63
Associate	9-10	71.95%	28.05%	82	0.179895	3.84
Non-degree	9-10	75.68%	24.32%	37		6.63

Table 15: Years spent in a horticulture position since the completion of the program (years).

Program	Years since graduation	Mean	Variance	Observed	Degrees of Freedom	t-statistic observed	t-critical value $\alpha=0.05$ $\alpha=0.01$
Associate	1-2	1.271197	0.627878	117	18	-2.57358	1.734
Non-degree	1-2	1.723684	0.48538	19			2.552
Associate	3-4	3.177215	0.974602	79	19	-2.30416	1.729
Non-degree	3-4	3.575	0.349342	20			2.539
Associate	5-6	4.489899	2.821325	99	18	-1.62609	1.734
Non-degree	5-6	5.184211	2.922515	19			2.552
Associate	7-8	6.408228	5.232656	79	21	-1.05105	1.721
Non-degree	7-8	6.840909	2.271104	22			2.518
Associate	9-10	7.756098	8.624962	82	36	-1.77696	1.689
Non-degree	9-10	8.689189	6.310435	37			2.443

Table 16: Career interruptions.

Program	Years since graduation	Yes	No	Observed	χ -statistic observed	χ -critical value $\alpha=0.05$ $\alpha=0.01$
Associate	1-2	37.07%	62.93%	116	1.845402	3.84
Non-degree	1-2	21.05%	78.95%	19		6.63
Associate	3-4	29.63%	70.37%	81	0.001054	3.84
Non-degree	3-4	30.00%	70.00%	20		6.63
Associate	5-6	35.35%	64.65%	99	1.47335	3.84
Non-degree	5-6	21.05%	78.95%	19		6.63
Associate	7-8	31.25%	68.75%	80	0.002587	3.84
Non-degree	7-8	31.82%	68.18%	22		6.63
Associate	9-10	40.24%	59.76%	82	0.280617	3.84
Non-degree	9-10	35.14%	64.86%	37		6.63

Years in Current Position

No difference was found in the years respondents were in their current position at a .01 significance level. The .05 significance level only pointed to one difference in the years seven to eight (see Table 17, page 45). The difference in the mean was 1.440476 years in favor of the non-degree graduates. Since this only showed up in one range at the .05 level it is doubtful that this is an indication of a difference in employment continuity demonstrated here.

Statistical Significance Discovered In The Confounding Variables

Differences were found in both the level of education attained prior to entering the program, and highest position before entering the program for all respondents, at both the .05 and .01 significance levels. Both differences were in favor of the non-degree programs.

Highest Level of Education Attained Before Program. The researcher found statistical evidence indicating that there was a significant difference in the highest level of education attained before entering the respective programs. All groups except the seven to eight year group had significant differences. Examination of figure two (page 46) illustrates the differences (figure based on Table 18, Appendix E, page 74).

Table 17: Years in current position.

Program	Years since graduation	Mean	Variance	Observed	Degrees of Freedom	t-statistic observed	t-critical value $\alpha=0.05$ $\alpha=0.01$
Associate	1-2	1.842857	3.296034	77	13	-0.09265	1.771
Non-degree	1-2	1.892857	3.478022	14			2.650
Associate	3-4	3.065606	8.958997	66	17	0.440523	1.740
Non-degree	3-4	2.861111	1.435458	18			2.567
Associate	5-6	3.283516	4.233271	73	14	-1.33765	1.761
Non-degree	5-6	3.866667	1.980952	15			2.624
Associate	7-8	3.797619	5.845196	63	20	-2.34281	1.725
Non-degree	7-8	5.238095	5.990476	21			2.528
Associate	9-10	5.356322	10.16442	58	27	-1.95765	1.703
Non-degree	9-10	6.7325	8.929871	28			2.473

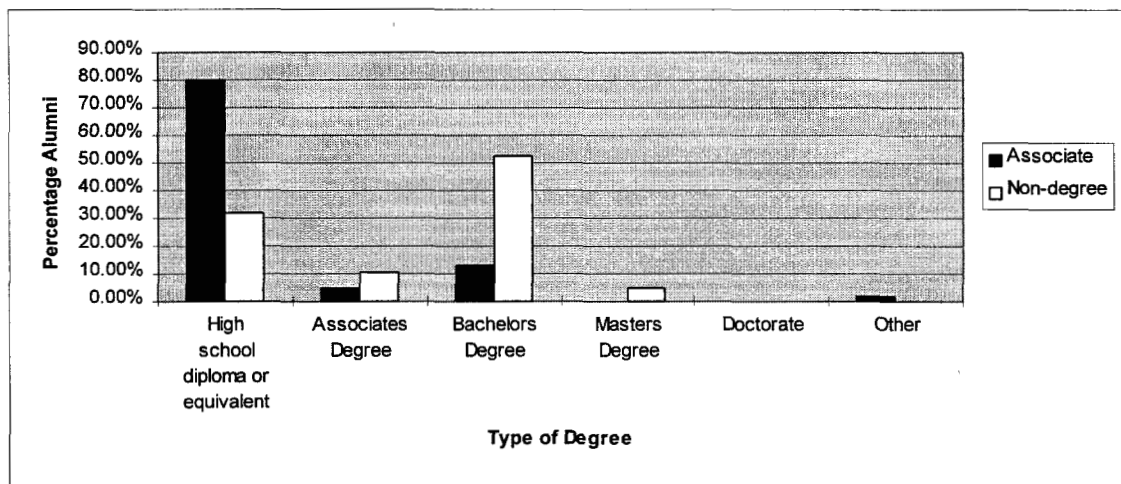


Figure 2: Highest Level of Education Before Entering Program - All Respondents

It appears that the non-degree training program graduates have a larger number of graduates that entered the program with a bachelors degree than did the associate degree programs. In an effort to determine the quality of the confounding effect, the researcher grouped the degrees into four broad categories. A graphic illustration of the results (data from table 19, page 75) are found in Figure 3 (page 47).

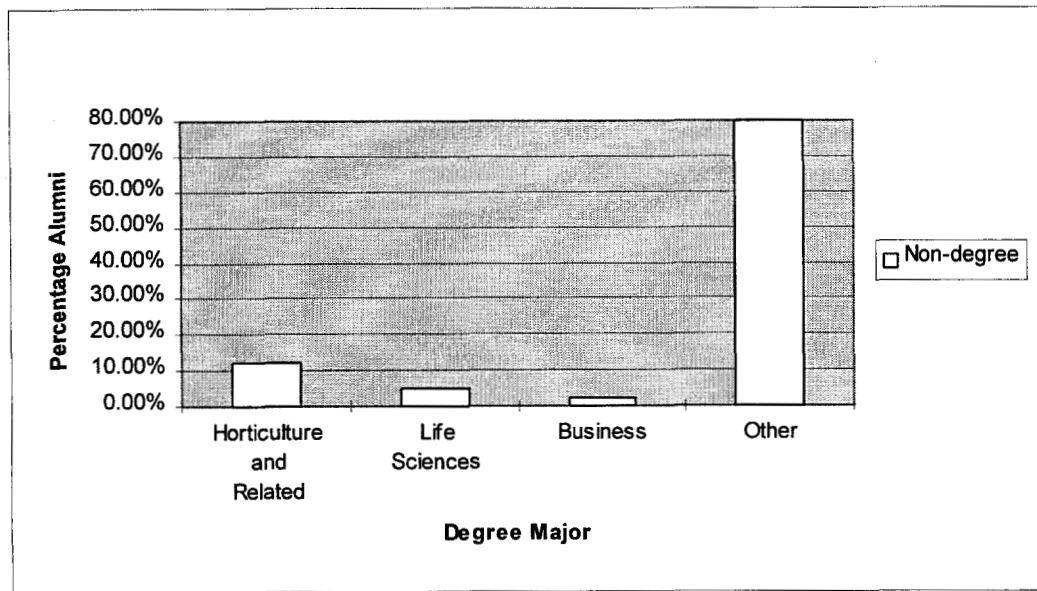


Figure 3: Types Of Bachelor Degrees Before Entering Non-Degree Program-Years One Through Ten

The majority of the degrees are in other fields. Although having degrees in these fields may have had an impact on general cognitive skills, based on the development of cognitive skills discussed in chapter one, it is unlikely that it has impacted cognitive skills specific to ornamental horticulture. But there could be a confounding effect due to general cognitive skill development and non-cognitive growth (e.g., maturity).

Highest Position Held Before Entering Program

The researcher also found statistical evidence (at both the .05 and .01 significance levels) indicating that there was a significant difference in the highest position level attained before entering the respective programs. Examination of Figure 4 (page 48) indicates the differences (data from Table 23, Appendix E, page 81).

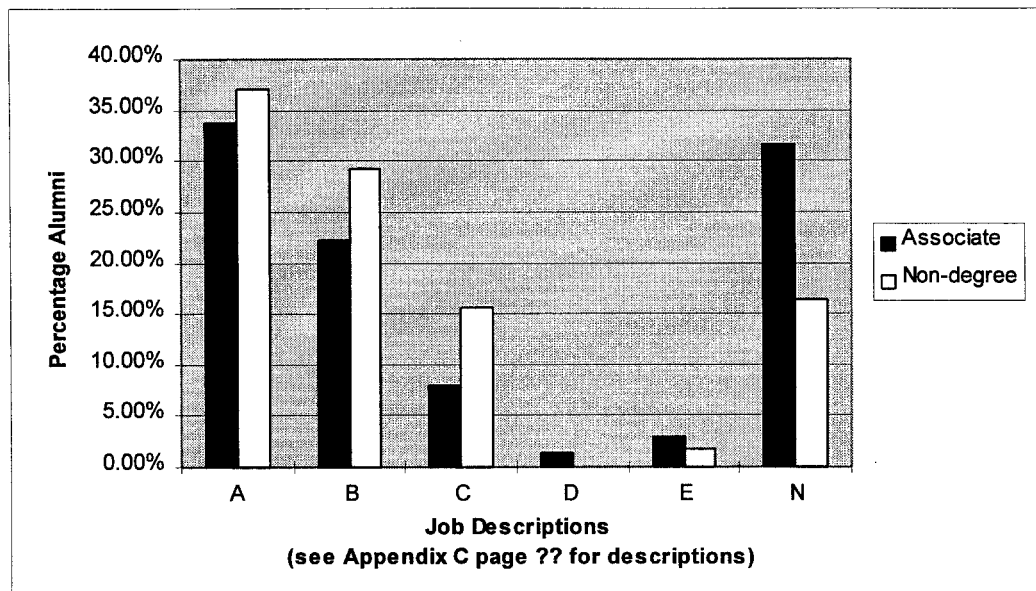


Figure 4: Highest Position Before Entering Program - Years One Through Ten

Category A stands for entry level positions, B stands for skilled positions, C stands for supervisory positions, D stands for management positions, E stands for the top administrator position, and N stands for a non-horticultural or no position (please see the survey, Appendix C, page 69 for the full category descriptions). It appears that the associate graduates more frequently start their program without holding a horticultural position. This most likely relates to the differences in admission policies. The non-degree training programs' admission policies favor candidates having previous experience in the field of horticulture. The associate degree programs have no similar policies. Having worked in the field before entering a program could afford some benefit to a student entering a program as well as in placement after graduation. This may explain why the results indicated some

differences in the years spent in a horticulture position after completing the program in favor of the non-degree graduates.

Chapter 5

DISCUSSION

This study did not support the presupposition that there would be a significant difference between ornamental associate degree programs and non-degree training programs in favor of the associate degree programs. Instead, this study supported the counter-presupposition that there would be no difference. The criterion validating variables supported the counter-presupposition at the .01 significance level. Some differences were found in the .05 level for position levels, but in the few instances where there were differences, they were in favor of the non-degree programs. Secondary validating variables reinforced the criterion validating variables at the .01 significance level. There was evidence that salaries of graduates at years nine to ten were significantly higher for non-degree programs. The differences found at the .05 were not conclusive. This chapter will discuss the presupposition, the counter-presupposition, and other related information found in Chapter 1 (Introduction), in the light of the evidence found in this study.

Institutional Hierarchy Presupposition

The theory of institutional hierarchy is based on the premise that attainment of a bachelors degree would enhance career advancement. It also was based on the likelihood of completing a bachelors degree based on the type of institution and program in which a student started. It was assumed by the researcher that attaining an associates degree would put a graduate in a better position to

complete a bachelors degree than would attaining a diploma. This then would improve career advancement. The researcher found no statistical difference between the two program types for education attained after completing the program at the .01 significance level. Analysis at the .05 level indicated in three of the year categories, associate graduates attained a bachelors degree more often than non-degree graduates. The presupposition hinged on the fact that the associate degree alumni would be more likely to complete a bachelors degree. Although there is some evidence indicating that this is true, it is not absolutely clear whether the presupposition's rationale applies to the conditions found in this study.

Counter-Presupposition To Institutional Hierarchy

It seems that there were factors in this study which may have had the same affect as some of the controls which were used in past research to support the counter-presupposition (please refer back to Chapter 1 page 2). The counter-presupposition depends on the control of variables like: family socioeconomic status; academic ability; pre-college (program) educational and occupational aspirations; and final level of education. It is possible that the two groups were homogenous in relation to one or more of these variables. As mentioned previously, educational attainment after graduation was statistically the same. Since both associate and non-degree programs required a high school diploma (or equivalent), it is possible that academic ability of those entering were comparable. Differences were found in educational attainment before entering the programs. Further analysis showed that this additional education attained by non-degree training program graduates was in non-related fields which would limit the effects to general cognitive skill. Therefore specific pre-program cognitive skills could have been controlled.

The socio-economic variability could have been controlled since lack of ethnic diversity has been found in the field of horticulture. Larkin's study (1995) on job satisfaction in public horticulture had responses that lacked ethnic diversity. This lack of ethnic diversity could have been naturally controlled by the sample population. Singer's study on diversifying public garden operations found also sighted a lack of ethnic diversity :

“Lack of education and experience were primary reasons given by BBG [Brooklyn Botanical Garden], DBG [Denver Botanical Gardens] and Lyon staff to account for the homogeneous applicant pool for horticulturist positions. (Singer 1995, 18)

It is plausible that this may be true of the alumni that were studied. If this were true, the lack of difference in autonomy seen could be due in part to the control of ethnic diversity that may naturally occur in the sample population.

Credentialization And Screening Of Alumni By An Institution

Since career advancement was found to be that same for both associate and non-degree programs, it is possible that both types of programs are perceived by employers as equivalent. Since the programs were selected based on their reputation it could be assumed that this process negated the effect of credentialization on the graduates. But, it would also be necessary to assume that employers do not perceive the two types of programs (associate versus non-degree) differently. It is the feeling of the researcher that credentialization and screening were the most important factors affecting this study. The researcher also feels that the career outcomes were the same because the perceptions of the employers were the same. There is no prior evidence to substantiate any difference in perception by employers. This type of information would be valuable to look at in further studies.

Development Of Cognitive and Non-Cognitive Skills

Since the non-degree programs had higher levels of general education, and higher career positions when entering their programs, they also may have had higher levels of general cognitive growth before entering the program. Non-degree graduates also may have had an advantage in specific job/field related cognitive growth because of the higher career levels. Non-cognitive growth may also have been higher for the non-degree graduates, since completing any type of bachelors degree, and having prior work experience could both increase non-cognitive skills. Although the non-degree graduates had some advantages entering the program, their advancement was equivalent after graduation. This survey did not directly test cognitive or non-cognitive development, so there is not way of being certain if there were any cognitive differences between the groups.

Chapter 6

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The researcher feels that the data did not fit the presupposition because the major factors that could distinguish the two groups were relatively equivalent. Although there were indications (at the .05 significance level) that associate graduates were more likely to continue their education and receive a bachelors degree, the non-degree students were more likely to enter their respective programs with a bachelors degree. Assuming that both associate degree and non-degree programs provide equivalent cognitive development specific to the ornamental horticulture career field, then both alumni would be equally likely to have developed equivalent specific cognitive growth, general cognitive growth, and non-cognitive growth (the last two which could be developed by finishing any bachelors degree program). If this were the case, the effects of institutional hierarchy and the development of cognitive and non-cognitive skills would be negated. Likewise it is more than likely that the credentialization effects were also negated due to the high reputation of all the programs studied. Although the screening processes are different (the associates screen with standardized tests, and the non-degree programs screen with interviews and letters of recommendation) both are very valuable and respected tools for selecting potential candidates. Of the major factors that could distinguish the two groups the researcher feels that the credentialization/screening effect is the most important.

The researcher also feels that equivalence in credentialization and screening could overcome minor discrepancies that may occur in cognitive and non-cognitive development. Cognitive and non-cognitive skill not only develop in an academic setting, but also in the workplace. Through credentialization, alumni are placed in positions that employers perceive they qualified for based on the institution they are affiliated with. Any discrepancies between the perceived skills, and the actual skills would disappear as the graduate continues to grow into the position. Barring any major differences between the skills perceived and actually present, the most important factor is being able to get into a challenging position and continue to grow. It is through this growth and development that careers can advance. Credentialization/screening opens the door to the opportunities that the graduates need for continued growth, and career advancement.

Recommendations For Use Of This Research

The researcher hopes that his research is used by administrators of ornamental horticulture education programs. The survey, and the associated analysis used in this research, is a valuable tool for administrators to use in outcome assessment. This type of research is also valuable to students entering ornamental horticulture education programs. It will help them make an informed decision when selecting programs to enter.

Recommendations For Future Research

This research was limited to six institutions in a limited geographic region of the United States and Canada. It would be useful to have other studies done in other parts of the United States and Canada. Replication studies including fifteen or

twenty years might also be useful. A study evaluating employer perceptions of non-degree training and associate programs would be useful in determining the effect of credentialization on graduates. It would also be important to study the cognitive changes that take place in non-degree training programs versus associate programs relate this information to career advancement. A longitudinal study of the career expectations of students entering these two types of programs and comparing them to actual career advancement could also be valuable since student's expectations also play an important role in career advancement.

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APPENDIX A
LIST OF PROGRAMS CONSIDERED FOR USE IN THE STUDY

Associate Programs

Becker Junior College Leicester, MA	Springfield Technical Community College Springfield, MA
Ohio State University Agricultural Technical Institute Wooster, OH	University of Massachusetts Dept. Plant and Soil Sciences Amherst, MA
Allegheny Community College Cumberland, MD	Charles County Community College La Plata, MD
Prince George's Community College Largo, MD	Sandhills Community College Carthage, NC
Southern Maine Vo-Tech Institute Portland, MA	University of New Hampshire Thompson School of Applied Science Durham, NH
Bergen Community College Paramus, NJ	Cumberland County Community College Vineland, NJ
Mercer County Community College Trenton, NJ	Community College of Finger Lakes Canandaigua, NY
New York City Technical College Brooklyn, NY	Niagara County Community College Sanborn, NY
State University of New York Agricultural and Technical College at Cobleskill Cobleskill, NY	State University of New York College of Technology at Alfred Alfred, NY
State University of New York College of Technology at Delhi Delhi, NY	State University of New York College of Technology at Farmingdale Farmingdale, NY
Suffolk County Community College Selden, NY	Ulster County Community College New Paltz, NY
Vocational Technical School Willow Grove, PA	Williamsport Area Community College Williamsport, PA
Norfolk School of Horticulture Norfolk, VA	Northern Virginia Community College Sterling & Annandale, VA
Potomac State College of West Virginia University Keyser, WV	Niagara College of Applied Arts and Technology St. Catherine's, ON Canada
Ryerson Polytechnical Institute Toronto, ON Canada	

Non-Degree Programs

University of Connecticut Ratcliffe Hicks School of Agriculture Storrs, CT	University of Delaware Newark, DE
Massachusetts Bay Community College Wellesley, MA	New England Wildflower Society Framingham, MA
Norfolk County Agricultural School Walpole, MA	Endicott College Center for Continuing Education Beverly, MA
Charles County Community College La Plata, MD	Dundalk Community College Baltimore, MD
Howard Community College Plant Science Program Columbia, MD	University of Maryland Department of Horticulture College Park, MD
Southern Maine Vo-Tech Institute South Portland, MA	New York Botanical Garden New York, NY
Pennsylvania State University Dept. of Horticulture University Park, PA	Longwood Professional Gardener Training Program Kennett Square, PA
James Rumsey Vocational Technical Center Martinsburg, WV	Algonquin College of Applied Arts and Technology Ottawa, ON Canada
Cambrian College of Applied Arts and Technology Sudbury, ON Canada	Durham College of Applied Arts and Technology Oshawa, ON
Fanshawe College of Applied Arts and Technology East London, ON Canada	Humbler College of Applied Arts and Technology Rexdale, ON Canada
Kemptville College of Agricultural Technology Kemptville, ON Canada	Kitchener-Waterloo School of Horticulture Waterloo, ON Canada
Niagara College of Applied Arts and Technology Welland, ON Canada	Niagara Parks Commission School of Horticulture Niagara Falls, ON Canada
Ridgetown College of Agricultural Technology Ridgetown, ON Canada	Seneca College of Applied Arts and Technology East Willowdale, ON Canada
Sheridan College of Applied Arts and Technology Burlington, ON Canada	Sir Sanford Fleming College of Arts and Technology Lindsay, ON Canada
St. Claire College of Applied Arts and Technology Windsor, ON Canada	St. Lawrence College Brockville, ON Canada
University of Guelph Guelph, ON Canada	

APPENDIX B

EXEMPTION FROM HUMAN SUBJECTS REVIEW BOARD



OFFICE OF THE VICE PROVOST
FOR RESEARCH

210 Hullihen Hall
University of Delaware
Newark, Delaware 19716-1551
Ph: 302/831-2136
Fax: 302/831-2828

8 July 1996

Mr. Peter Punzi
Longwood Graduate Program
153 Townsend Hall
Campus

Dear Mr. Punzi:

Subject: Human subjects approval for "Career advancement comparison between ornamental horticultural certificate and associate degree programs"

The above-referenced proposal, which you submitted for human subjects approval, will qualify as research exempt from full Human Subjects Review Board review under the following category:

Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless (1) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects, and (2) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

Please notify the Human Subjects Review Board if you make any changes in this project.

Sincerely,

A handwritten signature in cursive script that reads "Costel Denson".

Costel D. Denson
Vice Provost for Research
Chair, Human Subjects Review Board

cc: James Swasey

AN EQUAL OPPORTUNITY UNIVERSITY

APPENDIX C
SURVEY INSTRUMENT AND COVER LETTER



THE
LONGWOOD
GRADUATE PROGRAM
Public Horticulture
~Administration~
153 Townsend Hall
University of Delaware
Newark, DE 19717-1303
Tel: 302-831-2517
Fax: 302-831-3651

Dear Colleague,

I need your assistance. I am studying the career development of graduates of certificate and associate ornamental horticultural programs. This is part of my Master's research at the University of Delaware. The survey on the next 3 pages is composed of 20 questions that should take you less than 15 minutes to answer. It is vital to the accuracy of this research that your responses are incorporated into my research.

This research will be a valuable tool to both institutions with certificate and/or associate programs as well as students considering either of these modes of education.

Enclosed is a self-addressed stamped envelope to make responding that much easier. A response within two weeks would be greatly appreciated.

It is important that your response be anonymous, so please do not put your name anywhere on the survey.

Again thank you for helping make my research both accurate and useful to the institutions that train professionals like yourself, and the next generation of students to follow in your footsteps.

Sincerely,

Peter Punzi
Longwood Graduate Fellow

Professional Survey

Please complete the survey, place in the envelope provided seal and send. This survey should take less than 10 minutes. Do not place your name anywhere on the survey. Thank You.

1. What year did you graduate from your Associate Program? 19 _____
2. Which of the following did you complete **before** entering the Associate Program?

- ☐ High School Diploma or equivalent
- ☐ Associates Degree Major: _____
- ☐ Bachelors Degree Major: _____
- ☐ Masters Degree Major: _____
- ☐ Doctorate Major: _____
- ☐ Other Please specify _____

3. What degrees have you completed **after** graduating from the Associate program?

- ☐ Associates Degree Major: _____
- ☐ Bachelors Degree Major: _____
- ☐ Masters Degree Major: _____
- ☐ Doctorate Major: _____
- ☐ Other Please specify _____
- ☐ None

4. Which one of the following best describes your employment status throughout the full calendar year of 1995?

- ☐ Full-time ☐ Part-time ☐ Part-time temporary ☐ Unemployed

5. Were you employed in the field of horticulture throughout the full calendar year of 1995?

- ☐ Yes ☐ No

6. How many years since the completion of the Associate have you spent in a horticulture position? _____ years

7. Since obtaining the Associate has your career been interrupted? ☐ Yes ☐ No

8. What is the total length of time your career has been interrupted? _____ months

9. Which of the following describes the reason(s) for your career interruption?

- ☐ Time to raise a child or care for a dependent ☐ Worked in another career field
- ☐ Relocation due to partner's change of employment ☐ Returned to school
- ☐ Other; please specify _____

Please use the following five job descriptions to answer questions 10 through 13

A. Performs duties and participates in horticultural activities under close supervision, according to specific instruction.

Examples: Park Worker (Landscape Specialist), Landscape Laborer, Greenskeeper II, Groundskeeper (Grounds Caretaker), Horticultural Worker II, Budder, Transplanter, Tree Surgeon Helper.

B. Applies horticultural knowledge while performing activities as directed by supervisory personnel.

Examples: Garden Worker (Gardener, Florist), Horticultural Worker I, Plant-Care Worker (Interior Horticulturist), Pest Control Worker, Lawn Service Worker, Tree Pruner, Hydro-sprayer Operator.

C. Supervises and coordinates horticultural activities of oneself and/or others.

Examples: Horticulture Supervisor, Horticultural Specialty Grower, Plant Propagator, Landscape Supervisor, Greenskeeper I, Superintendent of Greens, Spray, Lawn & Tree Service Supervisor, Landscaper (Landscape Gardener), Tree Surgeon, Landscape Designer, Crew Leader, Head Gardener.

D. Plans, directs, and coordinates horticultural activities through subordinate supervisory personnel, according to executive directives.

Examples: Superintendent of Horticulture, Head of Horticulture, Manager (Christmas Tree Farm, Nursery, Garden Center, Orchard, etc.).

E. Administers affairs of a horticultural institution or company. Confers with the institution's Board of Directors, or the Company's owner, to formulate policies and plan overall operations.

Examples: Director, President, Owner.

N. Non-horticultural position or any position unrelated to horticulture.

10. ____ Please enter the letter that best describes the horticultural position you held just **before** entering the Associate program.

11. ____ Please enter the letter that best describes the first horticultural position you held just **after** graduating from the Associate program.

12. ____ Please enter the letter that best describes the horticultural position in which you have spent **most of your career since** graduating from the Associate program.

(If you answered "No" to question #5 this is the end of the survey. Please fold the survey and mail it in the envelope provided. Thank you)

13. ____ Please enter the letter for the horticultural position that best describes the position in which you are **currently**.

14. How many years have you been in your current position? _____ years

15. Please check the salary range that best represents your gross earned income (before taxes) from horticulture for the full calendar year 1995:

- | | | |
|---|---|---|
| <input type="checkbox"/> below \$14,000 | <input type="checkbox"/> \$26,001 to \$32,000 | <input type="checkbox"/> \$44,001 to \$50,000 |
| <input type="checkbox"/> \$14,000 to \$20,000 | <input type="checkbox"/> \$32,001 to \$38,000 | <input type="checkbox"/> above \$50,000 |
| <input type="checkbox"/> \$20,001 to \$26,000 | <input type="checkbox"/> \$38,001 to \$44,000 | |

16. Which of the following five statements best represents the level of autonomy you have in your current horticultural position (check only one):

- ☐ I act according to detailed instructions.
- ☐ I act according to general instructions, interpreting/changing somewhat ambiguous instruction. Some technical knowledge is required.
- ☐ I act in the frame of general guidelines. I revise existing procedures based on technical and professional knowledge for established principles or concepts. I am responsible for various activities and wide-ranging problems.
- ☐ I determine guidelines for my own area of responsibility. I can create new approaches and methods where no direct precedents are available.
- ☐ I determine policy in the area of my own responsibility. I can create my own direction of action according to general policy and I can make final decisions in a general field of activity within the frame of professional knowledge.

17. How many people do you supervise (approximate if number varies)? _____

18. Do you directly control or administer any type of budget? ☐ Yes ☐ No

19. If your answer to question #18 was yes, what was the dollar value of the budget you had control over in 1995?
\$ _____

20. Have you held or currently hold a leadership position in a horticultural organization of any type? ☐ Yes ☐ No

Thank you for taking the time to complete and return this survey. Please fold the survey and mail it in the envelope provided.

APPENDIX D

Statistical Formulas

Two-sample T-test

The two sample t-test formula compares two observed means:

$$t = \frac{\bar{x}_1 - \bar{x}_2 - \Delta}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

Where \bar{x}_1 and \bar{x}_2 are the means of the two samples, Δ is the hypothesized difference between the population means (zero used because the test is for the counterpresupposition of no difference), s_1 and s_2 are the standard deviations of the two samples, and n_1 and n_2 are the sizes of the two samples. The number of degrees of freedom for the problem is the smaller of $n_1 - 1$ and $n_2 - 1$ (Voelker & Orton 1993).

The t-statistic calculated with this formula is compared to the critical statistic value. The critical statistic value is based on the degrees of freedom and the alpha (α) level chosen (in this study $\alpha = 0.01$ and $\alpha = 0.05$). If the value of the t-statistic calculated (observed) is higher than the critical value, then the counterpresupposition can be rejected. At $\alpha = 0.01$ there is a 99% certainty that the counterpresupposition is not rejected by chance.

Chi-square Test (χ^2) For Comparing Categorical Data

The χ^2 formula compares expected and observed cell frequencies to measure the difference between observed and expected values:

$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

Where O is the observed cell frequencies (), E is the expected cell frequencies, and \sum is the summation of the results of the following computation. The degrees of freedom is (# of rows - 1) x (# columns - 1) (Page & Patton 1991).

The chi-square statistic calculated with this formula is compared to the critical chi-square statistic value. The critical statistic value is based on the degrees of freedom and the alpha (α) level chosen (in this study $\alpha = 0.01$ and $\alpha = 0.05$). If the value of the chi-square statistic calculated (observed) is greater than the critical value, the counter-presupposition can be rejected. At $\alpha = 0.01$ there is a 99% certainty that the counter-presupposition is not rejected by chance.

APPENDIX E

Survey Data

Table 18: Level of education completed before entering the program.

Program	Years since graduation	High school diploma or equivalent	Associates Degree	Bachelors Degree	Masters Degree	Doctorate	Other	Observed	χ^2 -statistic observed	χ^2 -critical value $\alpha=0.05$ $\alpha=0.01$
Associate	1-2	80.17%	5.17%	12.93%	0.00%	0.00%	1.72%	116	26.37467	11.07
Non-degree	1-2	31.58%	10.53%	52.63%	5.26%	0.00%	0.00%	19		15.09
Associate	3-4	87.65%	7.41%	2.47%	0.00%	0.00%	2.47%	81	30.61228	11.07
Non-degree	3-4	50.00%	5.00%	35.00%	10.00%	0.00%	0.00%	20		15.09
Associate	5-6	87.88%	9.09%	3.03%	0.00%	0.00%	0.00%	99	28.83418	11.07
Non-degree	5-6	63.16%	0.00%	15.79%	0.00%	0.00%	21.05%	19		15.09
Associate	7-8	86.25%	3.75%	5.00%	2.50%	0.00%	2.50%	80	12.11363	11.07
Non-degree	7-8	59.09%	9.09%	27.27%	0.00%	0.00%	4.55%	22		15.09
Associate	9-10	81.71%	9.76%	6.10%	1.22%	0.00%	1.22%	82	21.40205	11.07
Non-degree	9-10	45.95%	10.81%	37.84%	2.70%	0.00%	2.70%	37		15.09

Table 19: Major area of degree completed before entering the program.

Associate

Program	Years since graduation	Horticulture and related	Life Sciences	Business	Other	Observed	χ -statistic observed	χ -critical value $\alpha=0.05$ $\alpha=0.01$
Associate	1-10	62.50%	15.63%	9.38%	12.50%	32	9.078654	9.49
Non-degree	1-10	22.22%	22.22%	0.00%	55.56%	9		13.28

Bachelors

Program	Years since graduation	Horticulture and related	Life Sciences	Business	Other	Observed	χ -statistic observed	χ -critical value $\alpha=0.05$ $\alpha=0.01$
Associate	1-10	10.34%	6.90%	20.69%	62.07%	29	6.400472	9.49
Non-degree	1-10	12.50%	5.00%	2.50%	80.00%	40		13.28

Masters

Program	Years since graduation	Horticulture and related	Life Sciences	Business	Other	Observed	χ -statistic observed	χ -critical value $\alpha=0.05$ $\alpha=0.01$
Associate	1-10	0.00%	0.00%	0.00%	100.00%	3	0	9.49
Non-degree	1-10	0.00%	0.00%	0.00%	100.00%	3		13.28

Other

Program	Years since graduation	Horticulture and related	Life Sciences	Business	Other	Observed	χ -statistic observed	χ -critical value $\alpha=0.05$ $\alpha=0.01$
Associate	1-10	100.00%	0.00%	0.00%	0.00%	1	0	9.49
Non-degree	1-10	100.00%	0.00%	0.00%	0.00%	6		13.28

Table 20: Major area of degree completed after completing the program.

Associate

Program	Years since graduation	Horticulture and related	Life Sciences	Business	Other	Observed	χ -statistic observed	χ -critical value $\alpha=0.05$ $\alpha=0.01$
Associate	1-10	77.78%	5.56%	11.11%	5.56%	18	0.910081	9.49
Non-degree	1-10	75.00%	0.00%	25.00%	0.00%	4		13.28

Bachelors

Program	Years since graduation	Horticulture and related	Life Sciences	Business	Other	Observed	χ -statistic observed	χ -critical value $\alpha=0.05$ $\alpha=0.01$
Associate	1-10	70.45%	13.64%	7.95%	7.95%	88	4.437906	9.49
Non-degree	1-10	50.00%	0.00%	50.00%	0.00%	2		13.28

Masters

Program	Years since graduation	Horticulture and related	Life Sciences	Business	Other	Observed	χ -statistic observed	χ -critical value $\alpha=0.05$ $\alpha=0.01$
Associate	1-10	33.33%	0.00%	33.33%	33.33%	6	1.555556	9.49
Non-degree	1-10	0.00%	0.00%	0.00%	100.00%	1		13.28

Other

Program	Years since graduation	Horticulture and related	Life Sciences	Business	Other	Observed	χ -statistic observed	χ -critical value $\alpha=0.05$ $\alpha=0.01$
Associate	1-10	25.00%	0.00%	0.00%	75.00%	4	6.3	9.49
Non-degree	1-10	40.00%	20.00%	40.00%	0.00%	5		13.28

Table 21: Total length of time career has been interrupted (months).

Program	Years since graduation	Mean	Variance	Observed	Degrees of Freedom	t-statistic observed	t-critical value $\alpha=0.05$ $\alpha=0.01$
Associate	1-2	10.60256	106.1339	39	3	-0.219	2.353
Non-degree	1-2	11.75	98.91667	4			4.541
Associate	3-4	13.13636	145.6472	22	5	1.021762	2.015
Non-degree	3-4	9.666667	29.46667	6			3.365
Associate	5-6	25.91429	369.3748	35	3	0.180551	2.353
Non-degree	5-6	23.5	673	4			4.541
Associate	7-8	26	612.5217	24	5	0.745117	2.015
Non-degree	7-8	20.66667	154.2667	6			3.365
Associate	9-10	33.4	1036.938	30	12	-0.13575	1.771
Non-degree	9-10	34.84615	1025.974	13			2.650

Table 22: Reason(s) for your career interruption.

Program	Years since graduation	Time to raise a child or care for a dependent	Worked in another career field	Relocation due to a partner's change of employment	Returned to School	Other	Observed	χ -statistic observed	χ -critical value $\alpha=0.05$ $\alpha=0.01$
Associate	1-2	7.14%	28.57%	4.76%	38.10%	21.43%	42	4.316808	9.49
Non-degree	1-2	25.00%	25.00%	0.00%	0.00%	50.00%	4		13.28
Associate	3-4	4.17%	37.50%	0.00%	37.50%	20.83%	24	12.95455	9.49
Non-degree	3-4	0.00%	0.00%	0.00%	0.00%	100.00%	6		13.28
Associate	5-6	11.43%	51.43%	0.00%	22.86%	14.29%	35	1.699286	9.49
Non-degree	5-6	25.00%	50.00%	0.00%	0.00%	25.00%	4		13.28
Associate	7-8	12.00%	32.00%	4.00%	16.00%	36.00%	25	9.374476	9.49
Non-degree	7-8	42.86%	0.00%	28.57%	14.29%	14.29%	7		13.28
Associate	9-10	18.75%	53.13%	0.00%	12.50%	15.63%	32	7.53278	9.49
Non-degree	9-10	46.15%	38.46%	7.69%	0.00%	7.69%	13		13.28

Table 23: Horticultural position held just before entering the program.

Program	Years since graduation	A	B	C	D	E	N	Observed	χ -statistic observed	χ -critical value $\alpha=0.05$ $\alpha=0.01$
Associate	1-10	33.84%	22.27%	8.08%	1.31%	2.84%	31.66%	458	17.08323	11.07
Non-degree	1-10	37.07%	29.31%	15.52%	0.00%	1.72%	16.38%	116		15.09

Table 24: Salary range for gross earned income (before taxes) from horticulture for the full calendar year 1995.

Program	Years since graduation	below \$14,000	\$14,000 to \$20,000	\$20,001 to \$26,000	\$26,001 to \$32,000	\$32,001 to \$38,000
Associate	1-2	30.26%	28.95%	18.42%	13.16%	5.26%
Non-degree	1-2	26.67%	13.33%	53.33%	0.00%	0.00%
Associate	3-4	19.12%	14.71%	27.94%	20.59%	8.82%
Non-degree	3-4	5.56%	27.78%	27.78%	16.67%	11.11%
Associate	5-6	6.85%	12.33%	21.92%	20.55%	15.07%
Non-degree	5-6	6.67%	13.33%	33.33%	33.33%	13.33%
Associate	7-8	9.52%	15.87%	15.87%	20.63%	14.29%
Non-degree	7-8	5.00%	35.00%	20.00%	20.00%	10.00%
Associate	9-10	7.02%	26.32%	14.04%	21.05%	7.02%
Non-degree	9-10	7.14%	3.57%	3.57%	14.29%	35.71%

* This table is continued on the next page

Program	Years since graduation	\$38,001 to \$44,000	\$44,001 to \$50,000	above \$50,000	Observed	χ -statistic observed	χ -critical value
$\alpha=0.05$							
$\alpha=0.01$							
Associate	1-2	1.32%	0.00%	2.63%	76	9.490291	14.07
Non-degree	1-2	6.67%	0.00%	0.00%	15		18.48
Associate	3-4	5.88%	0.00%	2.94%	68	10.44652	14.07
Non-degree	3-4	0.00%	5.56%	5.56%	18		18.48
Associate	5-6	10.96%	2.74%	9.59%	73	3.009148	14.07
Non-degree	5-6	0.00%	0.00%	0.00%	15		18.48
Associate	7-8	7.94%	4.76%	11.11%	63	4.554898	14.07
Non-degree	7-8	0.00%	10.00%	0.00%	20		18.48
Associate	9-10	8.77%	5.26%	10.53%	57	18.93707	14.07
Non-degree	9-10	10.71%	14.29%	10.71%	28		18.48

*This table is a continuation from the previous page