A DETERMINATION OF THE AGRICULTURAL MECHANICS TASKS PERFORMED BY TEACHERS OF HORTICULTURE IN VIRGINIA

by

Jack L. Schinstock

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APPROVED:

John R. Crunkilton, Chairman

Donald E. Elson

James P. Clouse

E. Stephen Bell

Sammuel D. Morgan

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Blacksburg, Virginia

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Chapter 1

INTRODUCTION

In recent years, vocational education in agriculture has undergone considerable change in Virginia, especially since the passage of the 1963 Vocational Education Act and the Vocational Education Amendments of 1968. Examples of the changes that have occurred were found in the clientele currently being served, the curriculum being offered, and the individuals certifying to teach vocational agriculture. Changes similar to these have caused concern to teacher educators in other states (Matteson, 1974; Newcomb, 1976) regarding the pre-service and in-service needs of instructors of vocational agriculture.

Two major changes have occurred in the clientele currently being served by local vocational agriculture programs. First, the number of girls enrolling in vocational agriculture in Virginia has steadily and rapidly increased. The enrollment of girls in the 1976-77 academic year reached 2,196, or 8.6 percent of the total enrollment in vocational agriculture (Division of Vocational Education, 1976a). And second, Campbell (1976) noted that observation of new and existing programs in areas of large populations indicated that vocational agriculture was serving a larger number of urban and suburban youth than the program did in the past.

Change has also occurred in the variety of curricular offerings in vocational agriculture at the secondary level. Although the majority of the vocational agriculture departments in Virginia still

maintained an agricultural production offering, there was an increase in the number of departments which were either supplementing their programs with a nonproduction agricultural offering or completely changing to one or more of the nonproduction agricultural offerings. Much of this change has resulted from the implementation of the agricultural education options in Virginia in 1965. During the 1974-75 academic year, there were 110 departments offering the agricultural production option and 146 departments offering nonproduction options, with the largest number of the nonproduction options being in horticulture. While this shift in curricular offerings was occurring, a similar shift in option enrollment was also taking place. Whereas in 1966-67, 97 percent of the senior high school vocational agriculture students was enrolled in agricultural production options, by 1974-75, only 47 percent was enrolled in agricultural production options (Campbell, 1975:27).

Two noticeable changes in the characteristics of individuals certifying to teach vocational agriculture at Virginia Polytechnic Institute and State University have also occurred in recent years. First, the number of individuals certifying to teach who have not received high school vocational agriculture instruction has been rapidly increasing. In 1966, there were only five percent of the seniors certifying to teach who had not had high school vocational agriculture courses (Agricultural Education Program, 1966). Ten years later, 56 percent of the students certifying to teach vocational agriculture had not taken any vocational agriculture courses in high school (Agricultural Education Program, 1976a). And second, the number of

females certifying to teach vocational agriculture has been increasing rapidly. Beginning in 1974, the number of females certifying to teach vocational agriculture at Virginia Polytechnic Institute and State University began to increase steadily, reaching a total of 14 out of 51 students certifying in 1977 (Agricultural Education Program, 1977).

The level of mechanization in agriculture has been in a constant state of change and mechanization of the horticultural industry was no exception. As was pointed out in the South Carolina Ornamental Horticulture Curriculum Guide (Agricultural Education Section, 1975:2), "increased mechanization and technological development in ornamental horticulture demand better trained personnel to work in this area." In training programs for horticultural occupations, the areas of mechanics have not received the attention justified by their importance in horticultural business operations (Grant, et al., 1974:1).

THE PROBLEM

The problem which provided the impetus and direction for this study was the lack of identification of the agricultural mechanics tasks performed by teachers of horticulture. Thus, the purpose of this study was to determine the agricultural mechanics tasks performed by teachers of horticulture in Virginia.

NEED FOR THE STUDY

One result coming out of a study (McCracken and Yoder, 1976:56) conducted at The Ohio State University was that there is little commonality in the technical competencies required to teach in the different

instructional programs in vocational agriculture. McCracken and Warmbrod (1976:2) stated, "the technical preparation of a horticulture teacher must be considered as something quite different from the technical preparation of a production agriculture teacher."

Technical preparation of prospective and current teachers of horticulture in agricultural mechanics was an area in which little has been reported in recent years. However, Bass (1970:8), in his study of the technical competencies needed by teachers of high school ornamental horticulture, advanced the following idea:

> With greater emphasis in the future on the use of mechanical equipment to replace labor, there will be a greater need for high school graduates with a background in the operation and maintenance of horticultural machinery. For the student not planning to attend college, greater emphasis in this area is more important than work in floriculture, landscape management, nursery management, and turf management. A high school student can learn on the job plant identification, propagation, cultural practices, etc., more easily than the theory and maintenance of mechanized equipment. Employers would have less time and patience to teach these skills than they would horticultural practices. In addition, there will be a need for high school graduates in the ornamental industry with training in the basic skills of carpentry, masonry, and plumbing as well as a knowledge of electricity. A high school graduate who can build a greenhouse, . . . will be in greater demand than one without this type of training.

One result of the 1976 National Seminar for Updating Standards and Criteria for Identifying High Quality Programs of Vocational Education in Agriculture and Agribusiness Occupations was the development of Standards Specific to Ornamental Horticulture. As an indication of the importance of agricultural mechanics in ornamental horticulture, the first standard of the Standards Specific to Ornamental Horticulture (U. S. O. E. National EPDA Project, 1977:VI-1) stated:

> The complete program in ornamental horticulture includes technical horticulture, horticultural mechanics, supervised occupational experience, laboratory experience, leadership training, and occupational guidance.

At the same 1976 National Seminar, a report discussing minimum entry level competencies for teaching vocational agriculture was presented. In the absence of an effective competency evaluation system, Love (1976:2) recommended that minimum credit hour requirements be established for each technical agricultural area. Without reference to specific skills and knowledges, eight quarter credit hours in agricultural mechanics was suggested by Love (1976:3) as the minimum requirement for individuals preparing to teach ornamental horticulture.

Although teachers of horticulture have as their primary responsibility the preparation of students for employment in horticultural and related occupations (Agricultural Education Service, 1969:2), Cardozier (1967:66) indicated that teachers of vocational agriculture also spend a measurable amount of time maintaining equipment, counseling, purchasing, and organizing the department. In the Virginia Horticulture State Committee Report, the teachers of horticulture emphasized the additional time they spend for the care needed to maintain a quality program in horticulture (Agricultural Education Service, 1976:35).

The research proposed in this study was an attempt to gather information regarding the identification of agricultural mechanics tasks performed by teachers of horticulture. More specifically, the study attempted to provide information useful in: (1) planning in-service educational programs for prospective and current teachers of

horticulture, and (2) developing occupational internship programs in horticultural businesses.

RESEARCH QUESTIONS

The purpose of this study was to determine the agricultural mechanics tasks performed by teachers of horticulture in Virginia. The following research questions were developed for the study:

1. What were the agricultural mechanics tasks taught in the Horticulture Option and/or executed in the management of horticultural tools, equipment, and facilities by teachers of horticulture in Virginia?

2. What was the mean time-spent teaching and/or executing the agricultural mechanics tasks identified by at least 40 percent of the teachers of horticulture in Research Question Number One?

3. Was there a relationship between the years of teaching experience of the teachers and the total number of agricultural mechanics tasks performed?

4. Was there a relationship between the types of occupational experience possessed by the teachers and the total number of agricultural mechanics tasks performed?

5. Was there a relationship between the teachers' pre-service areas of specialization in agricultural education and the total number of agricultural mechanics tasks performed?

6. Was there a relationship between the sex of the teachers and the total number of agricultural mechanics tasks performed?

7. Was there a relationship between the teachers' occupational areas of teaching emphasis in horticulture and the number of agricultural mechanics tasks performed in the subject matter areas of construction and maintenance, electricity, horticultural equipment, mechanics laboratory management, power units, soil and water, and structures and environment?

DEFINITIONS

The operational definitions of terms frequently used in this study were as follows:

1. Agricultural Mechanics Task -- a discrete unit of work, with a distinct beginning and end, performed by an individual involved in the selection, operation, maintenance, and/or instruction of agricultural power units; agricultural machinery and equipment; structures and environment; soil and water management; electricity; agricultural mechanics laboratory management; and construction and maintenance.

2. Area of Specialization -- one of the five technical areas of specialization in agricultural education; i.e., agricultural production, agricultural machinery service, agricultural business, natural resources management, and horticulture.

3. Mean Time-Spent -- the sum of the relative time-spent ratings for the task divided by the number of teachers performing the task.

4. Occupational Area of Teaching Emphasis -- one of the four occupational areas of ornamental horticulture; i.e., floriculture, nursery management, landscape management, and turf management.

5. Occupational Experience -- a minimum of six months work experience by the teacher of horticulture in agricultural mechanics, a farming operation, or a horticultural business.

6. Relative Time-Spent -- the total time the teacher of horticulture spends performing a task compared with the time the teacher spends performing other agricultural mechanics tasks within that subsection of the task inventory.

7. Teacher of Horticulture -- an instructor of vocational agriculture, in Virginia, who is teaching the Horticulture Option.

8. Teaching Experience -- the number of years the teacher of horticulture has been teaching vocational agriculture.

ASSUMPTIONS

To facilitate the study, the following assumptions were made:

1. The instrumentation used in this study provided a valid assessment of the agricultural mechanics tasks performed by teachers of horticulture in Virginia.

2. Agricultural mechanics task statements used in this study reflect a valid summation of those who have studied and/or written about horticultural occupations.

3. Perception and reality to the individual teacher are synonymous.

LIMITATION

The study attempted to determine only the agricultural mechanics tasks performed by teachers of horticulture in their present positions and not what agricultural mechanics tasks they believed should be performed.

CHAPTER SUMMARY

Changes have occurred in recent years in vocational education in agriculture which have caused concern to teacher educators regarding the pre-service and in-service needs of instructors of vocational agriculture. Several studies have been conducted to determine the professional education needs of instructors of vocational agriculture, however, relatively few studies have been conducted to identify the technical agricultural needs of instructors of vocational agriculture.

Competency-based teacher education programs have resulted in a growing recognition that teacher education must be concerned with competencies in technical agriculture as well as professional education competencies (McCracken and Warmbrod, 1976:2). This study attempted to provide technical agricultural mechanics information useful in planning and/or developing educational programs for present and prospective teachers of horticulture.

Chapter 2

REVIEW OF THE LITERATURE

To establish a basis for the study, a review of the literature that bears upon the problem and that has implications for methodological issues was undertaken. The literature selected for this study provided a foundation for an understanding of the competencies needed by instructors of vocational agriculture, the characteristics of task survey instruments, the selection of tasks for inclusion in the instrument, and the independent variables.

THEORETICAL BACKGROUND

The rationale for studying the tasks performed in an occupation was found primarily in curriculum development. Historically, a number of approaches have been used for the development of vocational education curricula. The approaches most commonly used have been: (1) the subject approach, (2) the integrated approach, (3) the occupational or job analysis approach, (4) occupational areas or clusters approach, (5) the functions of industry approach, and (6) the concept approach. These approaches to curriculum development have employed various procedures for the selection of subject matter content.

Procedures for Content Selection

Smith, et al., (1959:152) classified the procedures for content selection as either judgmental, experimental, analytical, or consensual.

In the judgmental procedure, the curriculum developer made a decision as to what should or should not be included in a given curriculum. The curriculum developer's judgment had to be from a broad perspective.

> . . . If his social perspective is narrow, and his ideas and prejudices are too little affected by democratic ideals and too closely identified with the interests of special social groups. . . , the curriculum worker's judgment will hardly lead to the best selection of subject matters (Smith, et al., 1959: 153).

The experimental procedure of content selection determines by actual field trial or pilot test whether the curriculum satisfied a particular criterion (Thompson, 1973:158). Was the subject matter interesting, did students learn, did workers get jobs, or did adults like it? In short, was the curriculum doing what it was meant to do? If not, what changes needed to be made? These were the types of questions the experimental procedure attempted to answer.

The analytical procedure was probably one of the most widely used and well known methods of content selection. In general, it consisted of an analysis of the things people do in order to discover the subject matter functioning in these activities (Smith, et al., 1959:160).

The consensual procedure was a way of collecting peoples' opinions about what they believed the curriculum should be. Results were reported in terms of the proportion of experts in a particular group that believed a specific item was important in a curriculum. The jury of experts is professional people, leaders of industry, community leaders or any other group whose position, education, or background gave it more specialized knowledge than that possessed by the average person (Thompson, 1973:160).

During the remainder of this section, the approaches which have been used for the development of vocational education curricula in agriculture were examined. Particular emphasis was placed on the specific procedure or combination of procedures used for the selection of content.

Approaches to Curriculum Development

When agriculture was first introduced into the secondary schools in the first decade of this century, subjects were organized and taught on a yearly basis. Stimson and Lathrop (1942:454) identified the following as an example of a typical vocational agriculture program in Virginia:

Agriculture I.	Farm crops, soil, fertilizers
Agriculture II.	Livestock production, judging, feeds and feeding
Agriculture III.	Horticulture
Agriculture IV.	Farm management and rural engineering

Allen (1919:99) called this approach "the method of instructing by subjects." The more or less fixed curricula, as the one above, were also called box systems, block plans, and vertical arrangements (McMillion, 1976:171). Decisions regarding the content to be taught within each subject area were primarily made by the teacher of vocational agriculture (judgmental procedure).

Due to the difficulty instructors encountered when attempting to integrate what was taught from one year to the next, the integrated approach to curriculum development became widely used in the 1920's and 1930's. The basic idea which guided the integrated approach was that it cut across all subject areas on a yearly basis; thus, it was sometimes

referred to as the cross-sectional approach (Hammonds, 1950:87) and horizontal arrangement (Schmidt, 1924:63). Much of the literature during this period implied that instructors were becoming sensitive to community and student needs (Schmidt, 1924; Stewart and Getman, 1927). Therefore, decisions regarding curriculum were likely made on the subject matter which could be taught by the instructor (judgmental procedure) and were influenced by the opinions of individuals in the community and the interests of the students enrolled in vocational agriculture (consensual procedure).

Charles Allen (1919:42-45), generally regarded as the developer of the job analysis approach, stated that the first operation in the work of an instructor was determining what should be taught. What should be taught was subsequently determined by what Allen called trade analysis. In the more than half a century since Allen began his work with job analysis, many educators have used and/or contributed to this approach.

The occupational analysis approach was based on the assumption that an occupation was comprised of one or more jobs. According to Kenneke, et al., (1973:25) the occupational analysis approach sought to delimit manageable areas of work through which jobs could be identified and subsequently analyzed through job/trade or task analysis. The occupational or job analysis approach followed the analytical procedure for content selection.

As science and technology advanced, many schools were placed in the dilemma of either providing an agricultural curriculum which assisted a limited number of students in the preparation for their prospective

occupations or providing a curriculum which only partially assisted many students in the exploration and preparation for an agricultural occupation. As a result, Baker (1966:6-9) suggested an occupational clusters approach to curriculum development. In the occupational clusters approach to curriculum development, an attempt was made to identify, through modified analytical and consensual procedures, what was common to various occupations (Thompson, 1973:163). After the commonalities were identified, they served as a guide for the selection of appropriate content for foundation courses.

Many curricular approaches used in agricultural education took the job title of the worker as the basic unit. However, Clark (1960: 8-9) found that job titles do not really describe what a worker does and tasks performed by workers with similar job titles in similar businesses varied considerably. The conceptual framework which evolved to overcome this obstacle to curriculum development was called the functions of industry (Clark and Meaders, 1968:256-257). The functions of industry approach combined the judgmental and consensual procedures of content selection to identify all the functions which are performed at various levels of the industry.

Thompson (1973:172) described the objective of the concept approach to curriculum development in vocational education as "seeking an understanding of relationships." With advancements in science and technology came an increase in facts available to be understood and Thompson (1973:172) concluded:

> . . . some way must be found to permit man to understand and direct his environment. One way is to discover larger units of knowledge to use as structuring reference points. . . . called

> concepts. A concept was identified by Thompson as having five constructs. The constructs view a concept to be: a psychological construct; of functional value to guide an individual's thinking or behavior; derived from experience; fixed by a name, a word, an idea, or phrase; and a kind of learning.

Kenneke (1973:262) explained that the concept approach's basic application was to awareness and exploration levels of vocational education. The concept approach to curriculum development primarily followed the judgmental procedure of content selection.

The previous discussion purposely focused on the major concepts within the various approaches to curriculum development. This might have left the impression that such concepts were always found in separate and unique approaches. In reality, however, this was not the case.

COMPETENCIES NEEDED BY TEACHERS OF VOCATIONAL AGRICULTURE

The program in agricultural education is concerned with three large areas of study -- technical agriculture, professional education, and general education (Cardozier, 1967:144). Additionally, many curriculum development research projects in vocational education conducted in recent years could be classified, either explicitly and/or implicitly, under two major headings: (1) developing a professional education preservice and/or in-service program for vocational educators; and (2) developing a secondary program for students seeking employment in agricultural occupations. The latter heading was assumed to be implicitly related to the technical agricultural competencies needed by teachers of vocational agriculture.

Professional Education Competencies

Although researchers have varied their study designs in accordance with the setting in which the research was conducted, many studies have been completed with the explicit purpose of determining the professional education competencies needed by vocational educators. Several of these professional education studies have dealt with all vocational program areas. Cotrell (1972) identified ten catagories and 390 performance elements important to the successful performance of teachers and teacher-coordinators of all vocational programs. Erpelding (1972) studied the professional education competency needs of post-secondary teachers of vocational-technical programs. The professional education in-service needs for all secondary level occupational teachers in New York State were studied by Ely and Drake (1973).

Studies regarding the professional education competencies needed specifically by teachers of vocational agriculture have also been conducted. Stroller (1971) determined the professional education competencies needed by secondary teachers of vocational agriculture while those professional education competencies needed by teachers of agriculture in two-year technical institutes were studied by Feck (1971). Matteson, et al., (1974) identified the competencies needed by both secondary and post-secondary instructors of agriculture and also studied whether they should be developed in pre-service or in-service educational programs. Garner (1974) limited his study to identifying only those professional education competencies needed by students in agricultural education prior to student teaching.

Technical Agricultural Competencies

Studies located with the explicit purpose of identifying the technical agricultural competencies needed by teachers of vocational agriculture were relatively few. However, Bass (1970), using the consensual procedure in combination with the judgmental procedure, studied the technical agricultural competencies needed by teachers of ornamental horticulture. The specific objective of the study by Bass (1970:3) was:

> . . . to determine what areas of ornamental horticulture should be taught and to identify the competencies a person should develop in order to effectively teach the ornamental horticulture courses offered in the public schools of Virginia.

Technical agricultural competencies needed by teachers of vocational agriculture were often determined implicitly. McCracken and Warmbrod (1976:2) recommended that studies which have identified the entry-level competencies needed for employment in agricultural occupations be used by teacher educators in determining the technical agricultural competencies needed by teachers of vocational agriculture.

Many studies have been conducted to determine the entry-level competencies needed for employment in specific agricultural occupations. Holcomb, et al., have studied the competencies needed for horse production (1975) and cotton production (1975). Studies conducted at The Ohio State University (McCracken and Yoder, 1975) determined the competencies essential to successful performance in 28 agricultural occupations. The Vocational-Technical Education Consortium of States has conducted several studies of the tasks performed in various agricultural occupations in order to develop catalogs of performance objectives, criterion-referenced measures, and performance guides (1975:26-33).

In addition to studies conducted to determine technical agricultural competencies needed for employment in specific agricultural occupations, studies have also been conducted to determine the competencies needed within the occupational areas of agriculture. Amberson, et al., (1975) and Yoder and McCracken (1975), in separate studies, attempted to determine competency commonalities for the agricultural occupations studied in their respective projects. Yoder and McCracken (1975:56) concluded that a common core of basic skills across the occupational areas of agricultural production, agricultural business, agricultural mechanics and ornamental horticulture could not be determined; while Amberson, et al., (1975:169) concluded that a series of core courses would have to be developed in order to prepare future employees for the cluster of agricultural occupations selected for their study.

CHARACTERISTICS OF TASK SURVEY INSTRUMENTS

The United States Air Force Occupational Research Project was established in 1958. One of the most important outcomes from this project has been the development of new methodologies for collecting, analyzing, and reporting occupational information. The technique used by the Air Force involved the administration of job inventories to workers in the field (Christal, 1970:29).

Christal (1970:29) described the job inventory as containing two sections. The first section consisted of background information to be obtained from the worker about one's job and oneself. Information relating to previous education, time-on-the-job, tools used, and

equipment worked on were included in this section. Any item which may help answer questions or explain actions regarding the occupation was included in the background information section. The second section of a job inventory was a list of all the tasks performed by workers in the occupational area being surveyed.

As of 1973, the Air Force had selected the job inventory as the only feasible approach for collecting task information from a large number of workers. Christal (1973:1) outlined the reasons for this decision. First, the technique was economical. Data were collected from a large number of people for much less than it would have cost to collect data from few people using professional job analysts. Second, the information obtained was quantifiable. The number of people performing any given task was counted and their characteristics described. Third, the fact that information collected by this technique was quantifiable meant that it could be stored, manipulated, analyzed and reported by computer. Finally, being quantifiable meant that the data could also be validated and checked for stability using conventional statistical techniques.

The Center for Vocational and Technical Education at The Ohio State University has incorporated the United States Air Force task inventory concepts into a system for acquiring and using occupational information in revising and designing vocational education curricula. Melching and Borcher (1973) have expressed in a series of explicit steps the procedure one should follow in developing and using task inventories in vocational education.

Developing and using a task inventory involves three major phases. Melching and Borcher (1973:4) identified these three phases as:

(1) construction of initial inventory of tasks, (2) acquisition of information about each task, and (3) analysis of task data. All steps in the procedure for constructing and using task inventories were associated with one of the three phases. In the first phase, construction of initial inventory of tasks, the goal was to generate a comprehensive inventory of tasks performed in the occupation. The Vocational-Technical Education Consortium of States reported that no process in the task analysis has a more profound effect on the products that follow than the writing of discrete task statements for inclusion in the task survey instrument (n.d.:II-1).

In the second phase, acquisition of information about each task, Melching and Borcher (1973:13) stated that the two most basic items of information were probably these: (1) Does the incumbent perform the task? (2) What amount of time is spent performing this task compared with the time spent in performing other tasks? Christal (1973) strongly recommended the use of the relative time-spent scale as the primary rating factor in occupational surveys. Other authorities (Fryklund, 1970) chose to consider only performance frequency; while others (Mager and Beach, 1967) preferred analysis of task importance and learning difficulty. Christal (1973:7) made the following argument for use of the relative time-spent rating scale.

> . . . Research indicated that many workers do not have a clear idea of the exact percentage of their time devoted to each task they perform. On the other hand, they can state with confidence that they spend more time on one than on another. This led to the development of a "relative time-spent" scale, by which workers report the amount of work time they spend on each task relative to the amount of time they spend on other tasks.

In the third phase, analysis of task data, once the instruments were returned and checked for completeness, the responses were tabulated and summary statistics derived. The results were then used to guide the development or revision of occupational training programs (Melching and Borcher, 1973:4).

SELECTION OF TASKS FOR INCLUSION IN STUDY

Although studies were located which attempted to identify the competencies needed by a teacher of horticulture, only a limited number of the studies reported statistics regarding the knowledges and skills needed in agricultural mechanics. However, several studies, utilizing analytical and consensual procedures, included short sections on the agricultural mechanics knowledge and skills needed for employment in various horticultural occupations. The following studies were especially useful in providing basic information for the task inventory.

Shipley (1973) conducted a study of the agricultural mechanics competencies needed by employees in ornamental horticulture occupations as perceived by samples of secondary teachers of horticulture and horticultural business managers. The objectives of the study were: (1) to determine what agricultural mechanics knowledge and skills are needed for entry-level employment in nursery management, greenhouse management, turf management, and landscape management; (2) to determine what agricultural mechanics knowledge and skills are common to the four occupational areas in ornamental horticulture; and (3) to determine the appropriate grade level at which the agricultural mechanics knowledge

and skills needed for entry-level employment should be taught. After developing and validating a list of 86 agricultural mechanics knowledge and skills, Shipley used the consensual procedure to determine if a task was essential, highly desirable, desirable, or not needed for entry-level employment.

From June 1, 1973 to December 30, 1974, the Instructional Materials Laboratory, Department of Trade and Industrial Education at The Ohio State University conducted an extensive occupational analysis project. The basis for the project was to train vocational educators in the techniques of making a comprehensive occupational analysis and to generate occupational data for 61 various occupations. Only four of the occupational analyses conducted in the project were especially useful in selecting agricultural mechanics tasks for inclusion in the task survey instrument used in this study. The four studies, which were all concerned with the identification of tasks performed by horticultural employees, were Howsmon (1974), who studied tasks performed by garden center employees, Alstadt (1974), who studied tasks performed by turf specialists, Stemple and Dilley (1974), who studied the landscaping occupation, and Harbage and Lechner (1974), who studied tasks performed by horticultural equipment operators and mechanics.

In 1975, the Agricultural Education Department at The Ohio State University was involved in a major effort to improve the curricula in educational programs in agriculture. One product of this effort was a report of tasks common within each of the four occupational areas of agricultural production; agricultural business, supply, and service; agricultural mechanics; and ornamental horticulture (Yoder and McCracken,

1975). In addition to the report by Yoder and McCracken, three other occupational survey reports were useful in selecting agricultural mechanics tasks to be included in this study. Edwards, et al., (1975) reported information regarding the tasks performed by a retail lawn and garden center equipment mechanic. In two separate studies, Waddy, et al., identified the tasks performed by a greenhouse worker (1975) and a building and grounds foreman (1975).

Three projects assigned by the Vocational-Technical Education Consortium of States to two member states were of great assistance in the selection of agricultural mechanics tasks performed in horticultural occupations. The Vocational-Technical Education Consortium of States is a cooperative enterprise in which 16 different states and two branches of the military are currently participating to improve vocational-technical education and develop a base for competency based instructional programs. The primary purpose of the Vocational-Technical Education Consortium of States is to develop valid catalogs of performance objectives, criterion-referenced measures, and performance guides for learners in vocational-technical education (1975:2). In Florida, Morrill and Hunter, in two separate projects, developed catalogs of performance objectives, criterion-referenced measures, and performance guides for turfgrass maintenance workers (1975), and floriculture workers (1976). In Mississippi, Brooks, et al., (1975) compiled a similar catalog for gardening-groundskeeping.

Curriculum guides from Virginia (Agricultural Education Service, 1969), South Carolina (Agricultural Education Section, 1975) and the United State Office of Education (1974) were also useful in the selection

of agricultural mechanics tasks to be included in the task inventory. The horticultural mechanics course outline developed by Grant, et al., (1974) served as a guide in the determination of the agricultural mechanics subject matter areas to include in the task inventory as well as being useful in the selection of agricultural mechanics tasks.

LITERATURE RELATED TO INDEPENDENT VARIABLES

"The fundamental task of science is to explain phenomena," stated Kerlinger and Pedhazur (1973:3). Thus, the basic aim of the independent variables selected for the study was to discover explanations for the variation in the teachers' responses to the task survey instrument. Kerlinger (1973:9) stated that a partial explanation is possible by specifying what variables are related to what variables and how they are related. This section of the review of literature discussed why the independent variables were selected for the study.

Occupational Area of Teaching Emphasis

Regarding the occupational areas of horticulture which should be taught on the high school level in Virginia, Bass (1970:5) reported:

> The specialists were unanimous in believing that ornamental horticulture on the high school level should include courses in floriculture, landscape management, nursery (including greenhouse) management, and turf management.

Shipley and Hemp (1973:5) reported that the agricultural mechanics knowledge and skills essential for employment in a horticultural business were different for the various occupational areas. Knowledge and skills in electricity were found to be the most essential for greenhouse

management, while knowledge and skills in the use of hand tools were found to be the most essential for nursery management. For the occupational areas of turf management and landscape management, knowledge and skills in power and machinery were reported to be the most essential (Shipley and Hemp, 1973:5). In determining what areas of agricultural mechanics should be included in horticultural courses in Pennsylvania, Grant, et al., (1974:2) also recommended specific units in agricultural mechanics for the various occupational areas of horticulture.

Occupational Experience

Vocational teacher certification in Virginia is the responsibility of the State Board of Education which has determined that,"Teachers of in-school groups have demonstrated ability in practical occupational experience" (Division of Vocational Education, 1976b:I-14). In its Guideline for Certifying Agricultural Experience, the Agricultural Education Program (1976b) at Virginia Polytechnic Institute and State University has interpreted practical occupational experience to mean that "students shall have at least six months, or the equivalent, of agricultural experience, preferably in an area related to their teaching speciality. . ." The Standards for Quality Programs in Agricultural/Agribusiness Education were more specific regarding the requirements for occupational experience by teachers of horticulture. The Standards Specific to Ornamental Horticulture stated that "instructors have been employed 12 months or 2,000 hours in the ornamental horticulture industry" (U.S.O.E. National EPDA Project, 1977:V-3).

Specialization in Agricultural Education

In its Student Program Planning Manual, the Agricultural Education Program (1976c:30) at Virginia Polytechnic Institute and State University has recommended technical agricultural courses, called restricted electives, for each speciality option in agricultural education. The purpose of these restricted electives was to allow the student to specialize in the instruction received as an undergraduate in order that the student may be more competent in particular areas of teaching. The technical agricultural mechanics courses declared as essential were different for each speciality option (Agricultural Education Program, 1976c:31-42), suggesting that there was a relationship between agricultural mechanics courses and undergraduate specialization in agricultural education.

Sex and Teaching Experience

No literature was located which suggested that there might be a relationship between the agricultural mechanics tasks performed by teachers of horticulture and the independent variables sex and teaching experience. However, observation of both sexes of prospective teachers, first year teachers, and experienced teachers lead to the assumption by the investigator that a relationship might exist which would help explain some of the variation in the teachers' responses to the task survey instrument.

CHAPTER SUMMARY

The rationale for studying the tasks performed in an occupation was found primarily in curriculum development. Thompson (1973:167) stated that the occupational analysis approach to curriculum development was an excellent method of identifying the present tasks a worker performs. The analytical procedure for selecting subject matter content employed in the occupational analysis approach was intended to identify what the worker does so that these actions may be imitated by the trainee.

Cardozier (1967:144) stated the four-year college "program in agricultural education is concerned with three large areas of study -- agricultural subject matter, professional education, and general education." With the exception of the professional education competencies needed by teachers of vocational agriculture, literature pertaining to the explicit needs of agricultural education students in the three areas was somewhat limited. McCracken and Warmbrod (1976:2) suggested that the technical agricultural needs of teachers of vocational agriculture can be implicitly determined from the competencies identified as essential for entry-level employment in an agricultural occupation.

Literature regarding the development of task survey instruments emphasized the importance of using proper techniques for writing task statements. Although literature that pertained specifically to the agricultural mechanics tasks performed by teachers of horticulture was limited, several research studies and professional publications were reviewed which served as the basis for the writing of discrete task statements.

Christal (1973) described the two sections of task survey instruments and pointed out the importance of the background information section. Information gathered in the background information section, the independent variables, was described as helping explain responses to the task inventory section and helping answer questions about the occupational area.

Chapter 3

RESEARCH METHODOLOGY

In Chapters 1 and 2, a conceptual framework upon which the study was developed and a review of related literature were presented. The purpose of this chapter was to describe the population, the design of the study, the development of the instrument, the procedures used in data collection, and the statistical tools utilized in the analysis of data.

DESCRIPTION OF THE POPULATION

The target population for this study consisted of the instructors of vocational agriculture in Virginia who taught one or more state-funded horticultural classes during the 1976-77 academic year. Identification of the secondary instructors of vocational agriculture providing state-approved and funded horticultural instruction was obtained through telephone conversations with the six area assistant supervisors of agricultural education. Warmbrod (1965:107) recommended that when the population was 100 or less, the entire population should be studied. Therefore, the total population of 49 teachers of horticulture (Appendix A) was invited to participate in the study.

DESIGN OF THE STUDY

This study was designed to determine the agricultural mechanics tasks taught in the Horticulture Option and/or executed in the

management of horticultural tools, equipment, and facilities by teachers of horticulture in Virginia. The agricultural mechanics tasks identified were then analyzed in order to determine the mean time-spent in the performance of each task. The data were further analyzed to ascertain if there was a relationship between the number of agricultural mechanics tasks identified and the instructors' teaching experience, occupational experience, areas of pre-service specialization in agricultural education, occupational areas of teaching emphasis in horticulture, and sex.

The descriptive research method used in this study was analytical survey research. Kerlinger (1973:410-423) concluded that it was unsatisfactory to depend upon relatively hit-or-miss, so called representative samples based on "expert" judgments, and that survey research was a useful tool for educational fact finding. The basic survey procedure, as used in the social sciences, is made up of a combination of techniques which have been developed in various research disciplines. Psychologists, anthropologists, sociologists, economists, political scientists, and statisticians have all contributed to the development of survey research (Festinger and Katz, 1966:15-16). "These men have put a rigorous scientific stamp on survey research," stated Kerlinger (1973:410) "and, in the process, have profoundly influenced the social sciences."

A list of agricultural mechanics tasks generally assigned to employees in horticultural occupations and/or instructors of vocational agriculture was developed from a review of the literature. The questionnaire technique utilizing a summated rating scale was used to determine the respondents' perceptions of the relative amount of time

they spent performing each agricultural mechanics task. A computer was used to calculate the frequency of responses and to make other statistical analyses as described later in this chapter.

INSTRUMENTATION

Teachers of horticulture in Virginia have as their primary responsibility the preparation of students for employment in horticultural and related occupations (Agricultural Education Service, 1969:2). In addition, teachers often have the responsibility for the maintenance and repair of horticultural tools, equipment, and facilities established as a part of their work requirement. Thus, the teacher of horticulture might have performed agricultural mechanics tasks in two ways: (1) teaching the tasks essential for horticultural occupations, and (2) managing horticultural tools, equipment, and facilities.

Selection of Tasks

During the initial stage of this study, the investigator reviewed the literature to determine what research had been conducted regarding the identification of agricultural mechanics tasks performed by employees in horticultural occupations and vocational agriculture teachers. Through the process of reviewing the research studies and professional writings, the agricultural mechanics tasks believed to be performed by teachers of horticulture were identified. The investigator proceeded to revise and combine the tasks into a list which was believed to be comprehensive yet manageable for this research effort. A task inventory was then developed by organizing the tasks into the

following agricultural mechanics subject matter areas: (1) construction and maintenance, (2) electricity, (3) horticultural equipment, (4) mechanics laboratory management, (5) power units, (6) soil and water, and (7) structures and environment.

To further refine and revise the task inventory, a panel of experts (Appendix B) was asked to review the task list. The purpose of this review (Appendix C) was to add missing task statements, delete irrelevant task statements, and improve wording of vague or lengthy task statements. Because Melching and Borcher (1973:11) stated that from three to eight experts were generally adequate for most tasks studies, five experts were chosen for the study. The panel of experts was comprised of one member with expertise in agricultural mechanics, one member with expertise in the Virginia Horticulture Option, one member from the Virginia state supervisory staff in agricultural education, and two members with recent practical teaching experience in horticulture at the secondary level.

In order to obtain first hand information from incumbent teachers of horticulture regarding the construction of the task survey instrument, the task inventory was pilot tested with a sample of teachers in North Carolina. C. V. Tart, Chief Consultant for Agricultural Education in the North Carolina State Department of Public Instruction, was asked to identify five teachers of horticulture in North Carolina (Appendix D) who would be willing to complete and to make comments about the questionnaire. On March 1, an introductory letter (Appendix E) was sent to the North Carolina teachers explaining the purpose of the study. On March 8, the pilot test copy of the task survey instrument was mailed to

the teachers along with a cover letter (Appendix F) further explaining what was desired of them. The purpose of the pilot test was to obtain first hand feedback from job incumbents concerning the communicability of task statements, the clarity of directions, and the need for additional task statements. All five North Carolina teachers responded to the request.

Instrument Construction

To obtain data necessary to answer the seven research questions, a task survey instrument was developed by the investigator (Appendix G). The task survey instrument consisted of two parts, a background information section and the task inventory section. A description of the two parts of the task survey instrument follows.

Background Information. In order to determine if relationships existed between the number of agricultural mechanics tasks performed by teachers of horticulture and selected independent variables, background information about the teachers and their instructional programs had to be obtained. Therefore, the background information section of the task survey instrument was used to collect the following information from each teacher:

1. years of teaching experience;
2. types of occupational experience possessed;
3. pre-service areas of specialization in agricultural education;
4. occupational areas of teaching emphasis in horticulture; and
5. sex.

Task Inventory. The task inventory section of the task survey instrument consisted of a listing of the tasks selected from the literature, tasks added by the panel of experts, and tasks suggested by the pilot test teachers. As was indicated in the review of literature, the two most basic items of information needed from the task inventory for a study of this type were:

1. Does the incumbent perform the task?
2. What is the relative amount of time-spent performing the task compared with the time-spent performing the other tasks?

Answering these two questions necessitated the use of two procedures in the task inventory section of the task survey instrument.

In the first procedure, the teachers were instructed to go through the complete task list placing a checkmark in the column headed "Check if Done in Present Job" for all tasks they currently performed. The teachers were instructed to check all the tasks they presently performed before proceeding to the second procedure in order that they might have more knowledge on which to base their responses to the second procedure.

In the second procedure, the teachers were asked to rate the relative amount of time they spent performing each agricultural mechanics task that they had checked in the first procedure. A summated rating scale was used to measure the relative amount of time the teacher spent performing each checked task. The scale employed in the study contained a five-point rating. The response rankings were: much below average time, below average time, about average time, above average time, and much above average time. The assigned values were one, two, three,

four, and five respectively. Respondents indicated the extent of time they spent performing each task by encircling the number best representing their perceptions:

1 = Much Below Average Time

2 = Below Average Time

3 = About Average Time

4 = Above Average Time

5 = Much Above Average Time

Teachers were asked to compare the relative amount of time spent doing a task with the time they spent on the other tasks checked in only that subsection, agricultural mechanics subject matter area, of the task inventory. Melching and Borcher (1973:19-20) indicated that comparing the time spent in each subsection of a task inventory would enhance the future development of instructional programs from the results of a task analysis.

Instrument Reliability

Ebel (1963:310) defined reliability as "the consistency with which a set of test scores measure whatever they do measure." Ary, et al., (1972:204) operationally defined the reliability of a set of scores as the correlation between the scores on two administrations of the same test or parallel forms of the test. This was the basis underlying all reliability estimation procedures and took into account both the stability of the respondent and the internal consistency of the instrument.

The time and labor involved in construction and administration of two complete test forms presented certain difficulties in estimating reliability. Therefore, in 1937, G. F. Kuder and M. R. Richardson introduced another method for estimating reliability which used all the variance and covariance information about consistency from item to item within a single form of a test (Thorndike, 1971:410). The method developed by Kuder and Richardson was commonly referred to as the KR-20 reliability estimate, so named because the twentieth formula in the original paper provided the operational definition. The KR-20 formula was derived for use with dichotomously scored items, but in 1951, L. J. Cronback provided an extension of the basic formulation to include any method of item scoring (Mehrens and Ebel, 1967:134). Because the latter method, referred to as Cronback's coefficient alpha, was more general, it was used to estimate the reliability of the task survey instrument used in this study.

Mehrens and Ebel (1967:133) explained that a test or instrument divisible into distinct subtests or subsections should be so divided before using the KR-20 formula or Cronback's coefficient alpha formula for estimating reliability. Therefore, reliability estimates were determined for each of the seven agricultural mechanics subject matter areas included in the task survey instrument. The reliability estimates of the relative time-spent rankings reported by the teachers of horticulture, as determined by Cronback's coefficient alpha, were reported in Table I.

These reliability estimates indicated a high degree of internal consistency in the teachers' rankings of the relative time-spent in the

TABLE I

RELIABILITY ESTIMATES FOR AGRICULTURAL MECHANICS SUBJECT MATTER AREAS

Agricultural Mechanics Subject Matter Areas	Reliability Estimate[a] α
Construction and Maintenance	.905
Electricity	.937
Horticultural Equipment	.950
Mechanics Laboratory Management	.909
Power Units	.965
Soil and Water	.883
Structures and Environment	.856

[a] Cronback's coefficient alpha was used to determine reliability estimates.

performance of the tasks included in each agricultural mechanics subject matter area.

Instrument Validity

Ebel (1965:310) defined validity as "the accuracy with which a set of scores measure what they ought to measure." Thorndike (1971:444) indicated that the American Psychological Association has classified instrument or test validity under three major headings. These were criterion-related validity, content validity, and construct validity. Primarily based on the American Psychological Association's definition, Thorndike (1971:444) defined these terms as follows:

> Criterion-related (predictive) validation compares test scores, or predictions made from them, with an external variable (criterion) considered to provide a direct measure of the characteristic or behavior in question.
>
> Content validity is evaluated by showing how well the content of the test samples the class of situations or subject matter about which conclusions are to be drawn.
>
> Construct validity is evaluated by investigating what psychological qualities a test measures, i. e., by determining the degree to which certain explanatory concepts or constructs account for performance on the test.

Probably the most common method of determining the validity of an instrument, such as the one used in this study, would be to observe a number of horticulture teachers on the job and interview their immediate supervisors regarding the agricultural mechanics tasks performed by the teachers. A number of reasons precluded the use of this approach. First, the investigator believed that an appreciable amount of empirical research had been done that had basically identified the tasks included in this study. For example, studies by Shipley (1973),

Stemple and Dilley (1974), Harbage and Lechner (1974), Howsmon (1974), Alstadt (1974), Edwards (1975), and Morrill and Hunter (1975) dealt with validity when developing their research instruments. In addition, the results of their studies provided information regarding what agricultural mechanics task statements should be included in this study. Second, the investigator felt that the panel of experts provided additional credence to the validity of the instrument. Their knowledge of the profession and the individuals presently in the profession placed them in a position to verify both the content and construct validities of this instrument. And third, by pilot testing the task survey instrument in North Carolina with a sample of incumbent teachers of horticulture, additional verification was added to the content validity of the instrument. Thus, based on these three considerations, the investigator felt reasonably confident that steps had been taken to assure the validity of the instrument.

DATA COLLECTION PROCEDURES

In order to obtain the greatest number of teacher responses, two methods of data collection were used. The first method involved administering the task survey instrument to the teachers attending the Horticulture Option workshop held in Arlington, Virginia, on April 1, 1977.

Since attendance at the workshop was less than 39 percent of the total population of teachers of horticulture in Virginia, a second method of data collection was also used. The teachers of horticulture who did not attend the workshop were mailed a task survey instrument

and a stamped envelope, addressed to the investigator. Included with the instrument was a cover letter (Appendix H) from the investigator and his dissertation committee chairman explaining the purpose of the study and encouraging the teachers to complete and to return the questionnaire. To insure maximum return of the instruments, a visible code was used to identify each instrument. A statement regarding the confidentiality of each teacher's responses was included in the cover letter.

Two weeks after the initial mailing, a post card reminder (Appendix I) was mailed to the teachers whose questionnaires had not been returned. Ten days after the post card reminder had been mailed, a telephone call was made to the teachers whose task survey instruments still had not been received by the investigator. A new instrument, along with another return-addressed, stamped envelope, was mailed to those teachers who indicated that they had misplaced the first questionnaire.

Before combining the responses of the teachers attending the workshop and the responses of the teachers completing the mailed questionnaire into a homogeneous set of data, a t-test of significance was calculated for selected variables to determine if the teachers responding by the different methods of data collection were similar. The variables selected for the comparison were:

1. years of vocational agriculture teaching experience;
2. number of students enrolled in the local Horticulture Option;
3. number of periods taught per day;

4. number of teachers in the local department; and

5. total number of agricultural mechanics tasks performed.

In Table II, the results of the five comparisons were presented. Since no difference, at the .01 probability level, was found for any of the selected variables, the data were treated as if they had been collected from a homogeneous group by only one method of data collection.

STATISTICAL METHODS

Data were transferred from the returned task survey instruments to IBM cards and analyzed by computer, utilizing the equipment of the Computer Center at Virginia Polytechnic Institute and State University. The Statistical Package for the Social Sciences (SPSS), a system of computer programs (Nie, et al., 1975), was used in the statistical analysis.

Descriptive statistics were used to summarize the data pertaining to the characteristics of the teachers of horticulture in Virginia. Frequency counts and percentages were calculated for the descriptive data regarding the performance of each agricultural mechanics task in research question number one.

In deciding whether a task should be considered for inclusion in an instructional program, one criterion that has been used is the proportion of workers who claim they perform the task (Melching and Borcher, 1973:19). For this study the proportion of .4 (or 40 percent) was selected by the investigator. The proportion of .4 was selected since it was about midway between the proportion of .7 illustrated by Melching and Borcher (1973:19) and the proportion of .15 used by Brooks,

TABLE II

T-TESTS BETWEEN WORKSHOP RESPONDENTS AND MAILED QUESTIONNAIRE RESPONDENTS ON FIVE SELECTED VARIABLES

Variables	Degrees of Freedom	t Value	Significance Level[a]
Years of Vocational Agriculture Teaching Experience	45	-0.74	0.466
Number of Students Enrolled in Local Option	45	-0.25	0.806
Number of Periods Taught Per Day	45	2.32	0.025
Number of Teachers in Local Department	45	-1.51	0.142
Total Number of Agricultural Mechanics Tasks Performed	45	0.65	0.519

[a] A two-tailed test at the .01 level of probability was used to ascertain if differences existed.

et al. (1975:6). Therefore, for each agricultural mechanics task that was performed by more than 40 percent of the teachers of horticulture, mean time-spent values in research question number two were obtained by summing the relative time-spent ratings and dividing by the number of teachers performing the task. Mean time-spent values were also calculated for those tasks performed by less than 40 percent of the teachers and were recorded in Appendix J.

Measures of the degree of relationship and their associated significance were utilized to answer the last five research questions formulated in the study. The level of significance for testing the research questions was established at the .01 probability level. The dependent variable and the independent variable in research question number three were treated as interval level data. A Pearson product-moment correlation coefficient was used to measure association and its level of significance was used as the test for the question.

In research questions four, five, and six, the dependent variable was treated as interval data and the independent variables were treated as dichotomous nominal data. To measure associations between the variables in these three research questions, point biserial coefficients of correlation were calculated and their corresponding levels of significance were used to test the questions. The seven dependent variables in research question number seven were treated as interval data and the independent variables were treated as dichotomous nominal data. A point biserial coefficient of correlation was used to measure association and its level of significance was used as the test for research question number seven.

Chapter 4

ANALYSIS OF DATA

The purpose of this study was to determine the agricultural mechanics tasks performed by teachers of horticulture in Virginia. This chapter was concerned with a discussion of the presentation and analysis of data. Results pertaining to the characteristics of the respondent sample, identification of tasks performed, mean time-spent performing the tasks, and coefficients of correlation were described.

DESCRIPTION OF SAMPLE

In 1976-77 there were 49 instructors of vocational agriculture in Virginia providing state-funded and approved instruction in the Horticulture Option. All teachers of horticulture were invited to participate in the study and response to the questionnaire was high, as demonstrated by these returns:

Questionnaires Administered	Number Returned	Percent Returned	Number Usable	Percent Usable
49	48	97.96	47	95.92

One questionnaire was returned with all 165 tasks rated as to relative time-spent performing them; however, the tasks had not been checked as having been performed. In a subsequent telephone conversation with the respondent, the investigator ascertained that the teacher taught only floral arrangement and actually performed very few of the

agricultural mechanics tasks. The teacher indicated that the tasks were, therefore, rated as to perceived importance in the Horticulture Option. Since the teacher did not perform all the tasks rated, the questionnaire was not used in the analysis. A telephone call was made to the teacher who had not responded to the questionnaire by the cut off date for accepting responses. The investigator learned that the teacher had first assumed responsibility for the horticultural instruction on March 1, 1977 and did not feel qualified to respond to the questionnaire.

Years of Teaching Experience

One of the variables thought to be related to the total number of agricultural mechanics tasks performed was years of vocational agriculture teaching experience. The range for years of teaching experience was from one year to 36 years, with the average number of years of teaching experience being 8.6. A majority (51 percent) of the teachers of horticulture had been teaching vocational agriculture less than five years.

Types of Occupational Experience Possessed

The number of teachers indicating that they possessed at least six months of agricultural experience was 39. The types of occupational experience possessed by the teachers of horticulture in Virginia were presented in Table III. Eight teachers either failed to respond to the types of occupational experience possessed question or indicated that they possessed less than six months of experience in

TABLE III

TYPES OF OCCUPATIONAL EXPERIENCE POSSESSED BY TEACHERS OF HORTICULTURE

Types of Occupation Experience[a]	Number of Teachers (N=39)[b]	Percent of Teachers
Farming	28	71.8
Horticulture	16	41.0
Agricultural Mechanics	6	15.4
Other	4	10.3

[a]Thirteen teachers possessed at least six months occupational experience in more than one of the categories.

[b]Eight of the 47 respondents either did not possess at least six months of occupational experience or failed to respond to the question.

one of the categories. A majority of the teachers, 28 out of 39, indicated that they possessed farm experience. Sixteen teachers possessed agricultural experience in a horticultural occupation and six teachers possessed experience in agricultural mechanics. Some teachers indicated that they possessed experience in more than one of the occupational categories. Other types of occupational experience possessed by the teachers of horticulture included working on a horse farm, in a feed supply store, and for the Virginia Division of Forestry.

Sex

Only seven out of the 47 teachers of horticulture (14.9 percent) were females. Although this seemed like a small percentage, it represented 58.3 percent of all females teaching vocational agriculture in Virginia during the 1976-77 school year (Agricultural Education Service, 1976).

Teaching Emphasis in Horticulture

As a group, the teachers of horticulture emphasized all four occupational areas of horticulture in their instructional programs. The frequency counts and percentages of teachers emphasizing each horticultural occupational area were recorded in Table IV. Floriculture was the only occupational area of horticulture that was emphasized by a majority (70.2 percent) of the teachers. In descending order of the number of teachers emphasizing each occupational area in their instructional programs, floriculture, which was emphasized by 33 teachers, was followed by landscape management with 22 teachers, nursery management with 14

TABLE IV

OCCUPATIONAL AREAS OF TEACHING EMPHASIS
BY TEACHERS OF HORTICULTURE

Occupational Areas	Number of Teachers[a] (N=47)	Percent of Teachers
Floriculture	33	70.2
Landscape Management	22	46.8
Nursery Management	14	29.8
Turf Management	8	17.0
Other	6	12.8

[a]Five teachers indicated that they emphasized two occupational areas, seven emphasized three areas, and six emphasized all four areas.

teachers, and turf management with eight teachers. Other instructional areas that were emphasized by the teachers included fruits, vegetables, floral arrangement, power equipment, and generalized horticulture.

Specialization in Agricultural Education

Undergraduate specialization in agricultural education was another factor that was believed to be related to the total number of agricultural mechanics tasks performed. Table V indicated that teachers of horticulture had specialized in all the technical agricultural areas selected for the study. Nearly half, 48.9 percent, of the teachers indicated that they had either majored in horticulture or chosen horticulture as their speciality option in agricultural education. In descending order of the number of teachers specializing in each area, horticulture was followed by agricultural production, natural resources management or forestry, agricultural machinery service, and agricultural business. Of those teachers specializing or majoring in something other than a technical agricultural area, the majority indicated that they had majored in either biology, botany, general science, or chemistry.

Local Department Characteristics

Three characteristics of local departments of vocational agriculture offering the Horticulture Option were also used in the study. These characteristics were: (1) number of students enrolled in the Horticulture Option, (2) number of periods of horticultural instruction taught by the teachers of horticulture per day, and (3) number of

TABLE V

PRE-SERVICE AREAS OF SPECIALIZATION IN AGRICULTURAL EDUCATION BY TEACHERS OF HORTICULTURE

Areas of Specialization	Number of Teachers[a] (N=47)	Percent of Teachers
Horticulture	23	48.9
Agricultural Production	17	36.2
Natural Resources Management	3	6.4
Agricultural Machinery Service	2	4.3
Agricultural Eusiness	1	2.1
Other	9	19.1

[a]Eight teachers reported that they had specialized in more than one technical agricultural area.

vocational agriculture teachers in the local department. The data in Table VI showed that the average number of students in the local Horticulture Option was 36.57, with one department having as many as 86 students and another department having as few as 6 students. Seven departments of vocational agriculture offered only one period of horticultural instruction per day and 12 departments offered as many as six periods, with the average being 3.6 periods per day (Table VI). The number of teachers in local vocational agriculture departments offering the Horticulture Option ranged from 12 instructors in single teacher departments to one instructor in a six teacher department, with the average number of teachers per department being 2.49.

RESULTS OF RESEARCH QUESTIONS

The problem which provided the impetus and direction for the study was the lack of identification of the agricultural mechanics tasks performed by teachers of horticulture. Thus, the purpose of this study was to determine the agricultural mechanics tasks performed by teachers of horticulture in Virginia. The analyses of the seven research questions developed for the study were presented in the following discussion.

Analysis of Research Question Number 1

All 165 agricultural mechanics tasks included in the task survey instrument were taught in the Horticulture Option and/or executed in the management of horticultural tools, equipment, and facilities. The number and percentage of teachers performing each agricultural mechanics

TABLE VI

SELECTED CHARACTERISTICS OF LOCAL DEPARTMENTS OF VOCATIONAL AGRICULTURE OFFERING THE HORTICULTURE OPTION

Characteristics	Mean	Standard Deviation
Number of Students in the Local Horticulture Option	36.57	20.15
Number of Periods of Horticulture Taught by the Teacher	3.60	1.84
Number of Teachers in Local Department	2.49	1.16

task were recorded in columns two and three respectively of Table VII (Appendix J). The least number of tasks performed by a teacher was 21 and the greatest number of tasks performed by a teacher was 144. Although all tasks were performed by at least one teacher, no task was performed by 100 percent of the teachers. The mean number of tasks performed was 67.77 with a standard deviation of 31.59.

Analysis of Research Question Number 2

The mean time-spent performing each agricultural mechanics task was determined by summing the relative time-spent ratings and dividing by the number of teachers performing the task. The relative time-spent scale ranged from one to five as shown below:

1 = Much Below Average Time

2 = Below Average Time

3 = About Average Time

4 = Above Average Time

5 = Much Above Average Time

The mean time-spent values for all tasks included in the task survey instrument were recorded in column four of Table VII (Appendix J). The 79 agricultural mechanics tasks that were performed by more than 40 percent of the teachers were included in a mean time-spent list for the appropriate subsection, agricultural mechanics subject matter area, of the task survey instrument. The mean time-spent lists for the seven selected agricultural mechanics subject matter areas were discussed in the following paragraphs.

Construction and Maintenance. Eleven out of 25 tasks in the construction and maintenance agricultural mechanics subject matter area were performed by more than 40 percent of the respondents. In Table VIII, the eleven tasks were listed in descending order of their mean time-spent values, which ranged from a high of 2.890 to a low of 2.050. The data in Table VIII also indicated that the tasks which were performed by the highest percentage of respondents did not necessarily have the highest mean time-spent values. For example, the agricultural mechanics task "read and interpret drawings and plans" was performed by 76.6 percent of the respondents and had a mean time-spent value of 2.722, whereas "figure a bill of materials" was performed by only 57.4 percent of the respondents but had the highest mean time-spent value, 2.890.

Electricity. Ten of the 14 agricultural mechanics tasks in the electricity subject matter area of the task survey instrument were performed by more than 40 percent of the respondents. The mean time-spent values for the electricity subsection (Table IX) of the task survey instrument ranged from a high of 2.794 to a low of 2.049. Of the 79 agricultural mechanics tasks performed by more than 40 percent of the respondents, "replace fuses" had the lowest mean time-spent value (2.049).

Horticultural Equipment. Sixteen out of 40 tasks in the horticultural equipment subject matter area were performed by more than 40 percent of the respondents. The agricultural mechanics task "mix planting media using a mechanical soil mixer" had the highest mean time-spent value (3.762) of all tasks included in the task survey instrument which were

TABLE VIII

MEAN TIME-SPENT VALUES FOR TASKS PERFORMED BY MORE THAN FORTY PERCENT OF THE TEACHERS IN THE CONSTRUCTION AND MAINTENANCE SUBJECT MATTER AREA

Agricultural Mechanics Tasks	Number of Teachers Who Performed Task (N=47)	Percent of Teachers Who Performed Task	Mean Time-Spent Value[a]
Figure a bill of materials	27	57.4	2.890
Operate and maintain power shop tools	26	55.3	2.731
Construct a germination flat	22	46.8	2.728
Read and interpret drawings and plans	36	76.6	2.722
Replace and glaze broken greenhouse windows	22	46.8	2.681
Construct a greenhouse propagation bed	29	61.7	2.551
Construct wooden planters	20	42.6	2.500
Sketch drawings of construction projects	27	57.4	2.371
Build a cold frame or hot bed	30	63.8	2.300
Hand paint structures and equipment	28	59.6	2.179
Replace damaged supports for black cloth	20	42.6	2.050

[a]Mean Time-Spent value was based on the following scale: 1 = much below average time, 2 = below average time, 3 = about average time, 4 = above average time, 5 = much above average time.

TABLE IX

MEAN TIME-SPENT VALUES FOR TASKS PERFORMED BY MORE THAN FORTY PERCENT OF THE TEACHERS IN THE ELECTRICITY SUBJECT MATTER AREA

Agricultural Mechanics Tasks	Number of Teachers Who Performed Task (N=47)	Percent of Teachers Who Performed Task	Mean Time-Spent Value[a]
Regulate (set) automatic time clocks	23	48.9	2.794
Install a supplemental lighting system	24	51.1	2.501
Replace light bulbs	36	76.6	2.473
Oil electric motors	23	48.9	2.348
Install automatic electrical time clock controls	25	53.2	2.320
Reset circuit breakers	31	66.0	2.291
Repair electrical extension cords	32	68.1	2.219
Replace service cords on electrical equipment	20	42.6	2.150
Replace an electrical attachment plug	27	57.4	2.148
Replace fuses	20	42.6	2.049

[a]Mean Time-Spent value was based on the following scale: 1 = much below average time, 2 = below average time, 3 = about average time, 4 = above average time, 5 = much above average time.

performed by more than 40 percent of the respondents. The mean time-spent values for the horticultural equipment subject matter area, presented in Table X, ranged from 3.762 to 2.142, the greatest range of mean time-spent values of the seven agricultural mechanics subject matter areas included in the task survey instrument.

Mechanics Labcratory Management. All but one of the 14 agricultural mechanics tasks in the mechanics laboratory management subject matter area were performed by more than 40 percent of the respondents. Mean time-spent values in the mechanics laboratory management subsection of the task survey instrument ranged from a high of 3.386 to a low of 2.667. The mean time-spent values for the mechanics laboratory management subject matter area were recorded in Table XI.

Power Units. In the tractors and small engines subject matter area, there were 15 out of 36 agricultural mechanics tasks which were performed by more than 40 percent of the respondents. The mean time-spent values for the power units subsection of the task survey instrument were presented in Table XII. Mean time-spent values ranged from a high of 2.900 to a low of 2.191 for the power units subject matter area.

Soil and Water. Nine out of 21 agricultural mechanics tasks were performed by more than 40 percent of the respondents in the soil and water subject matter area. The mean time-spent values ranged from a high of 3.091 to a low of 2.434. The data in Table XIII included the mean time-spent values for the soil and water subsection of the task survey instrument.

TABLE X

MEAN TIME-SPENT VALUES FOR TASKS PERFORMED BY MORE THAN FORTY PERCENT OF THE TEACHERS IN THE HORTICULTURAL EQUIPMENT SUBJECT MATTER AREA

Agricultural Mechanics Tasks	Number of Teachers Who Performed Task (N=47)	Percent of Teachers Who Performed Task	Mean Time-Spent Value[a]
Mix planting media using a mechanical soil mixer	21	44.7	3.762
Pasteurize growning media using an electrical pasteurizer	24	51.1	3.333
Adjust horticultural equipment	42	89.4	3.167
Apply pesticides using a small tank sprayer	34	72.3	3.148
Mow grass using a rotary mower	38	80.9	3.132
Shred planting media using a soil shredder	22	46.8	3.046
Sharpen cutting edges on power equipment	28	59.6	3.000
Till soil using a small engine rotary tiller	44	93.6	2.977
Replace worn or defective parts on equipment	30	63.8	2.900
Assemble horticultural equipment	34	72.3	2.882
Lubricate horticultural equipment	38	80.9	2.816
Apply pesticides using a fogger	22	46.8	2.728
Fertilize soil using a broadcast (cyclone) spreader	28	59.6	2.572
Plant grass using a broadcast (cyclone) spreader	25	53.2	2.519

TABLE X (Continued)

Agricultural Mechanics Tasks	Number of Teachers Who Performed Task (N=47)	Percent of Teachers Who Performed Task	Mean Time-Spent Value[a]
Apply pesticides using a fumer	19	40.4	2.474
Apply pesticides using a plant duster	21	44.7	2.142

[a]Mean Time-Spent value was based on the following scale: 1 = much below average time, 2 = below average time, 3 = about average time, 4 = above average time, 5 = much above average time.

TABLE XI

MEAN TIME-SPENT VALUES FOR TASKS PERFORMED BY MORE THAN FORTY PERCENT OF THE TEACHERS IN THE MECHANICS LABORATORY MANAGEMENT SUBJECT MATTER AREA

Agricultural Mechanics Tasks	Number of Teachers Who Performed Task (N=47)	Percent of Teachers Who Performed Task	Mean Time-Spent Value[a]
Clean and store hand tools	44	93.6	3.386
Order agricultural mechanics consumable supplies	29	61.7	3.241
Maintain safety devices	28	59.6	3.214
Select horticultural tools and equipment	42	89.4	3.167
Inventory horticultural tools and equipment	42	89.4	3.119
Keep a maintenance schedule	19	40.4	3.001
Sharpen cutting edges on hand tools	39	83.0	2.949
Order repair parts	36	76.6	2.860
Repair broken hand horticultural tools	39	83.0	2.820
Evaluate layout of facilities	30	63.8	2.800
Repair broken hand shop tools	27	57.4	2.740
Install safety devices	27	57.4	2.667
Replace filter on mask respirator	27	57.4	2.667

[a]Mean time-spent value was based on the following scale: 1 = much below average time, 2 = below average time, 3 = about average time, 4 = above average time, 5 = much above average time.

TABLE XII

MEAN TIME-SPENT VALUES FOR TASKS PERFORMED BY MORE THAN FORTY PERCENT OF THE TEACHERS IN THE POWER UNITS SUBJECT MATTER AREA

Agricultural Mechanics Tasks	Number of Teachers Who Performed Task (N=47)	Percent of Teachers Who Performed Task	Mean Time-Spent Value[a]
Attach tractor mounted equipment	21	44.7	2.900
Drive a tractor	34	72.3	2.853
Attach equipment to the tractor drawbar	20	42.6	2.799
Refuel engine	29	61.7	2.758
Replace spark plug	24	51.1	2.667
Prepare engine for storage	21	44.7	2.666
Service the air cleaner	22	46.8	2.591
Change crankcase oil and filter	24	51.1	2.583
Maintain battery ignition system (service distributor)	19	40.4	2.526
Service the battery	23	48.9	2.522
Inspect and service spark plug	22	46.8	2.455
Maintain the engine cooling system	21	44.7	2.428
Adjust the carburetor	24	51.1	2.375
Mix fuel-oil mixture for 2-cycle engine	23	48.1	2.305

TABLE XII (Continued)

Agricultural Mechanics Tasks	Number of Teachers Who Performed Task (N=47)	Percent of Teachers Who Performed Task	Mean Time-Spent Value[a]
Repair rope starters on small engines	21	44.7	2.191

[a]Mean time-spent value was based on the following scale: 1 = much below average time, 2 = below average time, 3 = about average time, 4 = above average time, 5 = much above average time.

TABLE XIII

MEAN TIME-SPENT VALUES FOR TASKS PERFORMED BY MORE THAN FORTY PERCENT OF THE TEACHERS IN THE SOIL AND WATER SUBJECT MATTER AREA

Agricultural Mechanics Tasks	Number of Teachers Who Performed Task (N=47)	Percent of Teachers Who Performed Task	Mean Time-Spent Value[a]
Clean water pipes and traps	22	46.8	3.091
Install automatic irrigation system	22	46.8	2.818
Repair a leaky faucet	22	46.8	2.591
Install mist irrigation nozzles	33	70.2	2.576
Protect water piping systems from freezing	25	53.2	2.561
Repair a leaky hose	35	74.5	2.543
Repair a leaky pipe	24	51.1	2.501
Measure land area	20	42.6	2.500
Repair mist irrigation pipe	23	48.9	2.434

[a]Mean time-spent value was based on the following scale: 1 = much below average time, 2 = below average time, 3 = about average time, 4 = above average time, 5 = much above average time.

Structures and Environment. Only five of the 12 agricultural mechanics tasks in the structures and environment subsection of the task survey instrument were performed by more than 40 percent of the respondents. The mean time-spent values ranged from a high of 3.332 down to 2.920, the smallest range of mean time-spent values of the seven agricultural mechanics subject matter areas included in the task survey instrument. The mean time-spent values for the structures and environment subject matter area were recorded in Table XIV.

Analysis of Research Question Number 3

A Pearson product-moment coefficient of correlation was calculated to describe the relationship between the number of years of vocational agriculture teaching experience and the total number of agricultural mechanics tasks performed by the respondents. A positive relationship, significant at the .01 probability level, was found between the years of teaching experience and the total number of agricultural mechanics tasks performed, as shown in these findings:

Pearson Product-Moment Coefficient	Significance Level
.428	.001

Analysis of Research Question Number 4

Point biserial coefficients of correlation, as indicated in Table XV, were calculated to describe the relationship between types of occupational experience possessed by the respondents and the total number of agricultural mechanics tasks performed. A significant

TABLE XIV

MEAN TIME-SPENT VALUES FOR TASKS PERFORMED BY MORE THAN FORTY PERCENT OF THE TEACHERS IN THE STRUCTURES AND ENVIRONMENT SUBJECT MATTER AREA

Agricultural Mechanics Tasks	Number of Teachers Who Performed Task (N=47)	Percent of Teachers Who Performed Task	Mean Time-Spent Value[a]
Adjust Cooling Equipment	31	66.0	3.322
Adjust Heating Equipment	33	70.2	3.121
Adjust Thermostat Control	41	87.2	3.000
Maintain Ventilation System	32	68.1	2.938
Apply Shading Compound or Paint Greenhouse Windows	25	53.2	2.920

[a]Mean time-spent value was based on the following scale: 1 = much below average time, 2 = below average time, 3 = about average time, 4 = above average time, 5 = much above average time.

TABLE XV

RELATIONSHIPS BETWEEN NUMBER OF TASKS PERFORMED AND TYPES OF OCCUPATIONAL EXPERIENCE POSSESSED BY TEACHERS OF HORTICULTURE

Types of Occupation Experience	Point Biserial Coefficient	Significance Level
Farm	.371	.005
Agricultural Mechanics	.319	.014
Horticulture	-.137	.180

relationship (r = .371) was found between farm experience and the total number of agricultural mechanics tasks performed. The findings also revealed that the relationships between the total number of tasks performed and occupational experience in agricultural mechanics and horticulture were not significant at the .01 probability level.

Analysis of Research Question Number 5

Point biserial coefficients of correlation, as recorded in Table XVI, were calculated to describe the relationships between the teachers' pre-service areas of specialization in agricultural education and the total number of agricultural mechanics task performed. The findings revealed that there were no relationships, at the .01 probability level, between the total number of agricultural mechanics tasks performed and the pre-service areas of specialization of: (1) agricultural machinery service, (2) agricultural business, (3) natural resources management, and (4) horticulture. A significant relationship (r = .438) was found between the total number of tasks performed and pre-service specialization in agricultural production.

Analysis of Research Question Number 6

A point biserial coefficient of correlation was calculated to describe the relationship between the total number of agricultural mechanics tasks performed and the sex of the teachers. No relationship, at the .01 probability level, was found between the sex of the teachers

TABLE XVI

RELATIONSHIPS BETWEEN NUMBER OF TASKS PERFORMED AND PRE-SERVICE AREAS OF SPECIALIZATION OF HORTICULTURAL TEACHERS

Pre-Service Areas of Specialization	Point Biserial Coefficient	Significance Level
Agricultural Production	.438	.001
Agricultural Machinery Service	.029	.424
Agricultural Business	-.221	.068
Natural Resources Management	.091	.271
Horticulture	-.212	.076

and the total number of agricultural mechanics tasks performed, as shown in these findings:

Point Biserial Coefficient	Significance Level
-.163	.137

Analysis of Research Question Number 7

Point biserial coefficients of correlation were calculated to describe the relationships between the number of tasks performed in the seven agricultural mechanics subject matter areas and the occupational areas of teaching emphasis in horticulture. The data shown in the correlation matrix of Table XVII indicated three relationships existed. The findings revealed that there were no relationships, at the .01 probability level, between the occupational areas of teaching emphasis in floriculture, nursery management, landscape management, and turf management and the number of tasks performed in the following agricultural mechanics subject matter areas: (1) construction and maintenance, (2) electricity, (3) mechanics laboratory management, (4) power units, and (5) soil and water. Significant relationships existed between the occupational areas of teaching emphasis in landscape management ($r = .368$) and turf management ($r = .452$) and the number of tasks performed in the horticultural equipment subject matter area. Likewise, a significant relationship ($r = .392$) was found between the turf management occupational area of teaching emphasis and the number of tasks performed in the structures and environment subject matter area.

TABLE XVII

CORRELATION COEFFICIENTS BETWEEN OCCUPATIONAL AREAS OF TEACHING EMPHASIS IN HORTICULTURE AND NUMBER OF TASKS PERFORMED BY TEACHERS OF HORTICULTURE IN EACH OF THE AGRICULTURAL MECHANICS SUBJECT MATTER AREAS[a]

Subject Matter Areas	Occupational Areas of Teaching Emphasis			
	Floriculture	Nursery Management	Landscape Management	Turf Management
Construction and Maintenance	-0.188	0.086	0.204	0.217
Electricity	0.309	0.111	0.164	0.305
Horticultural Equipment	0.196	0.116	0.368**	0.452**
Mechanics Laboratory Management	0.150	0.061	0.154	0.175
Power Units	0.060	0.004	0.126	0.170
Soil and Water	0.223	-0.037	0.020	0.165
Structures and Environment	0.178	0.326	0.289	0.392**

[a]Point Biserial Coefficient

** $p < .01$

Chapter 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

SUMMARY

The purpose of this study was to determine the agricultural mechanics tasks performed by teachers of horticulture in Virginia. Furthermore, the study sought to determine if relationships existed between the number of tasks the teachers performed and the following independent variables:

1. years of teaching experience;
2. types of occupational experience possessed;
3. pre-service areas of specialization in agricultural education;
4. sex; and
5. occupational areas of teaching emphasis in horticulture.

Research Questions

The following research questions were developed for the study:

1. What were the agricultural mechanics tasks taught in the Horticulture Option and/or executed in the management of horticultural tools, equipment, and facilities by teachers of horticulture in Virginia?

2. What was the mean time-spent teaching and/or executing the agricultural mechanics tasks identified by at least 40 percent of the teachers of horticulture in Research Question Number One?

3. Was there a relationship between the years of teaching experience of the teachers and the total number of agricultural mechanics tasks performed?

4. Was there a relationship between the types of occupational experience possessed by the teachers and the total number of agricultural mechanics tasks performed?

5. Was there a relationship between the teachers' preservice areas of specialization in agricultural education and the total number of agricultural mechanics tasks performed?

6. Was there a relationship between the sex of the teachers and the total number of agricultural mechanics tasks performed?

7. Was there a relationship between the teachers' occupational areas of teaching emphasis in horticulture and the subject matter areas of construction and maintenance, electricity, horticultural equipment, mechanics laboratory management, power units, soil and water, and structures and environment?

Procedure

The population investigated in this study included all instructors of vocational agriculture in Virginia who taught one or more state-funded and approved classes of horticultural instruction during the 1976-77 academic year. All 49 teachers of horticulture in Virginia were invited to participate in the study and 47 teachers returned usable responses.

Analytical survey research was the method used in the study. A list of agricultural mechanics tasks believed to be performed by

teachers of horticulture was compiled from a review of the literature. These task statements were reduced to a workable number and improved in quality by a panel of experts. After the task statements were organized into a task survey instrument, the instrument was administered to five pilot test teachers of horticulture in North Carolina.

The task survey instrument contained a list of 165 agricultural mechanics tasks assigned to one of the following seven agricultural mechanics subject matter areas: (1) construction and maintenance, (2) electricity, (3) horticultural equipment, (4) mechanics laboratory management, (5) power units, (6) soil and water, and (7) structures and environment. The teachers were requested to respond to the task survey instrument in two ways. First, the teachers were to indicate if they performed the task. And second, the teachers were to indicate the relative amount of time they spent performing the task using a summated rating scale, ranging from one (much below average time) to five (much above average time). The instrument also contained questions regarding the teachers' years of teaching experience, occupational experience possessed, pre-service areas of specialization in agricultural education, sex, and occupational areas of teaching emphasis in horticulture.

Two methods of data collection were utilized. Nineteen teachers completed the task survey instrument at a Horticulture Option workshop in April, 1977. The task survey instrument, along with a cover letter from the investigator and his dissertation committee chairman, and a return-addressed envelope were mailed to the remaining teachers. Each

instrument was coded to allow for follow-up purposes. Two weeks after the initial mailing, a post card reminder was mailed to those teachers whose instruments had not been returned. Approximately ten days after the post card reminder had been mailed, a telephone call was made to those teachers who still had not responded. A t-test of significance was computed for selected variables to determine that there was no difference, at the .01 probability level, between the teachers responding by the two methods.

Reliability coefficients were then computed for each of the seven agricultural mechanics subject matter areas. The reliability estimates, as determined by Cronback's coefficient alpha, ranged from a high of .965 to a low of .856, indicating a high degree of internal consistency in the teachers' responses to each of the subject matter areas. Content validity was established by compiling agricultural mechanics task statements from previous research, utilizing a panel of experts, and pilot testing the task survey instrument in North Carolina.

The data were analyzed at the Computer Center of Virginia Polytechnic Institute and State University. The analyses of the data were made in relation to the specific research questions developed for the study. Statistical techniques used in analyzing the data included frequencies, percentages, means, point-biserial correlations, and Pearson product-moment correlation.

Findings

Characteristics of Teachers. The teachers of horticulture in Virginia during the 1976-77 academic year had been teaching vocational agriculture for an average of 8.6 years, taught an average of 3.6 periods of horticulture per day, had an average enrollment of 36.57 students in the Horticulture Option, and taught in a department with an average of 2.49 teachers. Seventy-two percent of the respondents possessed occupational experience in farming while only 41 and 16 percent possessed experience in horticulture and agricultural mechanics respectively. Thirty-three out of the 47 respondents emphasized the occupational area of floriculture in their instructional programs, the only area to be emphasized by a majority of the teachers, while 22 emphasized landscape management, 14 emphasized nursery management, and eight emphasized turf management. Five out of every six teachers of horticulture in Virginia during the 1976-77 academic year were males. Nearly half, 48.9 percent, of the horticultural teachers had specialized in the Horticulture Option during pre-service training in agricultural education. This percentage equaled the combined percentages for teachers of horticulture who had specialized in agricultural education pre-service speciality options of agricultural production, agricultural machinery service, agricultural business, and natural resources management.

Research Question Number 1. All 165 agricultural mechanics tasks included in the task survey instrument were performed by at least one teacher of horticulture. No task was performed by 100 percent of the teachers, nor did any teacher perform all 165 tasks.

Research Question Number 2. Seventy-nine out of the 165 agricultural mechanics tasks were performed by more than 40 percent of the teachers of horticulture. The mean time-spent values for the 79 agricultural mechanics tasks performed by more than 40 percent of the teachers of horticulture ranged from a high of 3.762 to a low of 2.049, and these findings were reported in Tables VIII through XIV of Chapter 4. With the exception of the "mechanics laboratory management" subject matter area, in which 92 percent of the tasks were performed by more than 40 percent of the teachers; the percentages of tasks performed by more than 40 percent of the teachers in the other six subject matter areas were fairly constant, ranging from 40 to 58 percent.

Research Question Number 3. A positive relationship was found between the total number of agricultural mechanics tasks performed and the number of years of vocational agriculture teaching experience. This relationship was significant at the .01 probability level.

Research Question Number 4. Occupational experience in farming was found to be related, at the .01 probability level, to the total number of agricultural mechanics tasks performed. Significant relationships did not exist between the total number of agricultural mechanics tasks performed and occupational experience in agricultural mechanics or horticulture.

Research Question Number 5. The only pre-service area of specialization in agricultural education that was found to be related, at the .01 probability level, to the total number of tasks performed was

agricultural production. Pre-service specialization in agricultural machinery service, agricultural business, natural resources management, and horticulture were not significantly related to the total number of tasks performed.

Research Question Number 6. No relationship, at the .01 probability level, was found to exist between the sex of the teachers and the total number of agricultural mechanics task performed.

Research Question Number 7. Three relationships, at the .01 probability level, were found between the number of tasks performed in the agricultural mechanics subject matter areas and the occupational areas of teaching emphasis in horticulture. Significant relationships existed between the number of tasks performed in the "horticultural equipment" subject matter area and the occupational areas of landscape management and turf management. Turf management was also found to be significantly related to the "structures and environment" subject matter area. The occupational areas of teaching emphasis in floriculture and nursery management were not found to be significantly related to any of the agricultural mechanics subject matter areas.

CONCLUSIONS

The findings from this study would seem to justify the following conclusions.

1. Although there was variation in the agricultural mechanics tasks performed, the number of tasks performed by the teachers of

horticulture as a group indicated that teachers of horticulture must possess skills in the area of agricultural mechanics.

2. The 79 agricultural mechanics tasks performed by more than 40 percent of the teachers of horticulture were distributed throughout the seven subject matter areas of agricultural mechanics, signifying that teachers of horticulture must possess skills in each of the agricultural mechanics subject matter areas.

3. The number of agricultural mechanics tasks performed by teachers of horticulture tended to increase as the number of years of vocational agriculture teaching experience of the teachers increased.

4. Teachers of horticulture who possessed occupational experience in farming tended to perform more agricultural mechanics tasks than teachers who did not possess farm experience.

5. Teachers of horticulture who had specialized in agricultural production during pre-service training in agricultural education tended to perform more agricultural mechanics tasks than those teachers who had specialized in something other than agricultural production.

6. The data revealed that there was not a significant relationship between the sex of the teachers and the number of agricultural mechanics tasks performed by teachers of horticulture.

7. Teachers of horticulture who emphasized the occupational areas of landscape management and turf management in their instructional programs tended to perform more agricultural mechanics tasks in the "horticultural equipment" subject matter area than teachers who did not emphasize landscape management and turf management.

8. Forty percent or more of the horticultural teachers tended to perform proportionally more agricultural mechanics tasks in the "mechanics laboratory management" subject matter area than in the other subject matter areas, indicating the importance that should be placed on laboratory management in teacher education programs.

RECOMMENDATIONS

Based on the findings of this study and the conclusions drawn, the following recommendations are offered.

1. Instructors of agricultural mechanics service courses in the Department of Agricultural Engineering at Virginia Polytechnic Institute and State University should give immediate attention to identifying skill development projects for prospective teachers of horticulture in order that the prospective teachers can develop the skills needed for the agricultural mechanics tasks performed by teachers of horticulture.

2. The findings of this study should be disseminated to the Joint Agricultural Education Staff in Virginia for their information and use in planning and evaluating the Horticulture Option.

3. Individual agricultural mechanics subject matter task lists should be shared with the Virginia Horticultural Teachers Committee for the committee's information and use in identifying topics for in-service workshops and development of relevant instructional materials.

4. A special research study involving horticultural business managers should be conducted to determine the agricultural mechanics tasks needed for entry-level employment in the various occupational areas of horticulture.

5. A special research study involving local vocational directors and principals should be conducted to determine the agricultural mechanics tasks that teachers of horticulture are expected to perform in the management and maintenance of horticultural tools, equipment, and facilities.

6. Teacher educators should give special consideration to including those tasks in the "mechanics laboratory management" subject matter area which are common to all technical agricultural speciality options into courses such as Vocational and Technical Education 4030, Methods of Teaching Vocational Agriculture; Vocational and Technical Education 5770, First Year Teachers; and Agricultural Engineering 4060, Agricultural Mechanics Shop Management.

7. A list of the agricultural mechanics tasks performed by more than 40 percent of the teachers of horticulture should be shared with representatives from the Horticulture Department at Virginia Polytechnic Institute and State University in order to determine which tasks are being taught in the horticultural courses identified as restrictive electives by the Agricultural Education Program staff.

8. A list of the agricultural mechanics tasks performed by more than 40 percent of the teachers of horticulture should be shared with representatives from the Department of Agricultural Engineering at Virginia Polytechnic Institute and State University to determine which Agricultural Engineering course(s) should be specified as restrictive elective(s) for prospective teachers of horticulture.

9. In developing a new course(s) in agricultural mechanics for prospective teachers of horticulture and/or planning an agricultural mechanics in-service workshop(s) for teachers of horticulture, the following steps whould be used in selecting agricultural mechanics tasks to include in the instruction:

a. first, initial consideration should be given to selecting those agricultural mechanics tasks which were performed by more than 40 percent of the teachers of horticulture;

b. second, if time does not permit teaching all tasks performed by more than 40 percent of the teachers, priority for selecting tasks should be based on mean time-spent values, with the highest value receiving top priority; and

c. tasks performed by less than 40 percent of the teachers and deemed critical for safety reasons should also be included in the instruction.

10. Tasks in the "horticultural equipment" subject matter area should be further analyzed to determine which are specific to the landscape management and turf management occupational areas of horticulture. These tasks should then be incorporated into occupational internship programs for prospective teachers of horticulture and currently employed teachers of horticulture.

IMPLICATIONS

The following statements seem to have implications for improvement of the Horticulture Option. These implications were founded solely on information acquired by the investigator during the research effort

and were not based upon the findings of this study.

1. In order to provide valid and up-to-date information for planning and evaluating the agricultural mechanics instruction in the Horticulture Option, an active statewide advisory council should be organized and be comprised of horticultural business managers, local vocational directors, and others as deemed appropriate.

2. Prospective teachers of horticulture should be required to gain occupational experience in a horticultural business for the purpose of becoming aware of the agricultural mechanics tasks performed in the horticultural industry.

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APPENDIXES

APPENDIX A

LIST OF TEACHERS OF HORTICULTURE

Albert H. Carter
Appomattox County High School

Charles E. Bedall
Valley Vocational Technical Center

Dennis L. Strole
Brookville High School

Dean Sutphin
Carroll County High School

Norman Olgers
Dinwiddie Senior High School

Mickey R. Cunningham
Fauquier Vocational Technical Center

L. Tully Larew
Narrows High School

Peter J. Hohmann
Lee-Davis High School

Diana Jacobeen
Hermitage High School

John W. Mathias
Lancaster High School

Robert O. Brown
Blacksburg High School

John A. Roberts
Nelson County High School

Joanne Grimm
Orange County High School

Max Timberlake
Powhattan High School

Barbara Wallace
Rowanty Vocational Technical Center

Richard M. Hylton
Pulaski County High School

Lynda Smet
Arlington Technical Center

David E. Updike
Botetourt Vocational School

Eddie W. Chitwood
Carroll County High School

John E. Scott
Charles City High School

C. C. Beam
Herndon High School

James L. Shreckhise
James Wood High School

Bruce Bowman
William Monroe High School

Thomas Schaaf
Patrick Henry High School

Robert W. Jones
Laurel Park High School

Nikolai Soloviev
Louisa County High School

Billy N. Stanger
Christiansburg High School

James Altman
Orange County High School

James E. Cromer
Pittsylvania County Vocational Center

David W. Fowlkes
Prince Edward County High School

Elissa Steeves
Pulaski County High School

Bobby L. Albrite
Rappahannock High School

William P. St. John
Chilhowie High School

W. R. Boggs
Spotsylvania High School

D. M. Carty
Graham High School

Phillip McCroskey
John S. Battle High School

Warren O. Wells
Holston High School

Danny J. Sowers
Wythe County Vocational Center

Carole Lohman
Granby High School

James S. Judkins
P. D. Pruden Vocational Technical Center

D. B. Waddle
Marion High School

Freddie C. Stevens
Spotsylvania High School

David A. Clark
Abingdon High School

Harold G. Shockley
Patrick Henry High School

Rex Crews
Washington and Lee High School

Susan Smith
Peninsula Vocational Technical Center

Raleigh Baggett
Norfolk Technical Vocational Center

Elgia L. Easter
Virginia Beach Vocational Technical Center

R. B. Carmean
Chesapeake Technical Center

APPENDIX B

PANEL OF EXPERTS LIST

Dr. Thomas A. Silletto, Assistant Professor
Agricultural Education (Agricultural Mechanics)
Virginia Polytechnic Institute and State University
Blacksburg, Virginia 24061

Mr. George C. Whiting, Assistant Professor
Vocational Horticulture
Virginia Polytechnic Institute and State University
Blacksburg, Virginia 24061

Mr. Stanley R. Burke, Assistant Supervisor
Agricultural Education
State Department of Education
Radford, Virginia 24141

Mr. Charles P. Griner, Instructor
Agricultural Education
Virginia Polytechnic Institute and State University
Blacksburg, Virginia 24061

Mr. David M. Coffey, Instructor
Agricultural Education
Virginia Polytechnic Institute and State University
Blacksburg, Virginia 24061

APPENDIX C

DIRECTIONS TO PANEL OF EXPERTS

COLLEGE OF EDUCATION

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Blacksburg, Virginia 24061

DIVISION OF VOCATIONAL & TECHNICAL EDUCATION

February 17, 1977

MEMORANDUM

TO: Panel of Experts for the Horticultural Mechanics Task Study

FROM: Jack L. Schinstock

SUBJECT: Directions for Reviewing the Horticultural Mechanics Task List

The purpose of this review is to delete obviously irrelevant task statements, add missing task statements, and reword vague or lengthy task statements. If you feel a task statement should be deleted, please put a mark through the complete task statement. If a task statement is missing that you feel should be added, write the task statement at the end of the section in which you believe it should be included. If a task statement is vague or lengthy and you feel there is a better way of expressing the statement, mark through the inappropriate words or complete statement and rewrite it in the space above the marked out words or statement. Additionally, if you feel a task statement would fit more logically in another section, please transfer the statement to the appropriate section.

The purpose of this Horticultural Mechanics Task Study is to identify the agricultural mechanics tasks performed by teachers of horticulture. The tasks to be identified are those agricultural mechanics tasks performed in the instructional portion of the Virginia Horticulture Option and those agricultural mechanics tasks performed in the maintenance of the horticultural tools, equipment, and facilities which might be located at the school. Agricultural mechanics tasks that might be performed by the teacher of horticulture in another agricultural option are not of interest in this study.

Please turn the page and begin the review.

APPENDIX D

LIST OF PILOT TEST TEACHERS

Mr. H. J. Smith
Vocational Agriculture Department
Chatham Central High School
Bear Creek, North Carolina 27207

Mr. James F. Bailey
Vocational Agriculture Department
East Montgomery High School
Biscoe, North Carolina 27209

Mr. Robert B. Goodson
Vocational Agriculture Department
Charles D. Owen High School
Black Mountain, North Carolina 28711

Mr. Ralph C. Kurfees
Vocational Agriculture Department
North Iredell High School
Harmony, North Carolina 28634

Mr. Fred E. Lay
Vocational Agriculture Department
Tabor City High School
Tabor City, North Carolina 28463

APPENDIX E

INTRODUCTORY LETTER TO PILOT TEST TEACHERS

COLLEGE OF EDUCATION

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Blacksburg, Virginia 24061

DIVISION OF VOCATIONAL & TECHNICAL EDUCATION

March 1, 1977

Dear _____

Mr. C. V. Tart, North Carolina State Department of Public Instruction, identified you as an outstanding teacher of horticulture who would be willing to assist with an ongoing research project. Mr. Tart is aware of the nature of this study and feels the information gathered will be useful.

The research in which I am engaged is an identification of the agricultural mechanics tasks performed by teachers of horticulture. The results of this study can be a valuable asset to the educator who has the responsibility of preparing pre-service courses in horticultural mechanics and in-service workshops for horticulture teachers.

Within the next week you will be receiving a field test copy of a Horticultural Mechanics Task Survey Instrument. I would like to ask your assistance in completing this instrument which will only require about thirty minutes of your time. All information and data gathered will be held in strictest confidence. In order that the study may proceed on schedule, I would appreciate it if you would complete and return the instrument as soon as possible after receiving it. A stamped, addressed envelope will be enclosed for your use in returning the instrument.

If you would like a summary of the findings, please complete the blank form which will be enclosed for your name, address, and telephone number and return it with the completed instrument.

Your assistance will be greatly appreciated.

Sincerely,

Jack L. Schinstock

cc: Mr. C. V. Tart

APPENDIX F

COVER LETTER TO PILOT TEST TEACHERS

COLLEGE OF EDUCATION

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Blacksburg, Virginia 24061

DIVISION OF VOCATIONAL & TECHNICAL EDUCATION

March 8, 1977

Dear Mr. _____

As I indicated in my letter of March 1, I would like to obtain your assistance on a study I am conducting in horticultural mechanics at Virginia Polytechnic Institute and State University.

Enclosed is a field test copy of a Horticultural Mechanics Task Inventory. It will require only about thirty minutes of your time to complete. All data and information gathered on the task inventory will be held in strictest confidence.

In order that the study may proceed on schedule, I would appreciate it if you would complete and return the task inventory as soon as possible. A stamped, addressed envelope has been enclosed for your use in returning the completed task inventory.

If you would like a summary of the horticultural mechanics study findings, please complete the enclosed blank card for your name, address, and telephone number and return it with the completed task inventory.

Your assistance in this study will be greatly appreciated.

Sincerely,

Jack L. Schinstock

APPENDIX G

TASK SURVEY INSTRUMENT

HORTICULTURAL MECHANICS

TASK INVENTORY

Compiled by

Jack L. Schinstock

April, 1977

Booklet Number ____

BACKGROUND INFORMATION

NAME:

SCHOOL:

Indicate the total number of years you have been teaching vocational agriculture.

_____ years

Indicate the total amount and type of occupational experience you possess.

_____ years _____ months -- in a farming operation

_____ years _____ months -- in an agricultural mechanics occupation

_____ years _____ months -- in a horticultural business

_____ years _____ months -- in other agricultural occupations

Please specify: _____

Sex: _____ Male _____ Female

Indicate your area of major teaching emphasis in ornamental horticulture (Check only one).

_____ floriculture

_____ nursery management

_____ landscape management

_____ turf management

_____ other -- please specify _____

Indicate your undergraduate area of specialization in agricultural education.

_____ agricultural production

_____ agricultural machinery service

_____ agricultural business

_____ natural resources management

_____ ornamental horticulture

_____ other -- please specify _____

DIRECTIONS

Have you completed the Background Information section? Make sure you have before you continue with this section.

Procedure A -- Checking Agricultural Mechanics Tasks of Present Job

1. As you read each task in the task section, place a check ( ) beside each task you perform and/or teach in your present job. Put your checkmark in the column headed "Check if Done in Present Job."

2. Do NOT complete the right-hand column, "Time Spent Doing These Tasks in Present Job," at this time.

3. If a task you perform and/or teach is not listed anywhere in the entire task list, write it on the blank lines at the end of the appropriate subsection.

4. Remember, at this time you are to complete only the column headed "Check if Done in Present Job." Now turn to page 1 and begin.

Procedure B -- Rating Time Spent on Tasks on Present Job

1. Now you are to rate the relative amount of time you spend performing and/or teaching each task. PLEASE NOTE: RELATIVE TIME SPENT MEANS THE TOTAL TIME YOU SPEND DOING A TASK COMPARED WITH THE TIME YOU SPEND ON THE OTHER TASKS CHECKED IN THAT SUBSECTION OF THE TASK LIST.

2. Use a rating of "1" if you spend much below average amount of time on a task, "2" for below average, "3" for about average, "4" for above average, and "5" if you spend much above average amount of time on a task.

3. Rate only the tasks you have checked by circling your rating on the 5-point scale in the right-hand column, headed "Time Spent Doing These Tasks in Present Job."

4. When you have completed all your ratings in the right-hand column for the tasks you have checked, you will have completed the Horticultural Mechanics Task Inventory. Now turn to page 1 and begin your rating for the "Time Spent Doing These Tasks in Present Job" column.

TASK INVENTORY Page 1 of 13 Pages

Time Spent Scale

1. Much below average time
2. Below average time
3. About average time
4. Above average time
5. Much above average time

A. CONSTRUCTION AND MAINTENANCE	Check if Done in Present Job	Time Spent Doing These Tasks in Present Job (Circle one)
1. Arc weld steel to steel		1 2 3 4 5
2. Bronze weld sheet metal		1 2 3 4 5
3. Build a cold frame or hot bed		1 2 3 4 5
4. Build supporting structures for training vines		1 2 3 4 5
5. Construct a decorative fence		1 2 3 4 5
6. Construct a germination flat		1 2 3 4 5
7. Construct a greenhouse propagation bed		1 2 3 4 5
8. Construct a masonry planter		1 2 3 4 5
9. Construct a slat (lathe) house		1 2 3 4 5
10. Construct wooden greenhouse benches		1 2 3 4 5
11. Construct wooden planters		1 2 3 4 5
12. Cut metal stock using an oxygen-acetylene torch		1 2 3 4 5
13. Figure a bill of materials		1 2 3 4 5
14. Hand paint structures and equipment		1 2 3 4 5
15. Install wall planters		1 2 3 4 5
16. Operate and maintain power shop tools		1 2 3 4 5
17. Pour a concrete walk or patio		1 2 3 4 5
18. Read and interpret drawings and plans		1 2 3 4 5

TASK INVENTORY Page 2 of 13Pages

Time Spent Scale

1. Much below average time
2. Below average time
3. About average time
4. Above average time
5. Much above average time

A. CONSTRUCTION AND MAINTENANCE	Check if Done in Present Job	Time Spent Doing These Tasks in Present Job (Circle One)
19. Repair plastic covering on a greenhouse		1 2 3 4 5
20. Repair wooden portion of greenhouse superstructure		1 2 3 4 5
21. Replace and glaze broken greenhouse windows		1 2 3 4 5
22. Replace damaged supports for black cloth		1 2 3 4 5
23. Replace plastic covering on a greenhouse		1 2 3 4 5
24. Sketch drawings of construction projects		1 2 3 4 5
25. Spray paint structures and equipment		1 2 3 4 5
26.		1 2 3 4 5
27.		1 2 3 4 5

TASK INVENTORY Page 3 of 13 Pages

Time Spent Scale

1. Much below average time
2. Below average time
3. About average time
4. Above average time
5. Much above average time

B. ELECTRICITY	Check if Done in Present Job	Time Spent Doing These Tasks in Present Job (Circle one)
1. Check electrical circuits using a meter or test lamp		1 2 3 4 5
2. Clean electric motors		1 2 3 4 5
3. Install automatic electrical time clock controls		1 2 3 4 5
4. Install a supplemental lighting system		1 2 3 4 5
5. Oil electric motors		1 2 3 4 5
6. Regulate (set) automatic time clocks		1 2 3 4 5
7. Repair electrical extension cords		1 2 3 4 5
8. Replace an electrical attachment plug		1 2 3 4 5
9. Replace electrical convenience outlets		1 2 3 4 5
10. Replace electrical switches		1 2 3 4 5
11. Replace fuses		1 2 3 4 5
12. Replace lamp sockets		1 2 3 4 5
13. Replace light bulbs		1 2 3 4 5
14. Replace service cords on electrical equipment		1 2 3 4 5
15. Replace solenoid valves (switches)		1 2 3 4 5
16. Reset circuit breakers		1 2 3 4 5
17. Reset ground fault circuit interruptors		1 2 3 4 5
18.		1 2 3 4 5
19.		1 2 3 4 5

TASK INVENTORY Page 4 of 13 Pages

Time Spent Scale

1. Much below average time
2. Below average time
3. About average time
4. Above average time
5. Much above average time

C. HORTICULTURAL EQUIPMENT	Check if Done in Present Job	Time Spent Doing These Task in Present Job (Circle one)
1. Adjust horticultural equipment		1 2 3 4 5
2. Aerate compacted soil or turf using an aerator		1 2 3 4 5
3. Apply pesticides using a fogger		1 2 3 4 5
4. Apply pesticides using a fumer		1 2 3 4 5
5. Apply pesticides using a plant duster		1 2 3 4 5
6. Apply pesticides using a small engine sprayer		1 2 3 4 5
7. Apply pesticides using a small tank sprayer		1 2 3 4 5
8. Apply pesticides using a tractor mounted sprayer		1 2 3 4 5
9. Assemble horticultural equipment		1 2 3 4 5
10. Compact turf or soil using a roller		1 2 3 4 5
11. Cut sod using a sod cutter		1 2 3 4 5
12. Cut weeds using a power "weed-eater"		1 2 3 4 5
13. Edge a walk using a power edger		1 2 3 4 5
14. Fertilize soil using a broadcast (cyclone) spreader		1 2 3 4 5
15. Fertilize soil using a drop-type hopper spreader		1 2 3 4 5
16. Grade land using a tractor mounted scraper blade		1 2 3 4 5
17. Load soil using a front-end loader		1 2 3 4 5
18. Lubricate horticultural equipment		1 2 3 4 5

TASK INVENTORY Page 5 of 13 Pages

Time Spent Scale

1. Much below average time
2. Below average time
3. About average time
4. Above average time
5. Much above average time

C. HORTICULTURAL EQUIPMENT	Check if Done in Present Job	Time Spent Doing These Tasks in Present Job (Circle one)
19. Mix planting media using a mechanical soil mixer		1 2 3 4 5
20. Mow grass using a gang reel mower		1 2 3 4 5
21. Mow grass using a reel-type mower		1 2 3 4 5
22. Mow grass using a rotary mower		1 2 3 4 5
23. Pasteurize growing media using a steam pasteurizer		1 2 3 4 5
24. Pasteurize growing media using a electrical pasteurizer		1 2 3 4 5
25. Plant grass seed using a broadcast (cyclone) spreader		1 2 3 4 5
26. Plant grass seed using a drop-type hopper spreader		1 2 3 4 5
27. Prune and trim trees using a chain saw		1 2 3 4 5
28. Remove debris using a vacuum lawn sweeper		1 2 3 4 5
29. Remove thatch using a vertical mower		1 2 3 4 5
30. Replace worn or defective parts on equipment		1 2 3 4 5
31. Sharpen cutting edges on power equipment		1 2 3 4 5
32. Shred planting media using a soil shredder		1 2 3 4 5
33. Sow seed using a broadcast hand seed sower		1 2 3 4 5
34. Till soil using a disc harrow		1 2 3 4 5
35. Till soil using a disc plow		1 2 3 4 5
36. Till soil using a moldboard plow		1 2 3 4 5

TASK INVENTORY Page 6 of 13 Pages

Time Spent Scale

1. Much below average time
2. Below average time
3. About average time
4. Above average time
5. Much above average time

C. HORTICULTURAL EQUIPMENT	Check if Done in Present Job	Time Spent Doing These Tasks in Present Job
		(Circle one)
37. Till soil using a small engine rotary tiller		1 2 3 4 5
38. Till soil using a spike tooth harrow		1 2 3 4 5
39. Till soil using a spring tooth harrow		1 2 3 4 5
40. Trim hedges and shrubs using electrical shears		1 2 3 4 5
41.		1 2 3 4 5
42.		1 2 3 4 5

TASK INVENTORY Page 7 of 13 Pages

Time Spent Scale

1. Much below average time
2. Below average time
3. About average time
4. Above average time
5. Much above average time

D. MECHANICS LABORATORY MANAGEMENT	Check if Done in Present Job	Time Spent Doing These Tasks in Present Job (Circle one)
1. Clean and store hand tools		1 2 3 4 5
2. Evaluate layout of facilities		1 2 3 4 5
3. Install safety devices		1 2 3 4 5
4. Inventory horticultural tools and equipment		1 2 3 4 5
5. Keep a maintenance schedule		1 2 3 4 5
6. Maintain safety devices		1 2 3 4 5
7. Order agricultural mechanics consumable supplies		1 2 3 4 5
8. Order repair parts		1 2 3 4 5
9. Repair broken hand shop tools		1 2 3 4 5
10. Repair broken hand horticultural tools		1 2 3 4 5
11. Replace filter on mask respirator		1 2 3 4 5
12. Replace gas mask canister		1 2 3 4 5
13. Select horticultural tools and equipment		1 2 3 4 5
14. Sharpen cutting edges on hand tools		1 2 3 4 5
15.		1 2 3 4 5
16.		1 2 3 4 5

TASK INVENTORY Page 8 of 13 Pages

Time Spent Scale

1. Much below average time
2. Below average time
3. About average time
4. Above average time
5. Much above average time

E. POWER UNITS (SMALL ENGINES & TRACTORS)	Check if Done in Present Job	Time Spent Doing These Tasks in Present Job (Circle one)
1. Adjust the engine governor		1 2 3 4 5
2. Adjust the carburetor		1 2 3 4 5
3. Adjust tractor brakes		1 2 3 4 5
4. Adjust tractor clutch		1 2 3 4 5
5. Adjust V-belt tension		1 2 3 4 5
6. Attach equipment to the tractor drawbar		1 2 3 4 5
7. Attach tractor mounted equipment		1 2 3 4 5
8. Change crankcase oil and filter		1 2 3 4 5
9. Check engine compression		1 2 3 4 5
10. Clean crankcase breather		1 2 3 4 5
11. Clean engine and tractor using a high pressure washer		1 2 3 4 5
12. Clean sediment bowl and fuel filter		1 2 3 4 5
13. Connect the power take-off		1 2 3 4 5
14. Connect the remote (hydraulic) cylinder		1 2 3 4 5
15. Drive a tractor		1 2 3 4 5
16. Inspect and service spark plug		1 2 3 4 5
17. Maintain battery ignition system(service distributor)		1 2 3 4 5

TASK INVENTORY Page 9 of 13 Pages

Time Spent Scale

1. Much below average time
2. Below average time
3. About average time
4. Above average time
5. Much above average time

E. POWER UNITS (SMALL ENGINES & TRACTORS)	Check if Done in Present Job	Time Spent Doing These Tasks in Present Job (Circle one)
18. Maintain the engine cooling system		1 2 3 4 5
19. Mix fuel-oil mixture for 2-cycle engine		1 2 3 4 5
20. Prepare engine for storage		1 2 3 4 5
21. Purge diesel fuel system (bleed air from lines)		1 2 3 4 5
22. Refuel engine		1 2 3 4 5
23. Repair a carburetor		1 2 3 4 5
24. Repair electrical starting circuit on small engine		1 2 3 4 5
25. Repair magneto ignition system (replace points & condenser)		1 2 3 4 5
26. Repair rope starters on small engines		1 2 3 4 5
27. Repair windup starters on small engines		1 2 3 4 5
28. Replace radiator hose		1 2 3 4 5
29. Replace spark plug		1 2 3 4 5
30. Service diesel engine fuel filter		1 2 3 4 5
31. Service front-wheel bearings on a tractor		1 2 3 4 5
32. Service hydraulic system		1 2 3 4 5
33. Service the air cleaner		1 2 3 4 5
34. Service the battery		1 2 3 4 5

TASK INVENTORY Page 10 of 13 Pages

Time Spent Scale

1. Much below average time
2. Below average time
3. About average time
4. Above average time
5. Much above average time

E. POWER UNITS (SMALL ENGINES & TRACTORS)	Check if Done in Present Job	Time Spent Doing These Tasks in Present Job (Circle one)
35. Steam clean engine and tractor		1 2 3 4 5
36. Time the ignition system (adjust ignition timing)		1 2 3 4 5
37.		1 2 3 4 5
38.		1 2 3 4 5

TASK INVENTORY Page 11 of 13 Pages

Time Spent Scale

1. Much below average time
2. Below average time
3. About average time
4. Above average time
5. Much above average time

F. SOIL AND WATER	Check if Done in Present Job	Time Spent Doing These Tasks in Present Job (Circle one)
1. Apply liquid fertilizer through an automatic irrigation system		1 2 3 4 5
2. Clean drainage ditches		1 2 3 4 5
3. Clean water pipes and traps		1 2 3 4 5
4. Determine soil moisture using a soil moisture sensing device (tensiometer)		1 2 3 4 5
5. Install a fertilizer proportioner		1 2 3 4 5
6. Install automatic irrigation system		1 2 3 4 5
7. Install mist irrigation nozzles		1 2 3 4 5
8. Install sprinkler irrigation nozzles		1 2 3 4 5
9. Install water piping systems		1 2 3 4 5
10. Lay out a drainage system using a transit or level		1 2 3 4 5
11. Measure land area		1 2 3 4 5
12. Operate a fertilizer proportioner		1 2 3 4 5
13. Protect water piping systems from freezing		1 2 3 4 5
14. Repair a leaky faucet		1 2 3 4 5
15. Repair a leaky hose		1 2 3 4 5
16. Repair a leaky pipe		1 2 3 4 5
17. Repair mist irrigation pipe		1 2 3 4 5

TASK INVENTORY Page 12 of 13 Pages

Time Spent Scale

1. Much below average time
2. Below average time
3. About average time
4. Above average time
5. Much above average time

F. SOIL AND WATER	Check if Done in Present Job	Time Spent Doing These Tasks in Present Job (Circle one)
18. Repair sprinkler irrigation pipe		1 2 3 4 5
19. Repair water pumps		1 2 3 4 5
20. Replace broken sprinkler heads		1 2 3 4 5
21. Replace gaskets on sprinkler irrigation system		1 2 3 4 5
22.		1 2 3 4 5
23.		1 2 3 4 5

TASK INVENTORY Page 13of 13Pages

Time Spent Scale

1. Much below average time
2. Below average time
3. About average time
4. Above average time
5. Much above average time

G. STRUCTURES AND ENVIRONMENT	Check if Done in Present Job	Time Spent Doing These Tasks in Present Job (Circle one)
1. Adjust carbon dioxide (CO_2) generators		1 2 3 4 5
2. Adjust cooling equipment		1 2 3 4 5
3. Adjust heating equipment		1 2 3 4 5
4. Adjust thermostat control		1 2 3 4 5
5. Apply shading compound or paint greenhouse windows		1 2 3 4 5
6. Calibrate thermostat with a thermometer		1 2 3 4 5
7. Install carbon dioxide (CO_2) generators		1 2 3 4 5
8. Install a humidistat		1 2 3 4 5
9. Install a thermostat		1 2 3 4 5
10. Maintain ventilation system		1 2 3 4 5
11. Replace a greenhouse fan		1 2 3 4 5
12. Service gas heater burners		1 2 3 4 5
13.		1 2 3 4 5
14.		1 2 3 4 5

Go to page ii and follow Procedure B

You have now completed the inventory. Please return the booklet.

APPENDIX H

COVER LETTER TO TEACHERS OF HORTICULTURE

COLLEGE OF EDUCATION

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Blacksburg, Virginia 24061

DIVISION OF VOCATIONAL & TECHNICAL EDUCATION

April 4, 1977

Dear Teacher of Horticulture:

As a part of my doctoral program in Vocational and Technical Education at Virginia Polytechnic Institute and State University, I am conducting a study that might be of interest and value to you and future teachers of horticulture in Virginia. The research in which I am engaged is a determination of the agricultural mechanics tasks taught in the Horticulture Option and/or performed in the maintenance of horticultural tools, equipment, and facilities. The results of this study can be a valuable asset to the teachers in Virginia as we develop topics for pre-service courses in horticultural mechanics and identify topics for in-service workshops.

Since you are a teacher of horticulture, I would like to obtain your assistance in determining what agricultural mechanics tasks you teach and/or perform in your job. Please fill out the brief informational page and follow the directions for checking and rating the tasks on the Horticultural Mechanics Task Inventory. Completion of the form will take about thirty minutes. All responses will be treated confidentially and only group information will be used in the analysis of data. No reference will ever be made regarding an individual's responses.

In order that the study may proceed on schedule, I would appreciate it if you would complete and return the task inventory as soon as possible. A stamped, addressed envelope has been enclosed for your use in returning the completed task inventory.

Your cooperation will be greatly appreciated.

Letter authorized by:

Dr. John R. Crunkilton
Chairman of Dissertation
Committee

Sincerely,

Jack L. Schinstock

APPENDIX I

POST CARD REMINDER

DEAR MR. _____

JUST A REMINDER

I AM DEPENDING ON YOU TO COMPLETE AND RETURN THE "HORTICULTURAL MECHANICS TASK INVENTORY" SENT TO YOU LAST WEEK. IF YOU HAVE NOT ALREADY DONE SO, WOULD YOU PLEASE TAKE A FEW MINUTES TO COMPLETE AND RETURN IT TO ME TODAY?

THANK YOU FOR YOUR COOPERATION.

JACK L. SCHINSTOCK

APPENDIX J

NUMBER AND PERCENT OF HORTICULTURAL TEACHERS PERFORMING EACH AGRICULTURAL MECHANICS TASK AND THE MEAN TIME-SPENT VALUE FOR THE TASK

TABLE VII

NUMBER AND PERCENT OF HORTICULTURAL TEACHERS PERFORMING EACH AGRICULTURAL MECHANICS TASK AND THE MEAN TIME-SPENT VALUE FOR THE TASK

Agricultural Mechanics Tasks	Number of Teachers Who Performed Task (N=47)	Percent of Teachers Who Performed Task	Mean Time-Spent Value[a]
(1)	(2)	(3)	(4)
CONSTRUCTION AND MAINTENANCE SUBJECT MATTER AREA			
1. Arc weld steel to steel	13	27.7	2.538
2. Bronze weld sheet metal	6	12.8	1.833
3. Build a cold frame or hot bed	30	63.8	2.300
4. Build supporting structures for training vines	17	36.2	1.999
5. Construct a decorative fence	10	21.2	2.200
6. Construct a germination flat	22	46.8	2.728
7. Construct a greenhouse propagation bed	29	61.7	2.551
8. Construct a masonry planter	4	8.5	1.998
9. Construct a slat (lathe) house	16	34.0	3.000
10. Construct wooden greenhouse benches	14	29.8	2.142
11. Construct wooden planters	20	42.6	2.500
12. Cut metal stock using an oxygen-acetylene torch	14	29.8	2.071

TABLE VII (Continued)

Agricultural Mechanics Task	Number of Teachers Who Performed Task (N=47)	Percent of Teachers Who Performed Task	Mean Time-Spent Value[a]
(1)	(2)	(3)	(4)
13. Figure a bill of materials	27	57.4	2.890
14. Hand paint structure and equipment	28	59.6	2.179
15. Install wall planters	8	17.0	1.998
16. Operate and maintain power shop tools	26	55.3	2.731
17. Pour a concrete walk or patio	14	29.8	1.857
18. Read and interpret drawings and plans	36	76.6	2.722
19. Repair plastic covering on a greenhouse	17	36.2	2.237
20. Repair wooden portion of greenhouse superstructure	11	23.4	2.273
21. Replace and glaze broken greenhouse windows	22	46.8	2.681
22. Replace damaged supports for black cloth	20	42.6	2.050
23. Replace plastic covering on a greenhouse	8	17.0	2.626
24. Sketch drawings of construction projects	27	57.4	2.371
25. Spray paint structures and equipment	17	36.2	1.999

TABLE VII (Continued)

Agricultural Mechanics Tasks	Number of Teachers Who Performed Task (N=47)	Percent of Teachers Who Performed Task	Mean Time-Spent Value[a]
(1)	(2)	(3)	(4)
ELECTRICITY SUBJECT MATTER AREA			
1. Check electrical circuits using a meter or test lamp	17	36.2	2.237
2. Clean electric motors	16	34.0	2.438
3. Install automatic electrical time clock controls	25	53.2	2.320
4. Install a supplement lighting system	24	51.1	2.501
5. Oil electric motors	23	48.9	2.348
6. Regulate (set) automatic time clocks	34	72.3	2.794
7. Repair electrical extension cords	32	68.1	2.219
8. Replace an electrical attachment plug	27	57.4	2.148
9. Replace electrical convenience outlets	17	36.2	1.999
10. Replace electrical switches	16	34.0	2.188
11. Replace fuses	20	42.6	2.049
12. Replace lamp sockets	17	36.2	2.237
13. Replace light bulbs	36	76.6	2.473

TABLE VII (Continued)

Agricultural Mechanics Tasks	Number of Teachers Who Performed Task (N=47)	Percent of Teachers Who Performed Task	Mean Time-Spent Value[a]
(1)	(2)	(3)	(4)
14. Replace service cords on electrical equipment	20	42.6	2.150
15. Replace solenoid valves (switches)	15	31.9	1.799
16. Reset circuit breakers	31	66.0	2.291
17. Reset ground fault circuit interruptors	5	10.6	1.598
18. Other[b]			
Install heating cables for hot beds	1	2.1	2.000
Service electric heaters	1	2.1	2.000
HORTICULTURAL EQUIPMENT SUBJECT MATTER AREA			
1. Adjust horticultural equipment	42	89.4	3.167
2. Aerate compacted soil or turf using an aerator	17	36.2	2.530
3. Apply pesticides using a fogger	22	46.8	2.728
4. Apply pesticides using a fumer	19	40.6	2.474
5. Apply pesticides using a plant duster	21	44.7	2.142

TABLE VII (Continued)

Agricultural Mechanics Tasks	Number of Teachers Who Performed Task (N=47)	Percent of Teachers Who Performed Task	Mean Time-Spent Value[a]
(1)	(2)	(3)	(4)
6. Apply pesticides using a small engine sprayer	11	23.4	2.453
7. Apply pesticides using a small tank sprayer	34	72.3	3.148
8. Apply pesticides using a tractor mounted sprayer	4	8.5	1.998
9. Assemble horticultural equipment	34	72.3	2.882
10. Compact turf or soil using a roller	18	38.3	2.556
11. Cut sod using a sod cutter	10	21.3	2.698
12. Cut weeds using a power "weed-eater"	14	29.8	2.642
13. Edge a walk using a power edger	15	31.9	2.666
14. Fertilize soil using a broadcast (cyclone) spreader	28	59.6	2.572
15. Fertilize soil using a drop-type hopper spreader	16	34.0	2.438
16. Grade land using a tractor mounted scraper blade	14	29.8	2.427
17. Load soil using a front-end loader	8	17.0	2.503
18. Lubricate horticultural equipment	38	80.9	2.816

TABLE VII (Continued)

Agricultural Mechanics Tasks	Number of Teachers Who Performed Task (N=47)	Percent of Teachers Who Performed Task	Mean Time-Spent Value[a]
(1)	(2)	(3)	(4)
19. Mix planting media using a mechanical soil mixer	21	44.7	3.762
20. Mow grass using a gang reel mower	8	17.0	3.878
21. Mow grass using a reel-type mower	10	21.3	2.900
22. Mow grass using a rotary mower	38	80.9	3.132
23. Pasteurize growing media using a steam pasteurizer	18	38.3	3.499
24. Pasteurize growing media using a electrical pasteurizer	24	51.1	3.333
25. Plant grass seed using a broadcast (cyclone) spreader	25	53.2	2.519
26. Plant grass seed using a drop-type hopper spreader	8	17.0	2.626
27. Prune and trim trees using a chain saw	14	29.8	2.358
28. Remove debris using a vacuum lawn sweeper	7	14.9	2.713
29. Remove thatch using a vertical mower	4	8.5	3.748
30. Replace worn or defective parts on equipment	30	63.8	2.900

TABLE VII (Continued)

Agricultural Mechanics Tasks	Number of Teachers Who Performed Task (N=47)	Percent of Teachers Who Performed Task	Mean Time-Spent Value[a]
(1)	(2)	(3)	(4)
31. Sharpen cutting edges on power equipment	28	59.6	3.000
32. Shred planting media using a soil shredder	22	46.8	3.046
33. Sow seed using a broadcast hand seed sower	16	34.0	2.438
34. Till soil using a disc harrow	16	34.0	2.250
35. Till soil using a disc plow	3	6.4	2.992
36. Till soil using a moldboard plow	14	29.8	2.216
37. Till soil using a small engine rotary tiller	44	93.6	2.977
38. Till soil using a spike tooth harrow	2	4.3	2.491
39. Till soil using a spring tooth harrow	4	8.5	2.996
40. Trim hedges and shrubs using electrical shears	15	31.9	2.535
41. Other[b]			
Till soil using tractor tiller	1	2.1	4.000
Trim hedges and shrubs using hand shears and loppers	5	10.6	3.200
Maintain steam soil wagon	2	4.3	3.500

TABLE VII (Continued)

Agricultural Mechanics Tasks	Number of Teachers Who Performed Task (N=47)	Percent of Teachers Who Performed Task	Mean Time-Spent Value[a]
(1)	(2)	(3)	(4)
MECHANICS LABORATORY MANAGEMENT SUBJECT MATTER AREA			
1. Clean and store hand tools	44	93.6	3.386
2. Evaluate layout of facilities	30	63.8	2.800
3. Install safety devices	27	57.4	2.667
4. Inventory horticultural tools and equipment	42	89.4	3.119
5. Keep a maintenance schedule	19	40.4	3.001
6. Maintain safety devices	28	59.6	3.214
7. Order agricultural mechanics consumable supplies	29	61.7	3.241
8. Order repair parts	36	76.6	2.860
9. Repair broken hand shop tools	27	57.4	2.740
10. Repair broken hand horticultural tools	39	83.0	2.820
11. Replace filter on mask respirator	27	57.4	2.667
12. Replace gas mask canister	15	31.9	2.666
13. Select horticultural tools and equipment	42	89.4	3.167
14. Sharpen cutting edges on hand tools	39	83.0	2.949

TABLE VII (Continued)

Agricultural Mechanics Tasks	Number of Teachers Who Performed Task (N=47)	Percent of Teachers Who Performed Task	Mean Time-Spent Value[a]
(1)	(2)	(3)	(4)
POWER UNITS SUBJECT MATTER AREA			
1. Adjust the engine governor	11	23.4	2.183
2. Adjust the carburetor	24	51.1	2.375
3. Adjust tractor brakes	11	23.4	2.089
4. Adjust tractor clutch	7	14.9	1.571
5. Adjust V-belt tension	14	29.8	2.927
6. Attach equipment to the tractor drawbar	20	42.6	2.799
7. Attach tractor mounted equipment	21	44.7	2.900
8. Change crankcase oil and filter	24	51.1	2.583
9. Check engine compression	8	17.0	1.874
10. Clean crankcase breather	17	36.2	2.472
11. Clean engine and tractor using a high pressure washer	12	25.5	2.166
12. Clean sediment bowl and fuel filter	16	34.0	2.500
13. Connect the power take-off	11	23.4	2.726
14. Connect the remote (hydraulic) cylinder	6	12.8	2.334

TABLE VII (Continued)

Agricultural Mechanics Tasks	Number of Teachers Who Performed Task (N=47)	Percent of Teachers Who Performed Task	Mean Time-Spent Value[a]
(1)	(2)	(3)	(4)
15. Drive a tractor	34	72.3	2.853
16. Inspect and service spark plug	22	46.8	2.455
17. Maintain battery ignition system (service distributor)	19	40.4	2.526
18. Maintain the engine cooling system	21	44.7	2.428
19. Mix fuel-oil mixture for 2-cycle engine	23	48.1	2.305
20. Prepare engine for storage	21	44.7	2.666
21. Purge diesel fuel system (bleed air from lines)	1	2.1	0.987
22. Refuel engine	29	61.7	2.758
23. Repair a carburetor	11	23.4	2.089
24. Repair electrical starting circuit on small engine	7	14.9	2.142
25. Repair magneto ignition system (replace points and condensor)	8	17.0	2.250
26. Repair rope starters on small engines	21	44.7	2.191
27. Repair windup starters on small engines	11	23.4	2.089
28. Replace radiator hose	14	29.8	2.216

TABLE VII (Continued)

Agricultural Mechanics Tasks	Number of Teachers Who Performed Task (N=47)	Percent of Teachers Who Performed Task	Mean Time-Spent Value[a]
(1)	(2)	(3)	(4)
29. Replace spark plug	24	51.1	2.667
30. Service diesel engine fuel filter	1	2.1	2.021
31. Service front-wheel bearings on a tractor	10	21.3	2.402
32. Service hydraulic system	5	10.6	2.002
33. Service the air cleaner	22	46.8	2.591
34. Service the battery	23	48.9	2.522
35. Steam clean engine and tractor	12	25.5	2.166
36. Time the ignition system (adjust ignition timing)	8	17.0	2.127
SOIL AND WATER SUBJECT MATTER AREA			
1. Apply liquid fertilizer through an automatic irrigation system	16	34.0	2.811
2. Clean drainage ditches	15	31.9	2.601
3. Clean water pipes and traps	22	46.8	3.091
4. Determine soil moisture using a soil moisture sensing device (tensiometer)	9	19.1	2.669
5. Install a fertilizer proportioner	15	31.9	2.732

TABLE VII (Continued)

Agricultural Mechanics Tasks	Number of Teachers Who Performed Task (N=47)	Percent of Teachers Who Performed Task	Mean Time-Spent Value[a]
(1)	(2)	(3)	(4)
6. Install automatic irrigation system	22	46.8	2.818
7. Install mist irrigation nozzles	33	70.2	2.576
8. Install sprinkler irrigation nozzles	16	34.0	2.876
9. Install water piping systems	18	38.3	2.778
10. Lay out a drainage system using a transit or level	7	14.9	2.431
11. Measure land area	20	42.6	2.500
12. Operate a fertilizer proportioner	16	34.0	2.876
13. Protect water piping systems from freezing	25	53.2	2.561
14. Repair a leaky faucet	22	46.8	2.591
15. Repair a leaky hose	35	74.5	2.543
16. Repair a leaky pipe	24	51.1	2.501
17. Repair mist irrigation pipe	23	48.9	2.434
18. Repair sprinkler irrigation pipe	9	19.1	2.998
19. Repair water pumps	5	10.6	2.397
20. Replace broken sprinkler heads	14	29.8	2.786

TABLE VII (Continued)

Agricultural Mechanics Tasks	Number of Teachers Who Performed Task (N=47)	Percent of Teachers Who Performed Task	Mean Time-Spent Value[a]
(1)	(2)	(3)	(4)
21. Replace gaskets on sprinkler irrigation system	9	19.1	2.778
22. Other[b]			
Install water pumps	1	2.1	3.000
STRUCTURES AND ENVIRONMENT SUBJECT MATTER AREA			
1. Adjust carbon dioxide (CO_2) generators	3	6.4	2.005
2. Adjust cooling equipment	31	66.0	3.322
3. Adjust heating equipment	33	70.2	3.121
4. Adjust thermostat control	41	87.2	3.000
5. Apply shading compound or paint greenhouse windows	25	53.2	2.920
6. Calibrate thermostat with a thermometer	14	29.8	2.716
7. Install carbon dioxide (CO_2) generators	2	4.3	1.504
8. Install a humidistat	5	10.6	2.604
9. Install a thermostat	15	31.9	2.666
10. Maintain ventilation system	32	68.1	2.938

TABLE VII (Continued)

Agricultural Mechanics Tasks	Number of Teachers Who Performed Task (N=47)	Percent of Teachers Who Performed Task	Mean Time-Spent Value[a]
(1)	(2)	(3)	(4)
11. Replace a greenhouse fan	12	25.5	3.082
12. Service gas heater burners	9	19.1	3.332
13. Other[b]			
Install ventilation system	1	2.1	3.000
Replace ventilation tubes	1	2.1	3.000
Change wet pad in air cooling system	1	2.1	3.000

[a]Mean time-spent value was based on the following scale: 1 = much below average time, 2 = below average time, 3 = about average time, 4 = above average time, 5 = much above average time.

[b]Task statements listed under "Other" were added to the task survey instrument by the teachers of horticulture.

VITA

Jack L. Schinstock was born in Dodge City, Kansas on April 19, 1948, the third of nine children. After attending elementary and secondary schools in Ford, Kansas, he entered Kansas State University in September, 1966. His Bachelor of Arts degree in Biology Education, with a minor in Spanish, was received in August, 1970 from the State University of New York College at Brockport. The Master of Agriculture degree in Mechanized Agriculture was received from the University of Florida in December, 1974. He began work toward the Doctor of Education degree in Vocational and Technical Education, specializing in Agricultural Education, at Virginia Polytechnic Institute and State University in January, 1975, satisfying the requirements for the degree in July, 1977.

From September, 1970 to June, 1973, he served as a Peace Corps Volunteer in the Central American Republic of El Salvador. During his Peace Corps service, he held the position of Instructor at the National School of Agriculture, a post-secondary institution of less than baccalaureate degree, where he taught farm machinery and agricultural mechanics. While pursuing the Ed.D. degree, he served as an instructor of agricultural mechanics and a graduate assistant in the Agricultural Education Program Area, Division of Vocational and Technical Education.

He is a member of the American Vocational Association, American Society of Agricultural Engineers, American Association of Teacher

Educators in Agriculture, and American Vocational Education Research Association. Membership is also held in the honorary organizations of Phi Kappa Phi, Gamma Sigma Delta, and Alpha Tau Alpha.

A DETERMINATION OF THE AGRICULTURAL MECHANICS TASKS PERFORMED BY TEACHERS OF HORTICULTURE IN VIRGINIA

by

Jack L. Schinstock

(ABSTRACT)

The problem for this study was to determine the agricultural mechanics tasks taught in the Horticulture Option and/or executed in the management of horticultural tools, equipment, and facilities by teachers of horticulture in Virginia. The study also sought to determine if relationships existed between the number of tasks performed and the following teacher variables:

1. years of vocational agriculture teaching experience;
2. types of agricultural experience possessed;
3. pre-service areas of specialization in agricultural education;
4. sex; and
5. occupational areas of teaching emphasis in horticulture.

A list of agricultural mechanics tasks performed by teachers of horticulture was compiled from previous research, evaluated by a panel of experts, and pilot tested with five teachers of horticulture in North Carolina. The final 165 agricultural mechanics tasks were assigned to seven agricultural mechanics subject matter areas and arranged into questionnaire form. Task inventories were administered to

the 49 teachers of horticulture in Virginia and 47 usable responses were received.

Each respondent in the survey checked the tasks they performed and rated the relative amount of time they spent performing each task. Teachers added tasks they performed which were not included in the inventory. Reliability estimates for the seven agricultural mechanics subject matter areas were determined using Cronback's coefficient alpha. The reliability of the teachers' responses to the relative amount of time they spent performing the tasks in each agricultural mechanics subject matter area was: (1) .905 for construction and maintenance, (2) .937 for electricity, (3) .950 for horticulural equipment, (4) .909 for mechanics laboratory management, (5) .965 for power units, (6) .883 for soil and water, and (7) .856 for structures and environment.

The findings revealed that all 165 agricultural mechanics tasks were being performed by teachers of horticulture in Virginia; however, no task was performed by 100 percent of the teachers nor did any teacher perform all 165 tasks. Mean time-spent values, ranging from 2.049 to 3.762, were calculated for the 79 agricultural mechanics tasks which were performed by more than 40 percent of the teachers of horticulture. Correlations between number of agricultural mechanics tasks performed and the teachers' years of teaching experience, occupational experience in farming, and pre-service specialization in agricultural production were significant at the .01 probability level. Correlations between the number of agricultural mechanics tasks

performed in the "horticultural equipment" subject matter area and the occupational areas of landscape management and turf management were also significant at the .01 probability level.

It was recommended that the findings of this study be used to improve agricultural mechanics instruction for prospective teachers of horticulture and to identify possible topics for in-service workshops and development of relevant instructional materials. Further study involving horticultural business managers was recommended to determine the agricultural mechanics tasks needed for entry-level employment in horticultural occupations. Another study involving local vocational directors and principals was recommended to determine the agricultural mechanics tasks teachers of horticulture are expected to perform in the management and maintenance of horticultural tools, equipment, and facilities.