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The Effects of Task Instruction Sheets on the Performance of Eleventh Grade Students Studying Vocational Horticulture

The Ohio State University

Ph.D. 1979

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THE EFFECTS OF TASK INSTRUCTION SHEETS ON
THE PERFORMANCE OF ELEVENTH GRADE
STUDENTS STUDYING VOCATIONAL HORTICULTURE

DISSERTATION

Presented in Partial Fulfillment of the Requirements for
the Degree Doctor of Philosophy in the Graduate
School of The Ohio State University

By
Dennis C. Scanlon, B.S., M.Ed.

*****

The Ohio State University
1979

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Department of Agricultural Education
To Clyde, with the greatest appreciation for your advice, counsel and friendship.
ACKNOWLEDGEMENTS

The personal achievement of one person is usually the result of the combined efforts of many. The achievement of this significant milestone in my career is no exception. This achievement has been possible because of the many friends, teachers and advisers who have encouraged and supported me throughout my entire professional career.

I wish to express my sincere gratitude to the following people who have contributed greatly to the successful completion of this study.

To Dr. L. H. Newcomb, for his encouragement, guidance, patience and unfaltering faith in my ability to do a good job.

To Dr. J. Robert Warmbroad for his masterful teaching and expert advice.

To Dr. J. David McCracken for his keen observations and crisp reviews of my writing.

To Dr. Aaron J. Miller for his personal support and encouragement of the study.

To Dr. Harlan E. Ridenour for his support and interest in the study.
ACKNOWLEDGEMENTS--Continued

To Dr. Roger Roediger for his advice, encouragement and support.

To Debbie for her assistance in typing all of the materials associated with this study.

To my wife, Janet, for her unwavering faith in my ability to succeed.

To my children, Sharon, Susan and Erin for those pleasant diversions necessary for success.
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# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>iii</td>
</tr>
<tr>
<td>VITA</td>
<td>v</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>vii</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. INTRODUCTION TO THE STUDY</td>
<td>1</td>
</tr>
<tr>
<td>Statement of the Problem</td>
<td>6</td>
</tr>
<tr>
<td>Specific Objectives of the Study</td>
<td>6</td>
</tr>
<tr>
<td>Need for the Study</td>
<td>7</td>
</tr>
<tr>
<td>II. REVIEW OF RELATED LITERATURE</td>
<td>11</td>
</tr>
<tr>
<td>Conditions of Learning</td>
<td>11</td>
</tr>
<tr>
<td>Aptitude-Treatment Interactions</td>
<td>18</td>
</tr>
<tr>
<td>Hypothesis to the Tested</td>
<td>24</td>
</tr>
<tr>
<td>III. PROCEDURE</td>
<td>26</td>
</tr>
<tr>
<td>Population and Sample</td>
<td>26</td>
</tr>
<tr>
<td>Design of the Study</td>
<td>29</td>
</tr>
<tr>
<td>Data and Instrumentation</td>
<td>35</td>
</tr>
<tr>
<td>Data Collection</td>
<td>39</td>
</tr>
<tr>
<td>Analysis</td>
<td>40</td>
</tr>
<tr>
<td>IV. FINDINGS OF THE STUDY</td>
<td>42</td>
</tr>
<tr>
<td>Description of the Sample</td>
<td>43</td>
</tr>
<tr>
<td>Preexperimental Equivalency</td>
<td>45</td>
</tr>
<tr>
<td>Posttest Data</td>
<td>45</td>
</tr>
<tr>
<td>Teacher Questionnaire</td>
<td>46</td>
</tr>
<tr>
<td>Hypothesis One</td>
<td>51</td>
</tr>
<tr>
<td>Hypothesis Two</td>
<td>53</td>
</tr>
<tr>
<td>Hypothesis Three</td>
<td>54</td>
</tr>
</tbody>
</table>

vi
### TABLE OF CONTENTS—Continued

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>V. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS</td>
<td>58</td>
</tr>
<tr>
<td>Procedure</td>
<td>60</td>
</tr>
<tr>
<td>Analysis of Data</td>
<td>62</td>
</tr>
<tr>
<td>Summary of Findings</td>
<td>62</td>
</tr>
<tr>
<td>Conclusions</td>
<td>63</td>
</tr>
<tr>
<td>Implications of the Study</td>
<td>65</td>
</tr>
<tr>
<td>Recommendations</td>
<td>65</td>
</tr>
<tr>
<td>Recommendations for Further Study</td>
<td>66</td>
</tr>
</tbody>
</table>

#### APPENDIXES

<table>
<thead>
<tr>
<th>Appendix</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Preliminary Information Survey</td>
<td>69</td>
</tr>
<tr>
<td>B. Poinsettia Production Task Instruction Sheets</td>
<td>71</td>
</tr>
<tr>
<td>C. Task Instruction Sheet Monograph</td>
<td>97</td>
</tr>
<tr>
<td>D. Teacher Questionnaire: Part A and B</td>
<td>103</td>
</tr>
<tr>
<td>E. Teacher Validation Questionnaire</td>
<td>111</td>
</tr>
<tr>
<td>F. Posttest Instrument</td>
<td>124</td>
</tr>
<tr>
<td>G. Data Summary Sheet</td>
<td>135</td>
</tr>
</tbody>
</table>

**BIBLIOGRAPHY**                                                      | 137  |
<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Kuder-Richardson 20 and 21 Reliability Coefficients and Mean Item Difficulty for Pilot Test.</td>
<td>36</td>
</tr>
<tr>
<td>2. Summary Statistics for the Sample</td>
<td>43</td>
</tr>
<tr>
<td>3. A Comparison of Mean and Standard Deviations of Reading Scores and Grade Point Average by Treatment Groups</td>
<td>45</td>
</tr>
<tr>
<td>4. Means, Standard Deviations and Adjusted Means of Posttest Scores by Treatment Groups</td>
<td>52</td>
</tr>
<tr>
<td>5. Analysis of Covariance: Adjusted Mean Posttest Scores by Treatment</td>
<td>52</td>
</tr>
<tr>
<td>6. Pearson-Product Moment Correlation Coefficients Between Mean Posttest Scores and Mean Reading Scores</td>
<td>53</td>
</tr>
<tr>
<td>7. Mean and Standard Deviations of Posttest Scores by Treatment and Reading Levels</td>
<td>55</td>
</tr>
<tr>
<td>8. Analysis of Variance: Posttest Scores by Treatment by Reading Level</td>
<td>57</td>
</tr>
</tbody>
</table>
CHAPTER I

INTRODUCTION TO THE STUDY

No facet of education has been more widely and thoroughly investigated during the past twenty-five years than that pertaining to what requisite conditions are necessary for learning to take place. (Dunkin and Biddle, 1974.) Early research which centered on learning, the learning process, and the learner sought to find universal qualities or characteristics of both teachers and learners that would insure that learning was taking place. The bulk of early research gave rise to behavioristic theories of learning which often reflected little more than the concepts and knowledge developed in research on animal or human learning. The difficulty generated by relying on this type of knowledge about learning, as suggested by Gage (1963), was that these theories of learning did not make explicit the processes and teaching alternatives by which teachers might provide optimal conditions for learning in the classroom.

Cruickshank (1976), has suggested that a teacher's choice of an instructional alternative should be based on five criteria:
1. Which instructional alternative is most likely to appeal to the learner?

2. Which instructional alternative is most appealing to the teacher?

3. Which instructional alternatives have the characteristics which seem to lend themselves to accomplishing the instructional goal?

4. Which instructional alternative is the most efficient in terms of preparation and teaching time?

5. What resources and facilities are available to implement which instructional alternatives?

Glaser (1967), after reviewing and synthesizing previous work on learning and individual differences concluded that the early researchers widespread inattention to individual differences indicated that psychologists had been carelessly optimistic in their expectations for the generality of behavioral laws; and therefore had failed to specify optimum instructional alternatives for any particular learning situation.

Often new knowledge regarding instructional alternatives is introduced into the classroom as a new form of curriculum material. Thus, a curriculum materials service often becomes an active partner in the implementation of research findings by developing curriculum materials which are compatible with and built upon the knowledge generated
by the researcher. Ridenour (1965), suggested that the major goal of a curriculum materials service was to assist the teacher in implementing and evaluating new ideas regarding curriculum organization and subject matter so that the end result would be improvement of instruction. Regarding evaluation, Ridenour pointed out that:

The effectiveness of educational materials in the teaching, learning process will be unknown until the materials have been tried in the classroom and evaluated in terms of whether or not they have brought about the behavioral changes in students that were specified in the educational objectives. (p. 137).

Research efforts aimed at the evaluation of instructional materials need to be given priority in the future. As early as 1966, the Review and Synthesis of Research in Agricultural Education clearly revealed the fact that experimental studies designed specifically to evaluate the effectiveness of instructional materials had not been common in agricultural education. In 1973 Meril reemphasized the need for evaluation of instructional materials when he stated:

Progress cannot be made toward an empirically based instructional development methodology until propositions that related objectives to learning activities are specified and tested. (p. 96).

Therefore, with this in mind, this study was initiated to evaluate the effectiveness of selected types of curriculum materials.
Kowalka (1974), stated:

Traditionally curriculum developers have refrained from assessing the instructional utility of the materials they produced. The abundance of instructional materials has caused teachers and other educators to begin urging developers to make available evidence that programs indeed teach what they purport to teach. (p. 17).

As today's schools are continually plagued by financial trouble, the users of curriculum materials are becoming more aware of the importance of choosing curriculum materials which efficiently and economically achieve stated objectives. A major goal of this study was to develop and evaluate the effectiveness of curriculum materials which emphasized laboratory learning experiences. Johnson (1976), discussed the fact that there are four basic procedures for selecting matter to be included in a given curriculum:

1. **Judgemental procedure.** In this procedure, the curriculum developer makes a decision, based on his own experience, as to what should or should not be included in a particular curriculum.

2. **Experimental procedure.** In this procedure, the curriculum developer attempts to determine, by actual tests, whether subject matter satisfies a particular criterion.

3. **Analytical procedure.** This procedure simply consists of an analysis of what people do in an occupation in order to discover the subject matter
involved in the activities.

4. **Consensual procedure.** In this procedure a curriculum developer collects peoples' opinions about what they believe the curriculum should be.

The curriculum materials developed for this study resulted from combining the judgemental and consensual procedures and were developed as instructional alternatives to traditional forms of laboratory instruction. Bloom (1971), commented that a researcher merely comparing one instructional method with another may be unable to demonstrate any difference in learner's achievement until he takes into consideration certain student characteristics.

Cronbach (1977), stated that the bulk of early research on learning clearly pointed to evidence that general abilities, rather than specialized abilities, predicted amount of learning and rate of learning, or both. Finch and Impelliteri (1971), concluded that any attempt to determine what instructional methodology is the most effective for all youngsters in any particular class, school or grade area is asking the wrong question. A more appropriate question is one which relates the degree of effectiveness of selected instructional strategies with selected student characteristics.
Statement of the Problem

This study was initiated in cooperation with the Ohio Agricultural Education Curriculum Materials Service to investigate the effects of introducing task instruction sheets to the horticulture laboratory setting. The specific problem investigated was, what effect, as measured by a student's score on an end of unit mastery test, would the use of task instruction sheets have on a student's level of mastery when being taught a unit on poinsettia production; and what was the relationship between a student's reading ability and his score on the end of unit achievement test at both levels of the treatment.

Specific Objectives of the Study

The specific objectives of this study were as follows:

1. To evaluate the effects of task instructional sheets by comparing the mean posttest scores of eleventh grade classes of students enrolled in vocational horticulture who were taught a unit on poinsettia production using task instruction sheets with similar classes of eleventh grade students who were not using task instruction sheets.

2. To determine the relationship between students reading ability and their scores on the poinsettia end of unit achievement test, and
3. To determine the interactive effect between the students' reading ability, indicated by the score on the Gates-MacGinitie Reading Test, and their performance at various levels of the experimental treatment.

Need for the Study

In 1950 professor Carsie Hammonds wrote:

Learning may be defined as a change in behavior that takes place in the course of practice. The change in behavior takes place while performing the activity. Thus the teacher does not have to practice in order to put into practice what he has learned, but primarily in order that the student may learn. Practice in some amount is necessary to the learning; it is necessary to acquiring and fixing modes of behavior, whatever the desired modes may be. (p. 163).

Gerald Leighbody, in his book, Vocational Education in American Schools, suggested that the single most persistant characteristic which distinguishes vocational education from general education is its unfaltering commitment to provide relevant, practical "hands on" instruction to its clientele. Since the original Smith-Hughes legislation of 1917 the scope of vocational education has been continually redefined to include larger and more diverse groups of people. Along with this increased scope and responsibility have come major problems associated with classroom and laboratory management, curriculum development, and supervised work experience programs.
In recent years laboratory management has become an increasingly difficult and complex problem facing many vocational educators. With the rise of the area vocational schools in the late sixties, the management problems associated with extended laboratory time became an acute reality. Extended laboratory time, specialized instructional areas, and extremely diverse groups of clientele forced many vocational agriculture teachers to search for alternative ways of providing practical "hands on" instruction when the traditional supervised occupational experience programs were not possible. Clearly, one alternative was the well equipped modern laboratory found in many of today's area vocational schools. While falling short of a true work experience program, the laboratory provided the learner with many of the practical experiences which were formally obtained through various work experience programs. Teacher educators must acknowledge the problems of laboratory management and search for instructional alternatives which will permit the teacher to optimize the learning experience of the laboratory for each student. Consider the words of Laurel N. Tanner in her best selling book, Classroom Discipline for Effective Teaching and Learning:

When pupils are divided into small groups or work alone, different strategies are required than when teachers work with the classroom group. Most teachers seem to have no trouble understanding
the whole-class mode of instruction. The reason is obvious. Most teachers attended self-contained classrooms in which whole-class teaching was the predominant mode of instruction. Very often when teachers found themselves in rooms without walls they felt queasy and uneasy. This is understandible. All too frequently teachers are given little or no preparation for the new situation. Teachers need to know just how the demands on them differ in various kinds of settings and what they must do to make the setting work for them instead of against them. (pgs. 97-98).

A fundamental precept upon which successful laboratory management is based is that the students are capable of engaging in self-directed inquiry and learning. An ideal teaching situation would occur if all students were at the developmental level required for this kind of instruction.

Unfortunately this is the ideal, not reality. Rarely are all the students in the laboratory able to provide their own "structure" in an unstructured learning situation. In other words, rarely are all students in the laboratory able to identify problems that interest them, and then proceed to develop plans for solving the problem.

Tanner (1978), has suggested that the key to the problem of laboratory management lies in the curriculum. Well designed curriculum with appropriate curriculum materials which carefully organize and structure the self-directed learning of the student will greatly enhance the value of the laboratory experience for each student. In view of the literature cited, it became apparent to this investigator that there was just cause for initiating a study aimed at improving management in the laboratory.
The need for increased instruction in laboratory management was emphasized in the 1978 study, *Summary of Needs Assessment for In Service Education for Ohio Teachers of Vocational Agriculture*. The study conducted by Hedges (1978) surveyed teachers as to their needs for in-service education. A major problem identified by a majority of the teachers surveyed was a need for in-service education programs which focused on laboratory management. This author felt that the key to good laboratory management was in developing curriculum with appropriate curriculum materials. Therefore, a study to introduce and evaluate the effectiveness of curriculum materials designed to optimize learning in the laboratory seemed especially appropriate at this time.

This study was designed to determine the effectiveness of instruction when selected curriculum materials prepared by the Ohio Agricultural Education Curriculum Materials Service were used to teach poinsettia production to high school students studying horticulture. The results of this study will assist the Curriculum Materials Service in developing additional series of task instruction sheets in other areas of instruction in agriculture.
CHAPTER II

REVIEW OF RELATED LITERATURE

The first section of this chapter will attempt to synthesize the work of educational psychologists in the area of learning theory with work currently being done in the field of individualized instruction. This synthesis will result in an empirical base to support the contention that task instruction sheets, as developed by this investigator, are a type of individualized instruction, and as such incorporate the condition of learning into their basic structure.

A review of literature related to aptitude treatment interaction studies will be reviewed in the second section of this chapter. This review will focus on the relationship between student aptitudes and academic achievement.

Conditions of Learning

In 1972, professor G. A. Nuthall in a personal communication with professor Michael J. Dunkin (Dunkin and Biddle, 1974) stated:

Research on learning is characteristically undertaken in order to find out how a particular kind of learning takes place. The result of this
orientation is that while someone like Skinner can show how best to achieve operant conditioning because of his extensive research into the nature of operant conditioning, he is not in a position to show whether in any particular set of circumstances operant conditioning is the appropriate kind of learning. The problem that faces the teacher is, given a particular curriculum objective which is the best form of learning in order to insure that the curriculum objective is best achieved? So long as research on learning is devoted to the understanding of particular instances of learning, and does not address itself to the question of what is the general nature of learning or attempt to provide a map of all the different types of learning that may operate in any set of circumstances then learning research cannot hope to provide teachers with the kind of information they need. (pgs. 22-23).

Gagné (1965), in his quest to discover the nature of the learning process, discussed a series of variables which he considered essential prerequisites for learning to take place. He referred to these variables as "the conditions of learning" and eventually described eight different types of learning and the internal conditions necessary for each type of learning to occur. Additionally, Gagné described a series of external events that influenced the learning process. In the learning process, external events are what is typically meant by the word "instruction."

Later in 1970, after additional research had been conducted, Gagné defined the term instruction as those tasks which teachers perform to insure that learning is taking place. He described these tasks in terms of teacher actions that:

1. Gain and control attention
2. Stimulate recall of relevant prerequisites
3. Inform the learner of the objectives
4. Present the stimuli
5. Offer guidance for learning
6. Provide corrective feedback
7. Approve performance
8. Provide transfer
9. Insure retention through practice.

Garry and Kingsley (1970) referred to the conditions of learning as a series of variables which must be present for optimum learning to occur. They suggested that these conditions of learning are:

1. Establish a set of clear objectives
2. Clarify the task; define the problem
3. Provide a model; a demonstration; verbal guidance and cues
4. Provide adequate amounts of time to practice
5. Provide immediate knowledge of results
6. Help the learner to analyze his performance.

Dale (1977), expressed conditions for effective learning in this manner:

1. The clearer, the nearer, and more realistic and relevant the statements of desired outcomes, the more effective the learning.
2. We learn what we practice.
3. Learning is increased by knowledge of results.
4. We learn what is meaningful.
5. Learning must be organized.

Galloway (1976) synthesized and summarized the work of previous learning theorists by stating quite simply that the general conditions for learning are:

1. Clear objectives—the learner knows what performance is expected.
2. Prerequisites—the learner has learned and can recall any information or skills necessary for the new learning task.
3. Attention to the task—the learner becomes involved in the learning task.
4. Knowledge of results—the learner gets feedback about his own performance.
5. Reinforcement—the learner is rewarded for correct responses.

Johnson (1976), suggested that vocational education must continually strive to develop new individualization techniques directed at changing parts of the curriculum to meet the learning needs of the participants. Bjorkquist (1971), added that these changes should be based upon the principles by which individuals learn, i.e., the basic conditions associated with learning in the learning process.
Pucel and Knaak (1975) developed a model for individualizing instruction which placed emphasis on developing performance objectives which indicate precisely what the student should master. These authors suggested that to reach the performance objectives the following steps in the instructional process are essential:

1. A statement of the conditions that define the environment within which the student will perform including the tools and materials necessary to accomplish the objectives.

2. Performance described as the visible actions of the student while carrying on the learning activities.

3. A statement of the minimal acceptance level of performance and assessment criteria by which it will be known if the student performed at or above the minimum acceptance level.

Bjorkquist (1971), stated that individualized instruction is characterized by behavioral objectives that specify what is to be learned by each learner, who is to do the learning, the observable behavior expected after instruction, the conditions under which the learning will occur, and the minimum level of acceptable performance. Faust (1977), defined individualized instruction as an approach to teaching based upon the belief that there is no standard student, and that each student learns best using strategies and objectives that reflect his/her experiences, abilities,
McGraw (1975), in evaluating some of the work of Dr. Fred Keller, developer of the Keller Plan for Personalized Systems of Instruction, found that the materials developed by Dr. Keller which were especially appropriate for individualized instruction were those that: 1) made use of objectives that divided the material into small units; 2) provided opportunity for the student to respond; and 3) provided immediate feedback to the student on the appropriateness of his response.

B. Othaniel Smith in his book, *Teachers for the Real World*, suggested that too often educational courses in psychology and fundamental learning processes are selected on their relevance to pedagogy rather than their relevance to the actual education of children and adults. Smith further suggested that to identify the fundamental concepts of learning and the conditions under which they should be applied is as vital to the teaching process as the teacher himself. If a primary goal of instruction is to insure the achievement of every student, then reaching such a goal requires that teachers define the objectives for their instruction, and use effective techniques for modifying student behavior towards those objectives.

The literature suggested that any instructional strategy aimed at modifying student behaviors toward specific
objectives should be based on a practical philosophy that is built upon the advocates and use of the basic principles of learning in the learning process. By synthesizing the fundamental components of individualized instruction, as stated by Bjorkquist, with the general conditions of learning one can arrive at a sound, empirical body of knowledge upon which instructional strategies may be based.

Individualized instruction, implemented through task instruction sheets, offers a practical approach to meeting individual needs in the laboratory.

It is the contention of this investigator that task instruction sheets meet the prerequisite characteristics for individualized instruction by:

1. stating behavioral objectives; what is to be learned,

2. stating the condition under which the student shall perform, and

3. stating the criteria by which student performance may be evaluated.

At the same time, task instruction sheets also fulfill the conditions of learning as described by Gagné, and as such, deserve serious consideration as an alternative strategy for delivering effective and efficient laboratory instruction. Therefore, based on the related research and literature reviewed, it seemed reasonable to hypothesize that
Students taught a unit on poinsettias using a series of task instructional sheets will score significantly higher on the criterion referenced posttest than students taught a unit on poinsettias without the use of task instruction sheets.

Aptitude-Treatment Interaction

The majority of research designed to evaluate the effectiveness of one instructional strategy over another has proven to be rather fruitless. (Dunkin and Biddle, 1974).

Travers (1962), summarized his findings for a number of studies exploring the outcomes of comparing one instructional methodology with another by stating that these studies:

have contributed almost nothing to the knowledge of the factors that influence the learning process in the classroom. In fact many of these studies do not even identify what the experimentally controlled variables are. (p.26)

Finch and Impellitteri (1971), stated that in attempting to determine what instructional methodology is the most effective for all youngsters in any particular class, school, or grade; one is asking the wrong question. A more appropriate question is one which relates to the degree of effectiveness of selected instructional strategies with selected kinds of students.
Bloom (1971), commented a researcher merely comparing one instructional method with another may be unable to demonstrate any difference in learner's achievements until he has taken into consideration certain student characteristics. Noted educational psychologists such as Cronbach (1967), Gagne (1967), Glaser (1967), have suggested that no single instructional process provides optimal learning for all students. Given a common set of objectives, some students will be more successful with one instructional program and others will be more successful with an alternate instructional program. Consequently, a greater proportion of students will attain the instructional objectives when instruction is differentiated for different types of students. As early as 1957, Cronbach encouraged psychologists to refine their experimental methods and observe experimental effects for subjects of different characteristics and to conduct investigations to find aptitude-treatment interactions. Later Cronbach (1967), suggested a learning theory whose propositions would state the conditions of instruction best for pupils of certain types; with conditions and types described in broad dimensions.

Cronbach and Snow, (1969), in their final report for a U.S.O.E. study to determine the individual differences in learning abilities of students as a function of instructional variables stated:
For the empirical scientist, the problem reduces to aptitude treatment interactions. To discover and demonstrate that aptitude treatment interaction exist requires a style of research that has only recently become the style of conscientious investigators. Two broad lines of empirical research in behavioral sciences, experimental and correlational, have received extended treatment in writing on methodology and have been illustrated as the standard ways of investigating problems of learning and aptitude. In the past decade, there has gradually emerged a realization that interaction research is a third variety which embraces both the older styles of study in a single setting and so permits investigation of a new kind of question. (p. 2).

DiVesti reporting in the February 1976, issue of the Researcher, indicated that learning research is shifting towards the study of individual differences as they interact with various treatments, that is, which treatments (educational or instructional strategies) have the greatest payoff for subjects with which characteristics. Cronbach (1967) defined aptitudes as:

A complex of personal characteristics that account for an individual's end state after a particular educational treatment. (p. 23)

Parkhurst (1975), has defined aptitude treatment interaction in three parts:

1. An aptitude variable can be any personalological variable upon which individuals differ.

2. A treatment is any instructional strategy or combination of instructional strategies that structures information for the purpose of having students learn that information.
3. An aptitude treatment interaction exists when, as a result of a given treatment, individuals at one end of an aptitude variable performs at one level on the criterion measure, and individuals at the other end of the aptitude variable perform at a significantly different level on the same criterion measure. Therefore, it appeared logical to hypothesize that there would be:

significant interaction between a student's reading aptitude, as measured by a score on a standardized reading test, and the type of instructional treatment received, as indicated by the student's score on the criterion referenced posttest.

Parkhurst (1975) suggested that future studies of individual differences in learning, must be more precise in postulating initial properties of the learner which interact with learning. Cronbach (1977), in reviewing literature on learning concluded that the bulk of past research clearly points to evidence that general measures predict amount learned or rate of learning or both. It had been expected that specialized abilities would account for interactions, however, the abilities that most frequently enter into interactions are general. Cronbach (1977) concluded that in the light of past research on aptitude-treatment interaction the serious investigator can arrive at no other conclusion than one which suggests a relationship
between general abilities and individual differences. He suggested that the majority of aptitude treatment interaction hypothesis that will be tested will be false, and offers this explanation:

Even if speculation is sound, fine tuning of the treatment condition is needed to bring the relationship squarely under the investigator's eyepiece. Until then the phenomenon is sure to wonder in and out of view as relevant uncontrolled conditions vary haphazardly from one replication to the next. (p. 495).

That is to say that thus far aptitude treatment interaction research has tested the generalizations that students superior in general ability profit more from a given type of learning situation, while students low in general ability profit more from some other form of learning.

Steward, Lash and Kazanas (1976) investigated the question: To what extent do reading ability and instructional format interact to affect student performance? This study was conducted as a 2 x 2 randomized, factorial design with instructional format and reading ability as the two independent variables. The dependent variable was student performance on an end of unit achievement test. A standardized reading test was administered to 115 tenth, eleventh and twelfth grade male subjects at an area occupational school in Westburg, New York. Thirty high reading ability students and thirty low reading ability students were randomly assigned to each of the two treatment groups. The subjects in each treatment group began learning Unit 1 at the same time.
Each student received materials designed for individual study. A posttest was administered as each student completed this unit. After the posttest, learning Unit 2 was administered as each student completed this unit. After the posttest, learning Unit 2 was initiated. A posttest covering the materials in the second lesson was administered after it was completed. All students then received an evaluation covering the materials in both learning units. The test of the null hypothesis of no significant interaction between instructional format and reading ability with regard to student performance on end of unit posttests was not rejected. The authors attributed lack of interaction to differences in the match between instructional objectives and instructional format for the learning units. However, a second null hypothesis of no significant difference between the performance of high and low ability readers on the posttest was rejected at an alpha level of .05. The results of this study suggested that there was a significant difference in a student's ability to effectively utilize various instructional formats, based on their ability to read. Therefore, based on the literature reviewed, it seemed appropriate to hypothesize that there will be:

- a positive relationship between a student's score on a criterion referenced posttest and a student's reading aptitude measured by a score on a standardized reading test.
Block (1971), stated that current findings in the field demonstrate that when no attempt is made to optimize the quality of each student's classroom instruction, then individual differences in student entry resources are reflected in their achievements.

While aptitude treatment interaction studies have not been as revolutionary and revealing as hoped, they do not deny the basic hypothesis that aptitude treatment interaction exists. Cronbach (1977), in the concluding chapter of his book, *Aptitudes and Instructional Methods*, stated:

> The substantive problem before us is to learn which characteristics of the person interact dependently with which features of instructional methods. Aptitude treatment interactions exist! To assert the opposite is to assert that whichever educational procedure is best for Johnny is best for everyone else in Johnny's school. (p. 501).

**Hypothesis to be Tested**

In consideration of the purpose of this study and the specific objectives, the following hypothesis were developed based on related research and literature. The following three hypotheses were used to guide the investigator in the evaluation of effectiveness of instruction that included the use of the task instruction sheet series, Poinsettia Production:

**Hypothesis One**

Students taught a unit on poinsettias using a series of task instructional sheets will score significantly higher on the criterion referenced posttest than students taught a unit on poinsettias without the use of task
instructional sheets.

Hypothesis Two

There will be a positive relationship between a student's score on a criterion referenced posttest and a student's reading aptitude, measured by a score on a standardized reading test.

Hypothesis Three

There will be significant interaction between a student's reading aptitude, the type of instructional treatment received, and a student's score on a criterion referenced posttest. The nature of the interaction is that the difference between the posttest scores of the students in the experimental group and the posttest scores of students in the control group will be greater for students with higher reading aptitudes than will be the difference in posttest scores for the two groups of students with lower reading aptitudes.
CHAPTER III

PROCEDURE

Population and Sample

The experimentally accessible population for this study included high schools with horticulture departments within a radius of approximately seventy-five miles of The Ohio State University. The following counties were included within that radius: Allen, Montgomery, Miami, Logan, Clark, Fayette, Madison, Union, Marion, Morrow, Delaware, Franklin, Pickaway, Ross, Hocking, Fairfield, Perry, Muskinghum, Licking and Knox.

Some of the counties within this seventy-five mile perimeter did not contain schools with horticulture departments; therefore, the sample was drawn from the following eleven counties which did contain horticulture departments: Allen, Montgomery, Miami, Logan, Clark, Madison, Marion, Delaware, Franklin, Muskinghum, and Licking. Additionally, sample schools selected from the accessible population had to meet the following two criteria:
1. Teach a unit on poinsettias between the months of September and December, and
2. Teach a unit on poinsettias to an eleventh grade class of students.

The target population for this study was all schools with horticulture departments within counties located in a seventy-five mile radius of The Ohio State University.

During the months of June, July and August, 1978, vocational horticulture teachers in Allen, Montgomery, Miami, Logan, Clark, Medina, Marion, Delaware, Franklin, Muskingum, and Licking counties were contacted by telephone or personal visits to determine their willingness to participate in this project. Every horticulture teacher contacted was willing to participate. At the initial contact, preliminary survey information (Appendix A) was collected from each school to determine which schools were eligible to participate in the study. A minimum of information regarding the research project was given at this time. Thirty-eight teachers were contacted, resulting in eighteen schools eligible to participate in the project. Twelve schools were randomly selected from the target population to participate in the study. Six schools were randomly assigned to the control group and six schools were assigned to the experimental group. Participating teachers in the
Experimental groups were given sufficient packages of poinsettia task sheets (Appendix B) so that each student in the class could have the entire series.

The experimental teachers were also given a monograph (Appendix C) prepared by the investigator describing the nature of task instruction sheets and their benefits to both students and teachers. The monograph contained suggestions for effectively integrating task instruction sheets into the existing laboratory course of study.

Teachers in the experimental groups were asked to integrate the task instruction sheets into their unit on poinsettias in such a way that each student would be given the opportunity to use the entire series of sheets. Participating teachers in the control groups were given the same orientation as the experimental groups except they were not given copies of the poinsettia task sheets or the monograph describing the nature and use of the task instruction sheets. Rather they were asked to teach the poinsettia unit as they normally would do.

In September and October 1978, each teacher participating in the study was visited. During this visit teachers were informed that they would be field testing a new type of curriculum material being developed for distribution to horticulture teachers in the state of Ohio.
They were also told that they were one of twelve schools selected for the field test, and that the results of the field test would be used as a basis for revising and developing future curriculum materials of this type. The teachers were not told that this study would be used as the basis for a dissertation. Nevertheless, all teachers were aware that they were field testing new materials, and therefore, could have used the materials differently than they would have normally used them, had they purchased them directly from the Curriculum Materials Service. This fact may have produced a slight "Hawthorne" effect within the experimental group of teachers. However, the fact that all teachers in the study were aware of the field testing program suggests that the "Hawthorne" effect would have been evenly distributed throughout both the experimental and control groups.

**Design of the Study**

The design selected for the study was the posttest only control group design. Design 6, as explained by Campbell and Stanley (1963), is a true experimental design.

Twelve classes of eleventh grade vocational horticulture students were included in the study. The twelve classes were randomly assigned to one of the two levels
of the treatment, method of instruction. Those classes in the experimental group received a series of task instruction sheets on poinsettia production. Teachers were asked to integrate the task instruction sheets into their lesson plans on poinsettia production in such a way that each student would be given the opportunity to use the entire series. Those classes in the control group did not receive the series of task instruction sheets dealing with poinsettia production. Rather, teachers in the control group were asked to teach their unit on poinsettia production as they had done in previous years. Both groups received the same end of unit posttest.

To verify that the groups were equivalent, grade point averages were collected for every student participating in the study.

The design used in this study is shown diagrammatically as follows:

\[ R \times X_1 \quad 0_1 \quad (\text{six classes}) \]
\[ R \times X_2 \quad 0_2 \quad (\text{six classes}) \]

The symbols represent the following:

\( R \) represents the random assignment of classes to one of the levels of the treatment,
$X_1$ represents the use of the task instruction sheets on poinsettia production as well as the prepared monograph describing the nature and use of task instruction sheets. $X_2$ represents control classes providing instruction on poinsettia production without the use of the task sheets. $O_1$, $O_2$ represent the poinsettia posttest used to determine student achievement.

The active independent variable was the method of instruction. There were two levels of the independent variable:

1. Instruction using the series of task instruction sheets, Poinsettia Production, in addition to those lesson plans already being used to teach poinsettia production.

2. Instruction in a unit on poinsettia production without the aid of task instruction sheets.

In addition to the manipulated independent variable, one attribute variable, reading ability, was measured. Based on the review of literature, reading ability was hypothesized to interact significantly with the treatment.
Therefore to control for the variation in reading ability, the variable reading ability was used as a covariate in the analysis. The independent variable method of instruction was monitored within the participating schools via a teacher survey instrument (Appendix D). The instrument was a forty-two item questionnaire designed to collect information on the instructional techniques used by all teachers teaching the poinsettia unit, and information how teachers in the experimental group used the poinsettia task sheets during the course of their instruction on poinsettia production.

A correlational design was used to describe the relationship between the attribute variable, reading ability, and the dependent variable, posttest scores. A Pearson-product moment correlation coefficient was used to correlate mean classroom reading scores with mean classroom posttest scores.

The posttest only control group design controls the major threats to internal validity. The effects of pre-testing were controlled since the study did not use a pretest. Rather, pre-experimental group equivalency was established by randomization and further verified by the collection of relevant antecedent data on both groups.
The antecedent data collected for each subject were grade point averages. History was controlled by randomization. Whatever historical events that might have produced a difference in student achievement in the experimental group would also produce a difference in student achievement in the control group. Intra-session history was monitored by using a questionnaire to evaluate the instructional strategies and techniques used by each teacher participating in the study. Maturation was controlled by randomization. The effects of maturation should be manifested equally in both the experimental and control groups. Instrumentation was controlled since all students responded to the same end of unit posttest instrument.

Regression was controlled by randomly assigning classes to levels of the treatment. Any regression effects would be represented equally in both experimental and control groups.

Selection was controlled by randomly assigning classes to levels of the treatment. Since randomization equates groups within the limits of sampling error, any threats to internal validity caused by selection would be equally manifested in both control and experimental groups.

Mortality was no threat to this study since no experimental units were lost during the course of the study.
The posttest only control group design controls some threats to external validity. Interaction of testing and the treatment was controlled by not administering a pretest to either the experimental or control group.

Interaction and selection of the treatment may limit the generalizability of this study since the researcher can provide no conclusive data to suggest that the target population of this study was representative of all vocational horticulture classes in the state of Ohio.

Multiple treatment interference was controlled by determining whether or not the classes of students were participating in another study or had recently participated in a similar study. The teachers reported that their classes were not, and had not, participated in another study.

Reactive arrangements were controlled by conducting the research within an ordinary classroom setting. The students were not told they were participating in an experiment. The treatment was presented as an ordinary classroom event and occurred during the regularly scheduled classroom periods in the school calendar. September, October, November and December were the seasonal months during which poinsettia production is normally taught. The posttest was included as a regular examination at the end of the unit.
Data and Instrumentation

A thirty-five item multiple choice poinsettia production test was developed to measure the dependent variable, students' posttest score. The preliminary posttest was composed of forty multiple choice items designed to cover the major points emphasized in teaching a unit on poinsettia production. To establish content validity for the posttest, a survey instrument (Appendix E) was sent to select horticulture teachers in the state of Ohio to determine what was being taught in the schools of the state. The horticulture teachers involved in the survey were asked to provide written comments regarding the accuracy of a proposed outline for teaching a unit on poinsettia production.

The results of the survey provided guidelines for drawing up the preliminary posttest that would be used for pilot testing. Before pilot testing, the preliminary poinsettia test was reviewed by several experienced teachers who had previously taught poinsettia units to high school students. During September of 1978, the preliminary poinsettia test was pilot tested with forty-two students enrolled in three horticulture departments in Franklin County, Ohio. All students who participated in the pilot testing had been previously taught a unit on poinsettia production.
After completion of the pilot testing, the data were processed to locate non-discriminating test items and to establish the reliability of the test. Two reliability estimates were calculated using the Kuder-Richardson 20 and 21 formulas. The Kuder-Richardson 20 is an index of internal consistency and is a function of the number of items on the test, the variability of the scores, and the proportion passing and failing each item.

The Kuder-Richardson 21 is also an estimate of internal consistency and is computed in the same manner as the Kuder-Richardson 20 except the mean score of the group is used instead of the proportion passing and failing each item. The data presented in Table 1 indicate that the reliability index for the initial forty item test used as the pilot test was .78 for the Kuder-Richardson 20 and .74 for the Kuder-Richardson 21. The mean item difficulty for the pilot test was .46.

### Table 1

<table>
<thead>
<tr>
<th>Kuder-Richardson 20</th>
<th>Kuder-Richardson 21</th>
<th>Mean Item Difficulty</th>
</tr>
</thead>
<tbody>
<tr>
<td>.78</td>
<td>.74</td>
<td>.46</td>
</tr>
</tbody>
</table>
The test items were reviewed in consideration of the relative difficulty of each item and the discrimination index of each item. The relative difficulty of the item indicated the percentage of students missing the item. The higher the percentage of students missing the item, the more difficult it was.

The discrimination index reflected the degree to which the item discriminated between the upper and lower 27.5 percent of the cases in the group. Ten items had an item discrimination index below twenty.

After reviewing these ten questions, two questions were eliminated as being too easy; one question was eliminated for requiring technical knowledge beyond that which would be expected of a high school student; and two questions were eliminated because of their ambiguous nature. A total of five questions were eliminated from the original pilot test.

Five questions were rewritten to provide a greater disparity among the possible distractors. The revised instrument used to quantify the dependent variable was a thirty-five item multiple choice test (Appendix F) developed to measure student knowledge of poinsettia production.
The attribute variable reading ability was measured by administering a standardized form of the Gates-MacGinitie Reading Test. All eleventh grade students participating in the study were tested using Level F, Form 1 of the standardized test. Level F consists of a vocabulary and comprehension test. The vocabulary test samples the students' reading ability and is a test of word knowledge rather than decoding skills. The comprehensive test measures the student's ability to read complete prose passages with understanding. The Gates-MacGinitie Reading Test, Level F, Form 1 has a reliability coefficient of .92 for the vocabulary section, and .91 for the comprehension section as reported in the Gates-MacGinitie Teaching Manual pages 60-61.

A forty-two item questionnaire, (Appendix D) was developed to monitor the teaching techniques used by teachers providing instruction on poinsettia production. The questionnaire was divided into two parts: Part A and Part B. Part A was completed by every teacher participating in the study and was designed to collect information on general instructional techniques used by teachers when teaching a unit on poinsettia production. Part B was completed only by those teachers in the experimental group and was designed to collect specific information on how
experimental teachers used the poinsettia task instruction sheets during the course of their instruction on poinsettia production. The questionnaires were administered to teachers after completion of the poinsettia unit.

Data Collection

During September 1978, the monograph describing the nature and use of task instruction sheets along with 25 packages of poinsettia task instruction sheets were delivered to every teacher in the experimental group. Each package contained a complete set of task instruction sheets as well as the monograph describing the nature of the task instruction sheet and how and where they might be integrated into the laboratory curriculum. These items are included in Appendixes B and C. In September and October of 1978, a standardized version of the Gates-MacGinitie reading test was administered to every student participating in the project. On this visit teachers were introduced to the data summary sheet (Appendix G).

The data summary sheet was designed to protect the anonymity of each student and to provide an easy method of recording data important to the success of this project. Teachers were given the option of inserting the names of the students on the data sheet in whatever order they chose. Each student was assigned a code number revealing only the
school to which they belonged. At the beginning of the reading test, students were instructed to write their identifying code number on their answer sheet. The reading test was then administered, collected and scored by the investigator. Teachers maintained the master data sheets containing the students' names and identifying numbers. Each teacher was asked to obtain and record on the data sheet the grade point average for every student participating in the study. Teachers were then instructed to teach the unit on poinsettias as they had in previous years. Teachers in the experimental group were asked to integrate the task sheets into their unit of instruction in such a way that each student in their class would have the opportunity to use the task instruction sheets. The schools were not visited for the remainder of the study.

Analysis

Hypothesis one, postulating significant difference between the mean posttest scores of the experimental and control groups was tested by using analysis of covariance. Based on the review of literature reading ability was hypothesized to interact significantly with the treatment, i.e., use or non-use of task instruction sheets. Therefore to control for the variation in reading abilities of
the students, and to evaluate the true effects of the treatment, mean classroom reading scores were used as the covariate. The unit of analysis used was schools. Schools were randomly selected and randomly assigned to groups and levels of the treatment, method of instruction. The dependent variable was mean classroom reading scores.

Hypothesis two was analyzed by calculating a Pearson product moment correlation coefficient to determine the relationship between mean classroom posttest scores and mean classroom reading scores.

Hypothesis three examined the interaction between treatment and reading scores on posttest scores. The unit of analysis was individual reading and posttest scores. The data were analyzed by dividing student reading scores into three levels and then subjecting the data to a 3 X 2 factorial analysis of variance test. Reading scores and treatment were used as the independent variables. The dependent variable was individual posttest scores of both the experimental and control groups.

Data generated by this study were analyzed using the Instructional and Research Computer Center facilities of The Ohio State University and the Statistical Package for The Social Sciences (1975) system of computer programs.
CHAPTER IV

FINDINGS OF THE STUDY

The major problem investigated in this study was the effect that task instruction sheets had on students' level of mastery of a given subject: poinsettia production. In addition to the major problem, the following two questions were also examined:

1. What was the relationship between students' ability to read and their score on the end of unit posttest?

2. What were the interactive effects between students' reading abilities, the treatment received, and their scores on the posttest.

Twelve classes of eleventh grade vocational horticulture students participated in the study. The twelve classes were randomly assigned to one of the two levels of the treatment, method of instruction. Those classes in the experiment group received a series of task instruction sheets on poinsettia production and a monograph prepared by the investigator describing the nature and use of task instruction sheets as well as their benefits to both students and teachers. Classes in the control group did not
receive the task sheets on poinsettia production nor the monograph describing the nature and use of task instruction sheets.

The attribute variable, reading ability, was measured by administering a standardized form of the Gates-MacGinitie Reading Test. All eleventh grade students participating in the study were tested using Level F, Form 1 of the standardized test.

Description of the Sample

The experimental units for this study were twelve eleventh grade classes of vocational horticulture students. All classes were located within a seventy-five mile radius of The Ohio State University. Table 2 presents summary statistics for both classes and teachers participating in the study.

**TABLE 2**

**SUMMARY STATISTICS FOR THE SAMPLE**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>n</th>
<th>#Students</th>
<th>%</th>
<th>#Teachers</th>
<th>%Total X Class Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental</td>
<td>6</td>
<td>117</td>
<td>56.5</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td></td>
<td>52</td>
<td>44.4</td>
<td>5</td>
<td>83.3</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td>65</td>
<td>55.6</td>
<td>1</td>
<td>16.6</td>
</tr>
<tr>
<td>Control</td>
<td>6</td>
<td>90</td>
<td>43.5</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td></td>
<td>30</td>
<td>33.3</td>
<td>5</td>
<td>83.3</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td>60</td>
<td>66.7</td>
<td>1</td>
<td>16.6</td>
</tr>
<tr>
<td>Total</td>
<td>12</td>
<td>207</td>
<td>100.0</td>
<td>12</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Each level of the treatment consisted of six intact classes with a total student enrollment of 207 students. Of the 207 students participating in the study, 90 (43.5 percent) were in the control group, and 117 (56.5 percent) were in the experimental group. Of the 90 students in the control group, 60 were female and 30 were male. Of the 117 students in the experimental group, 52 were male and 65 were female. The average class size for the experimental group was 18, while the average class size of the control group was 15. Of the 12 teachers participating in the study 10 were male and 2 were female. The teachers were evenly distributed with five males and one female at each level of the treatment. Teachers participating in the study were prepared to teach by one of two methods:

1. an approved four-year college program in agricultural education, or

2. an approved industry based program, which gives college credit for past work experience.

The teachers in this study were again divided equally within the groups. Four industry prepared teachers, and two four-year college prepared teachers were at each level of the treatment, method of instruction. No teacher participating in the study had less than two years teaching experience.
Pre-experimental Equivalency

To verify the results of randomization, antecedent data regarding students' reading abilities and grade point averages were collected for each student at the beginning of the study. The data presented in Table 3 show that the mean reading score of the control group was 43.34 with a standard deviation of 7.30, while the mean reading score of the experimental group was 39.19 with a standard deviation of 6.10. The mean grade point average of the control group was 2.08 with a standard deviation of .31, while the mean grade point average of the experimental group was 2.19 with a standard deviation of .18.

TABLE 3

A COMPARISON OF MEANS AND STANDARD DEVIATIONS OF READING SCORES AND GRADE POINT AVERAGE BY TREATMENT GROUPS

<table>
<thead>
<tr>
<th>Antecedent Data</th>
<th>n</th>
<th>Mean</th>
<th>SD</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reading Score</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental</td>
<td>6</td>
<td>39.19</td>
<td>6.10</td>
<td>1.07a</td>
</tr>
<tr>
<td>Control</td>
<td></td>
<td>43.34</td>
<td>7.30</td>
<td></td>
</tr>
<tr>
<td><strong>Grade Point Average</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental</td>
<td>6</td>
<td>2.19</td>
<td>.18</td>
<td>-.72a</td>
</tr>
<tr>
<td>Control</td>
<td>6</td>
<td>2.08</td>
<td>2.08</td>
<td></td>
</tr>
</tbody>
</table>

a p > .05
To verify the effects of random assignment, the student data on grade point average and reading scores were subjected to a t test to determine if significant differences existed between the means of the experimental and control groups. The data indicated no significant difference between the mean reading scores of the control and experimental groups, $t (10) = 1.07, p > .05$, nor any significant difference between the mean grade point averages of the control and experimental groups, $t (10) = -.72, p > .05$.

Teacher Questionnaire

A forty-two item questionnaire (Appendix D) was designed to monitor the teaching techniques used by the teachers participating in this study. The questionnaire was divided into two parts:

Part A, completed by all teachers participating in the study, was designed to collect information on the general instructional techniques used by all teachers. Part B, completed only by those teachers in the experimental group, was designed to collect specific information on how the teachers used the task instruction sheets.

Summary Data for Teacher Questionnaire: Part A

The data collected in Part A are summarized as follows:

Part I-A

Every teacher participating in the study
1. taught the poinsettia unit as a regular part of the junior course of study,
2. taught the poinsettia unit from a lesson plan they personally constructed, or
3. grew the poinsettias as a Christmas crop during the months of September, October and November.

The number of pots of poinsettias grown ranged from 150 to 600 with the mean number of pots grown being 415. Every teacher in the experimental group, and five in the control group used a textbook to teach the poinsettia unit. One teacher in the control group did not use a textbook.

The textbook most frequently mentioned was the Ball Redbook (George J. Ball, Inc.). Fifty percent of the teachers in the study used supplemental publications other than textbooks; fifty percent did not. Of those teachers using supplemental publications four were in the experimental group and two were in the control group. The most frequently mentioned supplemental publication was the Greenhouse Worker (The Ohio Agricultural Education Curriculum Materials Service); every teacher in the experimental group and five in the control group used the slide set, "Poinsettia Production," (The Ohio Agricultural Education Curriculum Materials Service), one teacher in the control group used no audio-visual aids.
No teacher participating in the study used any type (other than those supplied to the experimental group) of task sheets, job sheets, or work sheets to supplement their instruction on poinsettias.

The average number of hours spent in teaching the unit on poinsettias was 19.2. The actual number of hours spent teaching the unit on poinsettias ranged from four to 45.

The experimental group of teachers reported spending 60 percent of their time in the laboratory and 40 percent of their time in the classroom. Those teachers in the control group spent approximately 55 percent of their time in the laboratory and 45 percent of their time in the classroom.

Both groups of teachers reported that approximately 20 percent of the classroom time was spent in supervised study sessions. All teachers required students to take notes on laboratory and classroom discussions relating to poinsettias. However, only ten teachers, six experimental and four control, checked the notes at the end of the unit. Seven teachers, four experimental and three control, gave two or more reading assignments related to the poinsettia unit, five gave none. Eleven teachers, six experimental and five control, gave one or more quizzes on lectures, reading, or laboratory experiences related to the poinsettia unit, one teacher in the control group gave no quizzes. No teacher participating in the study assigned regular homework related to the poinsettia unit.
Part III-A

All teachers participating in the study reported that they gave end of unit mastery tests. In addition to the written mastery test, ten teachers evaluated student achievement with some form of performance testing.

Summary Data for Teacher Questionnaire: Part II-B

Part I-B

The data indicated that the experimental group reviewed the task sheets prior to their use, and indicated they were in agreement with their lesson planning. Three teachers reported that they distributed the task sheets singularly as the previous sheet was completed; two teachers distributed the task sheets irregularly as the need to have an additional sheet arose; and one teacher distributed all the task sheets at once. All six teachers reported that students were permitted to work on the task sheets both individually and in groups.

Part II-B

Three teachers reported that the task instruction sheets replaced parts of their lesson plans; three reported that the task instruction sheets were used in conjunction with their normal lesson plans. Every teacher using the task instruction sheets indicated that the task instruction sheets:
1. changed the quantity of content matter presented,
2. made it easier to prepare the classroom and laboratory portion of the poinsettia unit,
3. suggested changes in how to present the content matter of the poinsettia unit, and
4. made them more aware of needed teaching materials, equipment, and facilities.

The greatest change in mode of teaching was an increase in supervised study time. As a direct result of the increase in supervised study time, five teachers reported they were able to spend more time with students who really needed their help; were able to give more time to critical learning problems of the students as opposed to supervising student work assignments; and felt they did a more complete consistent, and relevant job of teaching.

Part III-B

All teachers in the experimental group said the task sheets were clear, easy to read, and easy to follow. The majority of teachers felt that the introduction, procedure, and evaluation sections were clear and easy to understand and follow.

Part IV-B

The majority of teachers in the experimental group felt that the task instruction sheets helped to contribute to greater student achievement by organizing and structuring both the laboratory and classroom portions of the
poinsettia unit. Generally, they felt that task instruction sheets helped to make the job of teaching easier, created minimal additional work, and provided accurate information for growing a crop of poinsettias.

As a final reaction, five teachers felt that the poinsettia module was excellent just as it was and said they would use it again. One teacher felt that the module was good, but that it needed some revision.

**Hypothesis One**

Based on the review of literature, reading ability was hypothesized to interact significantly with the treatment, method of instruction. Therefore to control for confounding effects of reading ability and to evaluate the true effects of the treatment, hypothesis one postulating a significant difference between the mean posttest scores of the experimental and control groups, was tested by using analysis of covariance. Mean classroom reading scores were used as the covariate.

The data reported in Table 4 indicate that the experimental group using the task instruction sheets had a mean posttest score of 21.48 with a standard deviation of 4.52, while the control group had a mean posttest score of 19.00 with a standard deviation of 2.31.
TABLE 4
MEANS, STANDARD DEVIATIONS AND ADJUSTED MEANS
OF POSTTEST SCORES BY TREATMENT GROUPS

<table>
<thead>
<tr>
<th>Treatment</th>
<th>n</th>
<th>Mean</th>
<th>Adjusted Means</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental</td>
<td>6</td>
<td>21.48</td>
<td>22.21</td>
<td>4.52</td>
</tr>
<tr>
<td>Control</td>
<td>6</td>
<td>19.00</td>
<td>18.27</td>
<td>2.31</td>
</tr>
</tbody>
</table>

The effects of the covariate, reading scores, are reflected as adjusted mean posttest scores. The posttest consisted of thirty-five multiple choice items; the score received represented the number of items the student answered correctly.

The analysis of covariance revealed that the groups differed significantly $p < .05$ at the .05 level, $F(1,11) = 5.16$, $p < .05$. Table 5 provides $F$ values for the treatment, use or non-use of task instruction sheets, and for the effects of the covariate, reading scores.

TABLE 5
ANALYSIS OF COVARIANCE: ADJUSTED MEAN POSTTEST SCORES BY TREATMENT

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading Scores</td>
<td>1</td>
<td>32.84</td>
<td>32.84</td>
<td>4.05$^a$</td>
</tr>
<tr>
<td>Treatment</td>
<td>1</td>
<td>41.84</td>
<td>41.84</td>
<td>5.16$^b$</td>
</tr>
<tr>
<td>Residual</td>
<td>9</td>
<td>72.90</td>
<td>8.10</td>
<td></td>
</tr>
</tbody>
</table>

$a$ $p > .05$

$b$ $p < .05$
The data provided sufficient evidence to reject the null hypothesis and support the research hypothesis of significant difference between treatment group means.

Hypothesis Two

There will be a positive relationship between a student's score on a criterion referenced posttest and a student's reading aptitude as measured by a score on a standardized reading test.

A Pearson-product moment correlation coefficient was used to analyze the relationship between the mean classroom posttest scores and the mean classroom reading scores. The results of the Pearson-product moment correlation coefficient for hypothesis two are reported in Table 6.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean Reading Scores</th>
<th>Mean Posttest Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Reading Score</td>
<td>1.000</td>
<td>.471&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>N = 12</td>
<td>N = 12</td>
<td></td>
</tr>
<tr>
<td>Mean Posttest Score</td>
<td></td>
<td>1.000</td>
</tr>
<tr>
<td>N = 12</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* a p > .05
The data in table 6 reveal a correlation coefficient of .47 between reading scores and posttest scores. A Pearson-product moment correlation coefficient of .47 with an N of 12 suggests a moderately positive relationship between posttest scores and reading scores, but is not sufficient to reject the null hypothesis at an alpha level of .05. Therefore, the research hypothesis was not supported by the data.

**Hypothesis Three**

There will be significant interaction between a student's reading aptitude, as measured by a score on a standardized reading test, the type of instructional treatment received and a student's achievement on a criterion referenced posttest.

To examine the interactive effects between the reading scores and the treatment, the data for hypothesis three were analyzed by arranging the mean classroom reading scores from high to low, and then dividing these mean scores into three levels: high, medium and low. The data were then analyzed using 3 X 2 analysis of variance with reading levels and treatment used as the independent variables. The results of the analysis of variance were invalid since two of the six cells involved in the 3 X 2 factorial analysis resulted in only one observation per cell. The small n produced by the true experimental design
of this study made any attempt to look at interaction impossible. Therefore to test for interaction with cell observations of sufficient magnitude, individual student reading scores were used as the unit of analysis.

As reported earlier in Table 2, a total of 207 students were involved in the study. Six classes consisting of 117 students were assigned to the experimental group and six classes of 90 students were assigned to the control group. Students were divided on the basis of reading scores into three reading levels: high, medium and low.

The data in Table 7 shows the distribution of post-test scores by treatment and reading levels.

TABLE 7
MEAN AND STANDARD DEVIATIONS OF POSTTEST SCORES by TREATMENT AND READING LEVEL

<table>
<thead>
<tr>
<th></th>
<th>Experimental</th>
<th>Control</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>31</td>
<td>37</td>
<td>68</td>
</tr>
<tr>
<td>HIGH</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \bar{X} )</td>
<td>24.45</td>
<td>20.95</td>
<td>22.54</td>
</tr>
<tr>
<td>SD</td>
<td>6.80</td>
<td>3.39</td>
<td>5.48</td>
</tr>
<tr>
<td>n</td>
<td>43</td>
<td>27</td>
<td>70</td>
</tr>
<tr>
<td>MEDIUM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \bar{X} )</td>
<td>21.49</td>
<td>17.44</td>
<td>19.93</td>
</tr>
<tr>
<td>SD</td>
<td>5.11</td>
<td>3.47</td>
<td>4.93</td>
</tr>
<tr>
<td>n</td>
<td>43</td>
<td>26</td>
<td>69</td>
</tr>
<tr>
<td>LOW</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \bar{X} )</td>
<td>18.72</td>
<td>17.19</td>
<td>18.14</td>
</tr>
<tr>
<td>SD</td>
<td>4.86</td>
<td>5.03</td>
<td>4.94</td>
</tr>
<tr>
<td>n</td>
<td>117</td>
<td>90</td>
<td>207</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \bar{X} )</td>
<td>21.26</td>
<td>18.81</td>
<td>20.19</td>
</tr>
<tr>
<td>SD</td>
<td>5.92</td>
<td>4.30</td>
<td>5.41</td>
</tr>
</tbody>
</table>
The data in Table 7 reveal that 68 students were placed in the high reading level. The mean posttest score for the 31 students in the high reading level experimental group was 24.45 with a standard deviation of 6.80; while the mean posttest score of the 37 students in the high reading level control group was 20.94, with a standard deviation of 3.39. Seventy students were placed at the medium reading level. The mean posttest score for the 43 students in the medium reading level experimental group was 21.48 with a standard deviation of 5.10; while the mean posttest score for the 27 students in the medium reading level control group was 17.44 with a standard deviation of 3.46. Sixty-nine students were placed at the low reading level. The mean posttest score for the 43 students in the low reading level experimental group was 18.72 with a standard deviation of 4.86; while the mean posttest score for the 26 students in the low reading level control group was 17.19 with a standard deviation of 5.02.

The data were then subjected to a two-way analysis of variance, with reading level and treatment level being used as the independent variables.

Table 8 provides F values for the main effects of treatment and reading level, as well as an F value for the two-way interaction between treatment and reading level.
TABLE 8
ANALYSIS OF VARIANCE: POSTTEST SCORES BY TREATMENT BY READING LEVEL

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment</td>
<td>1</td>
<td>459.00</td>
<td>459.00</td>
<td>19.08a</td>
<td>.001</td>
</tr>
<tr>
<td>Reading Level</td>
<td>2</td>
<td>825.04</td>
<td>412.52</td>
<td>17.15a</td>
<td>.001</td>
</tr>
<tr>
<td>Treatment X</td>
<td>2</td>
<td>57.38</td>
<td>28.69</td>
<td>1.19b</td>
<td>.305</td>
</tr>
<tr>
<td>Reading Level</td>
<td>201</td>
<td>4833.48</td>
<td>24.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>206</td>
<td>6020.09</td>
<td>29.22</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a  p < .01
b  p > .05

The calculated F values of 19.08 for treatment and 17.15 for reading level proved to be significant, p < .01, beyond the .01 level. The calculated F value of 1.19 did not surpass the critical value needed to reject the null hypothesis. Therefore, the research hypothesis postulating significant interaction between reading and treatment was not supported by the data.
CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The Problem and Hypotheses

The major problem investigated was: What was the effect that task instruction sheets had on student's level of mastery of a given subject: "poinsettia production?"

In addition to the major problem, the following two questions were also examined:

1. What was the relationship between students' ability to read, and their score on the end of unit posttest?

2. What were the interactive effects between students' reading abilities, the treatment received, and their scores on the posttest?

Twelve classes of vocational horticulture students participated in the study. The twelve classes were randomly assigned to one of the two levels of the treatment method of instruction. Those classes in the experimental group received a series of task instruction sheets on poinsettia production, and a monograph prepared by the investigator describing the nature of task instruction sheets and their benefits to both students and teachers. Classes in the control group did not receive the task sheets on poinsettia production nor the monograph describing the nature and use of task instruction sheets.
The attribute variable, reading ability, was measured by administering a standardized form of the Gates-MacGinitie Reading Test.

In consideration of the purpose of the study, the following hypotheses were developed to guide the investigation in the evaluation of the effectiveness of instruction that includes the use of task instruction sheets on poinsettia production.

Hypotheses

1. Students taught a unit on poinsettias using a series of task instruction sheets will score significantly higher on the criterion referenced posttest than students taught a unit on poinsettias without the use of task instruction sheets.

2. There will be a positive relationship between a student's score on a criterion referenced posttest, and a student's reading aptitude, measured by a score on a standardized reading test.

3. There will be significant interaction between a student's reading aptitude, the type of instructional treatment received, and a student's score on a criterion referenced posttest.
Procedure

The target population for this study was all schools with horticulture departments within a 75 mile radius of The Ohio State University. Twelve schools were randomly selected from the target population to participate in the study. Six schools were randomly assigned to the control group. Teachers in the experimental group were provided with sufficient packages of poinsettia sheets so that each student in the class could have the entire series. The experimental teachers were given a monograph describing the nature and use of task instruction sheets and their benefits to both student and teacher. Teachers in the experimental group were asked to integrate the task instruction sheets into their units on poinsettias in such a way that each student would be given the opportunity to use the entire series of sheets. Participating teachers in the control group were not given copies of the poinsettia task sheets, or the monograph describing the nature and use of the task instruction sheets.

The design used for this study was the posttest only control group design. Design six, as explained by Campbell and Stanley (1963), is a true experimental design. The twelve classes of eleventh grade vocational horticulture students participating in the study were randomly assigned to one of the two levels of the treatment, method of instruction. To verify that the groups were equivalent,
grade point average was collected for every student participating in the study.

Based on the review of literature, reading ability was hypothesized to interact significantly with the treatment. Therefore, to control for the variation in reading ability, and to evaluate the true effects of the treatment, reading scores were collected for each student and subsequently used as a covariate in the analysis.

A 35 item multiple choice poinsettia production test was developed to quantify the dependent variable, students' posttest scores. The poinsettia test was pilot tested and revised prior to use in the study.

The attribute variable, reading ability, was measured by administering a standardized form of Gates-MacGinitie Reading Test. All eleventh grade students participating in the study were tested using Level F, Form 1 of the standardized test.

A 42 item questionnaire was designed to monitor the teaching techniques used by teachers providing instruction on poinsettia production. The questionnaire was divided into two parts: Part A and Part B.

Part A was completed by every teacher participating in the study and was designed to collect information on general instructional techniques. Part B was completed only by those teachers in the experimental group, and was designed to collect specific information on how these teachers used the poinsettia task instruction sheets during the
course of their instruction on poinsettia production.

**Analysis of Data**

Hypothesis one, postulating a significant difference between the mean posttest scores of the experimental and control groups, was tested by using analysis of covariance. Mean classroom reading scores were used as the covariate. Hypothesis two, examining the relationship between students' ability to read and their performance on the end of unit mastery test, was analyzed by calculating a Pearson-product moment correlation coefficient. Hypothesis three examined the interactive effect between treatment and reading scores on posttest scores. The data were analyzed by post hoc dividing reading scores into three levels and then analyzing the data using $3 \times 2$ analysis of variance test. Reading levels and treatment were used as the independent variables.

**Summary of Findings**

The results of the analysis of covariance for testing hypothesis one revealed that there was a significant difference in the students' posttest scores between the two levels of the treatment, method of instruction. If the effects of the covariate, reading ability, were held constant, the series of task instruction sheets, Poinsettia Production, made a significantly greater difference in student achievement as measured by the students' posttest scores.
The results of the Pearson-product moment correlation coefficient used to test hypothesis two revealed a moderately positive relationship between the mean reading scores and the mean posttest scores. The correlation coefficient of .47 proved to be non significant at the .05 level of significance.

Hypothesis three examined the interactive effect between treatment and reading score. Reading scores for the sample were divided into three levels: high, medium and low. The data were then subjected to a two-way analysis of variance using reading and treatment levels as independent variables. The analysis of covariance revealed no significant interaction between reading scores and treatment.

Conclusions

It was concluded from the analysis of the data obtained from twelve classes of vocational horticulture students and the respective teachers that:

1. The use of task instruction sheets is capable of causing significant increases in student achievement when compared to similar groups of students not using task instruction sheets. Evidence presented in this study suggested that task instruction sheets contributed to organized and structured learning in the laboratory and supported the hypothesized contention that task instruction sheets do make a significant difference in student achievement.
2. The data associated with hypothesis two, did not support the hypothesized relationship between reading ability and posttest scores. This investigator, concluded that the lack of statistical significance was a direct function of sample size. Future studies which examine relationships between attribute and dependent variables would yield more valid and statistically significant results if the size of the sample were increased considerably.

3. The data reported for hypothesis three did not support the contention of significant interaction between treatment and reading scores on posttest scores. However close examination of the control and experimental mean posttest scores at each of the three reading levels showed higher mean posttest scores for the experimental group at every reading level. Thus, this researcher concluded that students who used task instruction sheets, regardless of their reading ability, performed better on the written end of unit posttest.

In summary, the major conclusions to be drawn from this study are:

1. The use of task instruction sheets is capable of causing significant increases in student achievement, and as such deserve serious consideration as an important component of effective laboratory management.
2. No significant relationship exists between students' ability to read, and their performance on a written end of course mastery test.

3. There is no significant interaction between a student's ability to read, and the treatment, as reflected in the posttest scores of the treatment groups.

Implications of the Study

The introduction of curriculum materials which help the student to logically organize and structure the material to be learned appear to make a significant difference in student achievement. The obvious implication from this should be an increased emphasis by the profession in three areas:

1. Development of curriculum materials which help the student to logically organize and structure the laboratory and classroom learning situation,

2. Basic instruction in laboratory management techniques designed to identify and acquaint the beginning teacher with some of the curriculum and supervision problems associated with the laboratory, and

3. A renewed emphasis on in-service education designed to instruct experienced teachers in the preparation and use of laboratory curriculum materials.

Recommendations

Based on the findings of the study, and the experience
of the investigator in conducting the study the following recommendations are given:

1. It is recommended that teachers engaged in teaching vocational agriculture courses with extended laboratory periods give serious consideration to integrating task instruction sheets into their normal units of study. The results of this study have demonstrated that when task instruction sheets are used in conjunction with normal lesson planning, the increase in student achievement is significant.

2. It is recommended that the Ohio Agricultural Education Curriculum Materials Service join efforts with teachers supervisors, and teacher educators in specialized taxonomy areas to develop "packages" of task instruction sheets which deal comprehensively with major blocks of instruction in specialized taxonomy areas.

A two pronged approach aimed at identifying skills essential to successful performance in specialized job areas coupled with in-service programs on the nature and use of task instruction sheets would contribute greatly to the use of task instruction sheets throughout the state.

Recommendations for Further Study

Based on the findings of this study and the experience of the investigator, the following recommendations are given:
1. It is recommended that subsequent studies to determine the effectiveness of curriculum materials be designed to simultaneously evaluate the confounding effects of aptitude variables, such as reading ability, on criterion variables as student performance. Future studies which attempt to separate the effects of the aptitude variable from the treatment variable must employ a design which will permit the researcher to better quantify and control the variables of interest.

   A two factor design in which the subjects were blocked on the aptitude variable of interest would permit the researcher to evaluate the effects of the treatment at various levels of the aptitude variable of interest. A design of this type would yield two major benefits:

   A. It would increase the power of analysis by permitting the researcher to use students as the unit of analysis, thereby increasing the size of the sample subjected to statistical analysis.

   B. It would permit the researcher to closely examine the interactive effects between aptitude and treatment variables.

2. It is recommended that a future study be developed to examine the question of what variables are highly
correlated with increased student achievement.

Characteristics such as student and teacher backgrounds, as well as the attitudes of the student and teacher towards the curriculum materials provided should be monitored and correlated with student achievement.

3. It is recommended that a future study be developed to determine the effects of providing instruction on how to use task instruction sheets prior to their use in the classroom. The question for investigation would be: Are task instruction sheets more effective if teachers are adequately taught how to use them prior to their use in the classroom?
APPENDIX A

Preliminary Information Survey
COUNTY: ___________________________ SCHOOL: _____________________________

TEACHER: ___________________________ SCHOOL PHONE: ______________________

NAME OF GUIDANCE COUNSELOR: ________________________________

NAME OF SCHOOL PRINCIPAL: ________________________________

SCHOOL MAILING ADDRESS:

Street: ___________________________ City: ___________________________ Zip: ____________

PRIMARY RESPONSIBILITY FOR TEACHING: Juniors _________ Seniors _________

PRIMARY AREA OF TEACHING RESPONSIBILITY: Greenhouse _________ Turf _________

Floral Design _________ Landscape _________ Nursery _________

Other _________

DO YOU TEACH UNITS ON:

Pot Mums __________________________________________________________

Bench Mums ______________________________________________________

Poinsettias _______________________________________________________

Lillies ___________________________________________________________

The Ohio Agricultural Education Curriculum Materials Service is currently developing written teaching materials to be used with the four units listed above. In an attempt to provide you with the best teaching materials available we would like to field test several of the units this fall. If, in the immediate future we contact you, would you be willing to field test in your classroom, one of our experimental units?

Yes _________ No _________

The use of the teaching materials should not disrupt what you are currently doing with your classes.

All materials will be supplied by the Curriculum Materials Service at no cost to you!

Your cooperation is not only appreciated, but needed! Thanks for your interest and time.

Dennis C. Scanlon
Asst. Curr. Mat. Specialist
APPENDIX B

Poinsettia Production Task Instruction Sheets
HORTICULTURE LEARNING CENTER
Duty Area — D — Managing Greenhouse Crops
Coordinated by Dennis C. Scanlon
Curriculum Materials Specialist

POINSETTIA PRODUCTION

Tasks
01 Selecting Poinsettia Cultivars
02 Poinsettia Growing Schedule
03 Potting Poinsettias
04 Photoperiod Control for Poinsettias
05 Pinching Poinsettias
06 Chemical Growth Regulators for Poinsettias
07 Fertilizer Program for Poinsettias
08 Experimental Fertilizer Programs for Poinsettias
09 Temperature Control for Poinsettias
10 Merchandising Poinsettias

REFERENCE SOURCES
(1) The Ohio Agricultural Education Curriculum Materials Service, The Ohio State University, Room 254, 2120 Fyffe Road, Columbus, Ohio 43210
(2) The Pennsylvania State University, Department of Agricultural Education, 102 Armsby Building, University Park, Pennsylvania 16802
(3) Vocational Agriculture Service, College of Agriculture, University of Illinois, 434 Mumford Hall, Urbana, Illinois, 61801
(4) Geo. J. Ball, Inc., Ball Seed Co., West Chicago, Illinois 60185
(5) Gregg McGraw-Hill, 1221 Avenue of the Americas, New York, New York 10020
PURPOSE:

Poinsettia cultivars vary in the size of their bracts, color, height, rate of rooting, and response to pinching. The first part of any successful poinsettia program is to choose a cultivar that will suit your growing condition, as well as provide the greatest customer satisfaction. Therefore, you must know the two main sources of cultivars and the growing characteristics associated with some of their more popular varieties.

REFERENCES:

- Ball Catalog 1978. (4)
- The Ball Redbook. (4)
- Commercial Flower Forcing, Laurie, Kiplinger, and Nelson. (5)
- The Greenhouse Worker, Wotowiec. (1)
- Poinsettia (slide series), Lucal. (1)
- Producing Poinsettias Commercially. (3)

MATERIALS:

- access to greenhouse growing area
- catalogs from various wholesale suppliers
- sharp #2 pencil with eraser
PROCEDURE:
1. Using the references listed above, fill out both charts below.
2. Your charts should list the following information:
   A) Jobber or supplier from whom the cutting will be purchased,
   B) Original source of the cuttings,
   C) Name of 3 red cultivars, 2 pink cultivars, and 1 white cultivar available from each source,
   D) The color of each cultivar selected,
   E) The week response group of each cultivar selected, and
   F) Special characteristics or notes about each cultivar selected.
3. Proceed to the school greenhouse and determine what cultivars you are currently growing as a Christmas crop.
4. Directly below the poinsettia charts, list the names of the poinsettia cultivars currently being grown in the school greenhouse.

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Color</th>
<th>Week Group</th>
<th>Special Characteristics</th>
</tr>
</thead>
</table>
SCHOOL GREENHOUSE:

1.
2.
3.
4.

EVALUATIVE CRITERIA:

1. Correctly identified the 2 major sources of poinsettia cultivars.
2. Correctly selected different cultivars based on colors.
3. Identified the correct color for each cultivar selected.
4. Assigned each cultivar to the correct week grouping.
5. Listed special characteristics of each cultivar.
6. Correctly identified the cultivars grown in the school greenhouse.

Final Grade

Jobber or Supplier: ____________________________________________

Source: _____________________________________________________
HORTICULTURE LEARNING CENTER

Instructional Program Area — Floriculture Production
Duty Area — D — Managing Greenhouse Crops, Poinsettia Production

POINSETTIA GROWING SCHEDULE  Task 02

PURPOSE:
A well-grown marketable crop of poinsettias does not just happen — it is the result of careful planning. Planning gives consideration to cultural and environmental needs of the poinsettias. Careful planning also includes specific dates when important jobs should be done. Therefore, you should be able to write out a growing schedule that will supply a sufficient amount of detailed information for producing a crop of poinsettias for Christmas.

REFERENCES:
- Bali Red Book, (4)
- Commercial Flower Forcing, Laurie, Kiplinger, and Nelson. (5)
- Greenhouse Crop Production, (2)

MATERIALS:
- access to greenhouse growing area
- sharp #2 pencil with eraser

PROCEDURE:
Accurately fill out the growing schedule found on this page for a poinsettia crop.

Name ________________________________

Date ________________________________

Crop Name:

Common ________________________________

Cultivar ________________________________

Botanical ________________________________
**Potting Information:**

- Number of cuttings/pots received: __________________________ Date: __________________________
- Potting date: __________________________ Type: __________________________
- Size of pots: __________________________
- Cutting per pot: __________________________
- Recommended soil mix: __________________________

**Watering Information:**

- Frequency of watering: __________________________
- Volume of water per pot per watering: __________________________

**Fertilizer Information:**

- Recommended analysis: __________________________

**Method of delivery**

- A) Constant feed — __________________________ ounces of fertilizer per gallon of water. __________________________ Recommended PPM: __________________________
- B) Dry — __________________________ ounces per pot. __________________________
- C) Liquid concentrate — __________________________ ounces of solution per pot

Frequency of application of one of the above: __________________________

**Photoperiod Control:**

**Lighting Dates**

- From __________________________ to __________________________
- # of hours of light per night: __________________________

**Shade Dates**

- From __________________________ to __________________________
- # of hours of darkness per night: __________________________

**Temperature Information**

- Optimum night temperature: __________________________ °F

- A) From potting to start of shading: __________________________
- B) During flower bud initiation: __________________________
C) From first color to mid-December

D) From mid-December to sale.

Optimum day temperature: 10°F warmer than night temperature

**Fungus Control — Preventive:**

Recommended and approved fungicides to be used

Methods of application

Number of times to be applied

Application dates

---

**Pest Control — Preventive:**

Recommended and approved insecticides to be used

Methods of application

Number of times to be applied

Application dates

---

**Growth Regulator Information:**

Approved growth regulator to be used

Method of application

Ounces of regulator per gallon of water

Number of times to be applied

Application dates

---

**Pinching Information:**

Pinch date
PLEASE NOTE:

In all cases this material has been filmed in the best possible way from the available copy. Problems encountered with this document have been identified here with a check mark ✓.

1. Glossy photographs □
2. Colored illustrations □
3. Photographs with dark background □
4. Illustrations are poor copy □
5. Print shows through as there is text on both sides of page □
6. Indistinct, broken or small print on several pages □ throughout □
7. Tightly bound copy with print lost in spine □
8. Computer printout pages with indistinct print □
9. Page(s) □ lacking when material received, and not available from school or author □
10. Page(s) □ seem to be missing in numbering only as text follows □
11. Poor carbon copy □
12. Not original copy, several pages with blurred type □
13. Appendix pages are poor copy □
14. Original copy with light type □
15. Curling and wrinkled pages □
16. Other □

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### Evaluative Criteria:

1. Correctly named the cultivar being grown.
2. Accurately, neatly, and completely filled out all information requested on the growing schedule.
3. Has supplied dates (when requested) that would permit a Christmas crop.
4. Has supplied accurate information on quantities of fertilizer, insecticide, fungicide, and growth regulator.

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Final Grade
HORTICULTURE LEARNING CENTER
Instructional Program Area — Floriculture Production
Duty Area — D — Managing Greenhouse Crops, Poinsettia Production

POTTING POINSETTIAS

Task 03

PURPOSE:
The roots of poinsettias are exceptionally brittle, therefore care must be used when handling while potting. Carelessness and rough handling will result in a large number of dead plants. Therefore by using as much care as possible, you should be able to successfully pot as many poinsettias with a 100% live factor as specified by the instructor.

REFERENCES:
• Commercial Flower Forcing, Laurie, Kiplinger, and Nelson, (5)
• The Greenhouse Worker, Wotowiec, (1)
• Producing Poinsettias Commercially, (3)

MATERIALS:
• rooted poinsettia cutting or poinsettia cutting in 2½" pots
• watering devices
• sterilized potting soil
• pots
• empty flats
• waterproof markers
• plastic labels

PROCEDURE:
Your instructor will tell you how many pots you are expected to do. He will also specify the pot size and the number of plants per pot.

1. Begin by locating the assigned area in which you are to work.
2. Move sufficient quantities of pots, labels, and flats to the potting area. Be sure there is a sufficient supply of sterilized potting soil available to complete the job.
3. Determine the cultivar name and the color of the poinsettias you will be potting.
4. Gently remove the rooted cutting from the propagation flat or the shipping carton. If you are transferring from 2½" pots, tap the cutting from the pot. Do Not remove more cuttings than you can grade and pot in 15 minutes. If root systems dry out the plants are dead.
5. Before potting, it is essential that you grade the poinsettias for uniformity in height and development. If one of the 3 poinsettias placed in the pot is 2" shorter than the other, the finished product will be the same. Good growing starts at the potting tablet.
6. Using an empty flat, transfer your graded cuttings to the potting table. Place the flat of rooted cuttings to the right of the soil pile. The pots should be arranged on top of the soil pile with several empty flats to your left.
7. Pick up a container with your left hand and scoop in soil to fill the container approximately ½ full.
8. Pick up a cutting in your right hand and insert it into the pot. With your left hand, place enough soil around the base of the cutting to hold it in place. Do not fill the pot completely full with soil. Caution! Poinsettia roots are very brittle — handle gently.
12. Using a waterproof marker and plastic pot labels, label each pot with the following information: cultivar name, color, and potting date.

13. Transfer the potted cutting to the empty flat at your left. When the flat is full transfer it to the greenhouse and water immediately.

14. Your instructor will indicate your final bench placement for these plants.

EVALUATIVE CRITERIA:
1. The cuttings were handled with sufficient care.
2. Correctly graded the poinsettias for uniformity of height and development.
3. Cuttings were evenly spaced, correctly sloped, and not too close to the rim of the pot.
4. All cuttings were tight in the pot.
5. Correctly labeled all pots.
6. All pots were watered and placed at correct bench location.
7. Completed the assigned number of pots.

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Final Grade
9. Insert 2 more cuttings into the pot, using the same procedure described above.
10. Your 3 cuttings should be evenly spaced in the pot, leaning very slightly towards the outside of the pot, and at least 1" from the rim of the pot.

11. When all 3 cuttings have been placed, use the thumb and forefinger of both hands and firm the soil in the container around the base of each cutting.
HORTICULTURE LEARNING CENTER
Instructional Program Area — Floriculture Production
Duty Area — D — Managing Greenhouse Crops, Poinsettia Production

PHOTOPERIOD CONTROL FOR POINSETTIAS  Task 04

PURPOSE:

Poinsettias are PHOTOPERIODIC plants. This means that flower buds form in the poinsettia only if the dark portion of a 24-hour day is 12 hours or longer. Poinsettias which flower naturally usually do so about Thanksgiving. To produce a crop of poinsettias that will flower for Christmas we must create an artificial environment that will delay the natural flower bud formation process. In commercial greenhouses, this is usually done by some form of lighting program. Therefore, to successfully grow a crop of poinsettias for Christmas you must thoroughly understand the effects of light on the flowering date of the plant.

This experiment will require 6 to 8 weeks to complete.

Date began _________________________________ Date completed _________________________________

REFERENCES:

• Producing Poinsettias Commercially, (3)
• Greenhouse Crop Production, (2)
• Commercial Flower Forcing, Laurie, Kiplinger, and Nelson. (5)

MATERIALS:

• potted poinsettia plants  • plastic plant labels
• waterproof markers  • automatic timing device
• lights  • black shading cloth
• notebook  • sharp #2 pencil with eraser
PROCEDURE:

Successful completion of this experiment will require equipment to automatically control lighting beyond the normal cut off date. In addition, you will need to provide shade earlier than normal; therefore, you must have shade cloths that can be used prior to the normal starting time for shading. You should take steps to ensure that the equipment is available.

1. Each student participating in the experiment has been assigned to one of the groups below. Report to your instructor for your group assignment. At this time the instructor will also assign the number of poinsettias and bench space to be used for this experiment.
   - Group I: 3 days additional light — 3 days before normal shade
   - Group II: 7 days additional light — 7 days before normal shade
   - Group III: 10 days additional light — 7 days before normal shade

2. Determine which poinsettias have been assigned to your group and divide these plants into two lots: A and B.

3. Add labels to each pot so that each group may be identified, as well as the Lot to which each pot belongs. Example: Group 1, Lot A.

4. You will be required to provide additional lighting for all the poinsettias in Lot A and early shading for all the poinsettias in Lot B. Your group assignment will tell you how much additional lighting or shading above the normal you must provide. You may assume October 6 to be our normal date to stop lighting and begin shading.

5. Place all the poinsettias in Lot A on the lighting bench and see that they are lit for the specified length of time assigned beyond the normal. At the end of your additional lighting time, remove the poinsettias from the lighting bench and place them with the rest of the poinsettia crop.

6. Place all the poinsettias in Lot B on the bench and provide early shading for specified length of time assigned to your group. Since normal shading practices will begin October 6, your early shade date should be determined by counting backward from October 6.

7. The results of this experiment will not be known for several weeks and you will only be able to see results by comparing your "experimental" against the normal crop. Therefore, you must watch the development of the whole crop carefully.

8. When the results are obvious, record them as well as your conclusions in your notebook under Related Information - Poinsettias. When all the results are in, your instructor will discuss them with you.

EVALUATIVE CRITERIA:

1. Correctly labeled the experimental poinsettias for both group identification and lot identification.

2. Adequately lit the poinsettias in Lot A to insure results.

3. Taken steps to see that the poinsettias in Lot B will be properly shaded.

4. Carefully and accurately recorded the results.

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Final Grade
PINCHING POINSETTIAS

PURPOSE:

Poinsettias are pinched to control height and to produce a branched plant with several buds. A pinch may be hard or soft. A hard pinch removes enough new growth (about four inches) to provide a new cutting. A soft pinch removes one-half inch of terminal growth and provides more branching than the hard pinch. The decision to grow branched or single stem plants is made by the grower after considering the marketing conditions of the area. Therefore, you as a potential grower should be able to correctly pinch a crop of poinsettias so that every plant produces a branched saleable poinsettia.

REFERENCES:
- Ball Red Book, (4)
- Greenhouse Crop Production, (2)

MATERIALS:
- poinsettia plant material
- propagation knife
- watering equipment
- misting nozzle
- empty flats

PROCEDURE:

Your instructor will tell you what plants you are to work with and how many you are expected to pinch.

1. Proceed to the greenhouse and locate the plants you are to work with.
2. If the plants can be easily reached from the sides of the bench, you may leave them on the bench. If you cannot easily reach them, remove them from the bench. Do not lean over the bench of poinsettias.
3. Stop! At this point you must know whether the plants are to receive a hard pinch or a soft pinch. If you do not know ask your instructor.
4. If the plants are to be hard pinched use a sharp, sterile propagation knife. Cut the plant directly above the node. The cutting should be three to four inches long with approximately two sets of leaves. The remaining root stock should be five to six inches high with four or five nodes left above the soil line. The cuttings should be kept out of the sun, misted, and cooled until they can be stuck.
5. If you are soft pinching use your thumb and index finger to remove the top of the plant. Pinch at a point which will leave four or five nodes above the soil line. Each node will produce a flowering stem.
6. *Replace all plants removed from the bench. Do Not* leave pinched off plant material lying on the benches or floor; it will become a potential source of disease and fungus problems.

7. Following the pinch, mist all the plants that were pinched.

**EVALUATIVE CRITERIA:**

1. Correctly handled the cutting for a hard pinch.
2. Left the correct number of nodes on the rootstock.
3. Removed enough terminal growth material for a soft pinch.
4. Did not leave pinched off plant materials in the greenhouse.
5. Misted the pinched plants.

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**Final Grade**
CHEMICAL GROWTH REGULATIONS FOR POINSETTIAS  Task 06

PURPOSE:

In years past, it was customary to control height in poinsettias by restricting the water intake. Today, the use of the chemical growth retardants, Cycocel or A-Rest, is a desirable means of retarding plant growth. Since most commercial growers are using Cycocel or A-Rest as a regular part of their poinsettia program, you as a potential grower should know the effects and uses of these regulators in a poinsettia program.

REFERENCES:

- Ball Red Book, (4)
- Greenhouse Crop Production, (2)

MATERIALS:

- chemical growth regulators (Cycocel or A-Rest)
- mixing containers
- fluid measuring containers
- application containers
- sharp #2 pencil with eraser
- soap

PROCEDURE:

1. Consult with your instructor to determine which poinsettias will be treated. If you have either Cycocel or A-Rest determine which regulator will be used. Do Not use both regulators on the same plant.
2. Cycocel or A-Rest is most effective when applied as a soil drench. Use the charts below to decide on your application rate.

### Rates for Cycocel Application as a Soil Drench

<table>
<thead>
<tr>
<th></th>
<th>August 3000 - 5000 PPM</th>
<th>September 3000 PPM</th>
<th>October 3000 PPM</th>
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<tbody>
<tr>
<td>3000 PPM</td>
<td>3000 PPM</td>
<td>3000 PPM</td>
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<td>5000 PPM</td>
<td>5000 PPM</td>
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<tr>
<td>6000 PPM</td>
<td>6000 PPM</td>
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### Fluid Ounces of Cycocel Per Gallon of Water

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<thead>
<tr>
<th>Gallons</th>
<th>1 gallon</th>
<th>10 gallon</th>
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</thead>
<tbody>
<tr>
<td>3000 PPM</td>
<td>3½ ounces</td>
<td>32 ounces</td>
</tr>
<tr>
<td>5000 PPM</td>
<td>5½ ounces</td>
<td>54 ounces</td>
</tr>
<tr>
<td>6000 PPM</td>
<td>6½ ounces</td>
<td>54 ounces</td>
</tr>
</tbody>
</table>

### Application of Diluted Solution Per Pot at 3000 PPM

<table>
<thead>
<tr>
<th>Size of Pot</th>
<th>Fluid Ounces of Diluted Solution Needed per Pot at 3000 PPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 inches</td>
<td>3 ounces</td>
</tr>
<tr>
<td>6 inches</td>
<td>6 ounces</td>
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<tr>
<td>7 inches</td>
<td>7 ounces</td>
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### Fluid Ounces of A-Rest Per Gallon of Water

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<tr>
<th>Gallons</th>
<th>1 gallon</th>
<th>16 gallon</th>
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<tbody>
<tr>
<td>Standard concentration</td>
<td>¼ ounce</td>
<td>4 ounces</td>
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### Application of Diluted Solution Per Pot at Standard Concentration

<table>
<thead>
<tr>
<th>Size of Pot</th>
<th>Fluid Ounces of Diluted Solution</th>
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<td>6 inches</td>
<td>8 ounces</td>
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</table>
A-Rest is generally applied twice. Applications should be 1 week apart.

3. Fill in the information requested below:
   A) Growth regulator to be used
   B) Concentration rate to be used
   C) Gallons of diluted solution needed
   D) Fluid ounces of concentrate to make desired gallons
   E) Ounces of diluted solution to be applied per pot

Stop! Do Not apply any growth regulators until you have checked these figures with your instructor.

4. Carefully and accurately measure out the number of gallons of water needed.
5. Carefully and accurately measure out the ounces of Cycocel or A-Rest that you need and add it to the water.
   Note: Because of the difficulty in cleaning, growth regulators should only be mixed in containers specifically designated for this purpose.
6. Thoroughly mix the growth regulator with the water.
7. Locate some type of container that will allow you to accurately measure out and apply the growth regulator to the pot.
8. Move all materials and equipment to the area of the greenhouse where you will be working.
9. Apply the solution by pouring it onto the soil on the top of the pot. Do Not pour it directly onto the stem or foliage of the plant.
10. Thoroughly clean all buckets, measuring devices, and containers in warm, soapy water. Dry and put everything away that is clean.

EVALUATIVE CRITERIA:

1. Correctly identified which growth regulator to be used.

2. Correctly filled in all information regarding:
   Concentration rates to be used, gallons of diluted solution needed, fluid ounces of concentrate to use, and ounces of solution to be applied per pot.

3. Applied the solution to the pot in the correct manner.

4. Thoroughly cleaned and stored all equipment.

Final Grade

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FERTILIZER PROGRAMS FOR POINSETTIAS

PURPOSE:
The methods of supplying fertilizer to plants vary greatly. All possible combinations and types of programs cannot possibly be covered in a task sheet such as this. The principal methods of supplying fertilizers to poinsettias are listed here. You should write out the information requested so that you will know how to set up various fertilizer programs and determine the program that best fits the needs of your crop with the equipment available in your greenhouse.

REFERENCES:
- Ball Red Book, (4)
- Greenhouse Crop Production, (2)

MATERIALS:
- references
- sharp #2 pencil with eraser

PROCEDURE
1. Assuming that the soil fertility level has been amended as indicated by the soil test report before planting, the student should proceed to work out a fertilizing schedule for the poinsettia crop. Use each of the 3 methods of supplying fertilizer listed below:
   A) Liquid fertilizer constant feed
   B) Liquid fertilizer weekly feed
   C) Slow release dry fertilizer
2. Set up a weekly constant feed program by supplying the following information:
   A) Fertilizer analysis to be used
   B) Injection ration.
   C) Parts per million (PPM) to be fed
   D) Ounces of fertilizer per gallon of water
   E) Gallons of concentrate to be made
   F) Frequency of application
   G) Method of application
3. Set up a weekly liquid feed program by supplying the following information:
   A) Fertilizer analysis to be used
   B) Parts per million (PPM) to be fed
   C) Ounces of fertilizer per gallon of water
D) Gallons of diluting solution to be made

E) Amount of diluting solution to be applied per pot

F) Frequency of application

G) Method of application

4. Set up a fertilizer program for the poinsettia crop using dry fertilizer only.
   Supply the following information:
   A) Trade name of fertilizer being used
   B) Fertilizer analysis
   C) Ounces or tablespoons to be applied per pot
   D) Frequency of application

5. Consult with your instructor to determine if you have supplies and equipment available to use all 3 systems. If you do not, which system will you be using in the school greenhouse?

E V A L U A T I V E  C R I T E R I A:

1. Supplied accurate information for setting up a constant feed program.

2. Supplied accurate information for setting up a weekly liquid feed program.

3. Supplied accurate information for setting up a fertilizer program using slow release dry fertilizer only.

4. Correctly outlined the fertilizer program to be used in the school greenhouse.

Final Grade
EXPERIMENTAL FERTILIZER PROGRAMS FOR POINSETTIAS

PURPOSE:

The most important single factor in determining the finished quality of your poinsettia crop is the type of fertilizer program you decide to set up. Therefore, to satisfy the consumer's demand for a quality product you must thoroughly understand the different effects that various fertilizer programs will have on the finished product.

This experiment will take 5 to 6 weeks to complete.

Date began . . . . . . . . . . . Date completed . . . . . . . . . . .

REFERENCES:

• Boll Red Book, (4)
• Fertilizer Programs for Poinsettias (task sheet), (1)

MATERIALS:

• potted poinsettia plants
• slow release dry fertilizer
• automatic water delivery system
• measuring container (gallons)
• spoons
• buckets
• waterproof markers
• fertilizer (water soluble)
• fertilizer injector
• scale (measuring ounces)
• measuring container (fluid ounces)
• water hoses
• plastic plant labels
• posterboard

PROCEDURE:

1. Report to your instructor. He will assign you to one of the four groups listed below. The instructor will also assign poinsettia plants for this exercise.
   - Group I. Constant feed
   - Group II. Constant feed and dry fertilizer
   - Group III. Dry fertilizer only
   - Group IV. Weekly liquid feed

2. Proceed to the school greenhouse and locate the group of poinsettias you are to work with.

3. All the poinsettias in Group I will be fed using a liquid fertilizer with constant feed. Set up a schedule so that you or a member of your group will see that these poinsettias are watered when needed and with the correct system. Use the information in task sheet #7 to set up your fertilizer program.

4. All the poinsettias in Group II will be fed using a liquid fertilizer with constant feed plus slow release dry fertilizer. Set up a schedule so that you or a member of your group will see that these poinsettias are watered when needed and with the correct system. The slow release dry fertilizer should be added at the beginning of the experiment. Use the information in task sheet #7 to set up your fertilizer program.

5. All the poinsettias used in Group III will be fed using only a slow release dry fertilizer. You or a member of your group should see that the dry fertilizer is applied immediately at the beginning of the experiment. After the application of the dry fertilizer only fresh water should be used to water this group of poinsettias. Use the information in task sheet #7 to set up your fertilizer program.
6. All the poinsettias in Group IV will be fed using a once a week liquid feed program. Set up a schedule so that you or a member of your group will see that these poinsettias are watered when needed with the correct system. Use the information in task sheet #7 to set up your fertilizer program.

7. To avoid confusion, signs should be made for each group indicating what treatment each group should receive. In addition, each pot in a group should be labeled so that it can be identified by the group.

8. The results of the experiment will not be known for several weeks and you will only be able to see results by comparing your experimentals against the normal crop. Therefore, you must watch the development of the whole crop carefully.

9. When the results of this experiment are obvious (approximately 5 weeks) record them, as well as your conclusions in your notebook under Related Information - Poinsettias. When all the results are in, your instructor will discuss them with you.

EVALUATIVE CRITERIA:

1. Correctly identified the group of poinsettias with which he is to work.

2. Set up group scheduling to see that the poinsettias in this group received the proper treatment.

3. Correctly labeled the poinsettias with the group number.

4. Constructed signs indicating what treatment each group should receive.

5. Recorded obvious results in the student notebook.

Final grade

| Student | Teacher |
TEMPERATURE CONTROL FOR POINSETTIAS

PURPOSE:
Temperature directly affects the rate of plant growth and bract development in poinsettias. If temperature is not given careful attention, it can upset an otherwise well-planned schedule. Therefore, you should be able to write out a temperature schedule that could be used for growing a Christmas crop of poinsettias. This schedule should start with the potting date and end with the sale date.

REFERENCES:
• Stoll Red Book, (4)
• Commercial Flower Forcing, Laurie, Kiplinger, and Nelson. (5)
• Greenhouse Crop Production, (2)

MATERIALS:
• Access to greenhouse growing area
• Sharp #2 pencil with eraser
• Notebook

PROCEDURE:
1. Proceed to the school greenhouse and determine what poinsettia cultivar you are growing for Christmas.
2. Using the reference listed, set up a temperature schedule for your crop of poinsettias. Optimum day and night temperature should be given for the following stages of growth:
   A) Potting to start of shading,
   B) During flower bud initiation,
   C) From first color to mid-December, and
   D) From mid-December to sale.
3. Check the temperature in the greenhouse at least 3 times a week. Record the temperature along with the date, time of day, and thermometer location. Record this information in your notebook under Related Information - Poinsettias.

EVALUATIVE CRITERIA:
1. Correctly identified the poinsettia cultivar being grown.
2. Set up temperature schedule giving optimum day and night temperature from:
   A) Potting to start of shading
   B) Flower bud initiation
   C) First color to mid-December
   D) Mid-December to sale
3. Set up procedure for checking temperature and recording information at least 3 times a week.

Final grade
Purposes:

The best crop of poinsettias is worth very little if it is still setting in the greenhouse on January 1. The ultimate goal of any growing program is to produce a top quality crop that can be easily sold. Sales are made easier when the crop is attractively wrapped and conveniently packaged. Therefore, you should be familiar with merchandising techniques that make the crop more appealing to the customer, as well as help to insure that the entire crop will be sold.

References:

- Retail Floriculture, Book 1, (1)
- Greenhouse Crop Production, (2)

Materials:

- potted poinsettias ready for sale
- colored pot wrap
- poinsettia care tags
- poinsettia plant sleeves (6-30)
- delivery tags
- paper towels or rags
- Christmas trinkets and ribbon
- plant stand
- stapler with staples

Procedure:

1. Begin by locating the assigned area you are to work and the tools and equipment you are to work with.
2. Select several poinsettias which are ready for sale and bring them to your assigned work area. Be sure the pots are not dry, water if necessary.
3. Strip off all dead and brown leaves. Clean the pot with a damp paper towel or rag.
4. Tear off about 18" of pot wrap (colored foil) and place it on a flat table, colored side down. Place the pot in the center of the foil and pull opposite corners of the foil in towards the top of the pot.
Do not press the top to the foil tightly around the rim of the pot.

5. Decorate the plant appropriately with ribbon or Christmas trinkets.

6. Attach a poinsettia care tag by hooking it around the stem of the poinsettia.

7. Sleeve the plant. Sleeves are cone shaped pieces of wrapping paper used to protect the flowers and foliage of the plant. Sleeves are easily put on by using a plant stand.

Top and bottom are made from \( \frac{1}{4}'' \) flat steel plate. Support between top and bottom plates is \( 1 \frac{1}{4}'' \) black pipe. Fillet weld all pieces. Buttress supports may be added at the base. Sleeves are placed down over the small end of the plant stand.

8. Set the poinsettias on the top plate of the plant stand and slowly pull the plant sleeve up around it.

9. Fold the sleeve over at the top and staple. The pot will not fall through the bottom of the sleeve. In very cold weather it may be necessary to double sleeve or provide additional wrapping.

10. Tag the poinsettia for delivery by stapling the order or delivery card to the top of the wrapped poinsettia.

11. Set aside for delivery.

**EVALUATIVE CRITERIA:**

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<tr>
<td>1. Correctly selected poinsettias which are ready for sale.</td>
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<tr>
<td>2. Cleaned up the plant and pot.</td>
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<tr>
<td>3. Pot wrap was correctly put on the pot.</td>
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<tr>
<td>4. Decorated the plant appropriately, with available supplies.</td>
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<tr>
<td>5. Attached a poinsettia care tag.</td>
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<td>6. Correctly sleeved and stabled the poinsettia.</td>
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<td>7. Tagged the poinsettia for delivery.</td>
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<td>Final Grade</td>
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APPENDIX C

Task Instruction Sheet Monograph
Introduction

Clearly, one of the most obvious problems in managing a successful laboratory is that of providing organized and meaningful instruction to large blocks of students while laboring under the burden of limited supervision. Individualized instruction through the use of Horticulture Learning Center task sheets provides a reasonable solution which can be easily integrated into the present methods of instruction.

Horticulture Learning Center task sheets are designed to develop the concept of individualized instruction as a technique in managing the laboratory. Specifically, they are designed to supplement units of instruction being taught in the classroom by providing the learner with an individualized learning experience in the laboratory. As a result of incorporating the Horticulture Learning Center task sheets, the two major benefits are:

1. To provide the teacher with additional time to work with those students who require more individual attention, and

2. To enhance the overall quality of the vocational program by providing more direct, structured learning experiences for all students within the program.

Task sheets are not a substitute for the teacher. They are an instructional strategy, which when properly employed, will result in more effective and efficient teaching in the laboratory.
The Horticulture Learning Center task sheets are being developed in cooperation with the Ohio Agricultural Education Curriculum Materials Service, and are keyed to the state suggested Course of Study for Vocational Horticulture.

What are Horticulture Learning Center Task Sheets?
* A form of individualized instruction.
* An instructional strategy which:

1. Places emphasis on how a student learns, and not so much on what a student learns.
2. Provides criterion based references on which to judge an individual student's progress, and
3. Provides the flexibility necessary to deal with individual students, and situations in a variety of laboratory experiences.

What are the Benefits of Using Horticulture Learning Center Task Sheets?
* To the student:

1. Provides an opportunity for the student to learn at his own pace,
2. Provides the learner with clear-cut behavioral objectives, against which he can judge his progress,
3. Provides immediate feedback on how well the student is progressing towards his objectives,
4. Establishes a clear-cut hierarchy of competencies needed to progress from one level to the next.

In short, they provide the student with a clear-cut picture of where he has been; what he has done; where he is going, and what he will do.

* To the teacher:

1. Provides organized and structured learning experiences for all members of the class,
2. Provides a method of evaluating the progress of each individual student,
3. Permits the teacher to spend more time with students requiring more of his time,
4. Provides accurate records on which to base a students laboratory grade, and
5. Provides continuous feedback on the effectiveness of both classroom and laboratory instruction.

In short, they provide a structured and well-organized system for managing the laboratory experience.

How can Horticulture Learning Center Task Sheets be Integrated into the Course of Study?

Factors essential to the successful integration of the concept:

1. That the student has sufficient self motivation for wanting to learn the subject matter being presented,
2. That physical facilities are appropriate to accommodate the individualized system, and
3. That sufficient quantities of curriculum and resources materials are available to accommodate the individualized system.

Task sheets lend themselves to teaching sequentially structured manipulative skills, as opposed to rational decision-making skills. Therefore, to teach decision-making skills through the use of task sheets, one must begin by teaching cognitive level manipulative skills, upon which the eventual decision-making process will be based.

Methods of integrating Horticulture Learning Center task sheets into the Course of Study:
1. **Career based method.** As a teaching tool to teach skills or management techniques not normally taught by the teacher, but which are required for entry into a specific career area. Based on early identification of career, or career clusters.

   **Example:** Floriculture Design -- Welding Work  
   Greenhouse Technology -- Grafting

2. **Supplemental model.** Used primarily as a supplement to previously taught classroom material. Based on the "How to do it" idea for items previously discussed or explained in class.

   Task sheets used in this way depend upon well organized classroom instruction.

3. **Block model.** Used to introduce new blocks of information into the curriculum, which are not taught under the existing course of study. Very effective with extremely bright or very slow learners

   **Example:** Propagation techniques for succulents and cacti.  
   Procedure for washing greenhouse windows.

based on the theory that the educational process is a continuum, with students on both ends of the continuum suffering unless they receive individual help.

4. **Directed work experience model.** Used primarily where the teacher is not the prime director of the work related learning experience. Reinforces the idea of working at a certain competency level even when the teacher is not there. Based on the idea that good learning experiences can be provided away from the school, under the direction of para-professionals.

   **Example:** Landscaping private homes,  
   Pruning and shearing a stand of trees,  
   Bailing and burlapping in nursery operations,  
   Seeding new areas of turf.
* Vehicles for integrating Horticulture Learning Center task sheets into the Course of Study:

1. Taped sound and film cassettes,
2. Video taped programs,
3. Reference library, and
4. Commercially developed modules of instruction.

**Conclusion**

Specific items such as transparencies, worksheets, and tests have been purposely omitted from this package of Horticulture Learning Center task sheets. As the answer to how, where, and when this concept of study will be integrated into your Course of Study become more clear, you will be able to decide what additional items need to be included.
APPENDIX D

Teacher Questionnaire: Part A and B
Poinsettia Task Sheet Follow-up

Questionnaire -- Form A

PART I-A

1. Is a poinsettia unit a regular part of your course of study?
   ___Yes, ___No.
   a. To whom is it usually taught?
      ___Juniors, ___Seniors.
   b. At what time of the year is it normally taught?
      ___September, October, November
      ___December, January, February
      ___March, April, May.

2. Do you normally grow poinsettias for a Christmas crop?
   ___Yes, ___No.

3. How many did you grow?
   a. ___this year
   b. ___last year.

4. Did you teach the poinsettia unit from a lesson plan that you personally
   constructed? ___Yes, ___No.

   If NO, what was the origin of the lesson plan? ____________________________

5. Did you use a textbook to supplement your instruction on poinsettias?
   ___Yes, ___No.
   a. If YES, which one(s)? 1. ________ 2. ________ 3. ________
   b. Did the students have a copy? ___Yes, ___No.

6. Did you use written publications, other than textbooks, (Example: Green-
   house Worker, OSU: Crop Production, PSU) to supplement your instruction
   on poinsettias? ___Yes, ___No.
   a. If YES, which one(s)? 1. ________ 2. ________ 3. ________
   b. Did each student have a copy? ___Yes, ___No.

7. Did you use audio visuals to supplement your instruction on poinsettias?
   ___Yes, ___No.
   a. If YES, which one(s)? 1. ________ 2. ________ 3. ________

8. Did you use any type of task sheet, instruction sheet, job sheet, or work
   sheet (other than those supplied) to supplement your instruction on
   poinsettias? ___Yes, ___No.
1. Approximately how much time was spent on teaching the unit on poinsettias? ____ hrs.
   a. What % of the time (specified above) was spent 1. ____% Classroom, 2. ____% Laboratory.

2. Were students provided the opportunity to work alone or in groups in supervised study sessions? ____Yes, ____No.
   a. What % of the total time allocated for teaching the unit was used in supervised study sessions? ____%

3. Were students provided, at the beginning of the unit, with an advanced organizer so they could see the logical sequence of instruction? ____Yes, ____No.

4. Were students required to take notes on both laboratory and classroom discussions relating to poinsettias? ____Yes, ____No.
   a. If YES, did you check the notes at the end of the unit? ____Yes,

5. Did you give reading assignments relevant to the growing of poinsettias? ____Yes, ____No.
   a. If YES, approximately how many? ____

6. Did you give quizzes on lecture, reading or laboratory experiences? ____Yes, ____No.
   a. If YES, approximately how many? ____
   b. Were quizzes graded and given back ____Yes, ____No.

7. Did you regularly assign homework relevant to the growing of poinsettias? ____Yes, ____No.
   a. If YES, was homework 1. Graded and given back ____
      2. Graded and not given back ____
      3. Not graded or given back ____.

8. Do you align your growing schedule with your teaching schedules, i.e. do you teach poinsettias when you grow them? ____Yes, ____No.
   a. If YES, are your students given the opportunity to put "theory into practice" by actual "Hands on" experiences in the laboratory, i.e. potting, pinching, spacing, etc. ____Yes, ____No.
1. Do you normally give an end of unit mastery test?  
   ___Yes, ___No.

2. Are students evaluated on "achievement" by any means other than the end of unit mastery tests?  ___Yes, ___No.
   a. If YES, what skills are evaluated and how? _____________________
      ________________________________
      ________________________________
Poinsettia Task Sheet Follow-up

Questionnaire -- Form B

PART I-B

1. Did you review the task sheets before using them with your students? ___Yes, ___No.

2. Was the sequencing of the poinsettia task sheets in agreement with your lesson planning? ___Yes, ___No.

3. Was the pad of ten poinsettia task sheets given to the students?
   a. ___all at once.
   b. ___singularly, as the previous sheet was completed
   c. ___irregularly -- when the need to have one arose.

4. Were students required to complete ALL the task sheets? ___Yes, ___No.
   a. If NO, which sheets were not completed? 1. _______ 2. _______ 3. _______

5. How were the task sheets used?
   a. ___as supplemental laboratory exercises
   b. ___as classroom "group" projects
   c. ___as classroom supervised study sessions
   d. ___as homework assignments.

6. Were students permitted to work on the task sheets
   a. ___individually
   b. ___in groups
   c. ___both.

7. As task sheets were completed were they
   a. ___collected
   b. ___collected and graded
   c. ___collected, graded and returned
   d. ___not collected.

8. Which reference proved to be
   a. ___the most valuable
   b. ___the least valuable.
1. Did task sheets replace any other materials normally used in presenting content matter in the poinsettia unit?  ____Yes,  ____No.

2. Did the task sheets change the quantity of content matter presented in the poinsettia unit?  ____Yes,  ____No.

3. Did the task sheets make it easier for you to prepare the content portion of the poinsettia unit?  ____Yes,  ____No.

4. Did the task sheets suggest any changes about how to present the content matter of the poinsettia unit?  ____Yes,  ____No.

5. Did the task sheets make you more aware of needed teaching materials, equipment, and facilities?  ____Yes,  ____No.

6. Did task sheets change your teaching style?  ____Yes,  ____No.
   a. If YES, how? __________________________________________________________

7. Did the task sheets cause you to organize the students differently in the laboratory?  ____Yes,  ____No.
   a. If YES, how? _______________________________________________________

8. Were you able to spend more time with students who really need you as a result of using the task sheet format?  ____Yes,  ____No.

9. Did you give more time to critical learning problems of the students as opposed to spending time "supervising" students' work assignments?  ____Yes,  ____No.

10. Do you feel you did more complete, consistent or relevant teaching as a result of students using the task sheets?  ____Yes,  ____No.
1. Were the task sheets clear, easy to read, and easy to follow? ____Yes, ____No.

2. Did the illustrations make the task sheets easier to understand?
   a. ____ added considerable meaning
   b. ____ did not make any difference
   c. ____ tended to confuse the task.

3. Were you satisfied with how the task sheets were marketed, i.e. in pad form? ____Yes, ____No.
   If you would prefer them another way which way? _______________________

4. Were the introduction and purpose of each task sheet clearly stated, so that each student knew what he was supposed to do? ____Yes, ____No.
   a. What changes would you suggest in this section? _______________________

5. Were the procedure sections of each task sheet
   a. ____ too easy
   ____ too difficult
   ____ just about right
   e. ____ too long, wordy
   ____ too short, incomplete
   ____ about the right length
   b. ____ clear and easily followed
   ____ unclear confusing
   f. ____ not related to stated objectives
   ____ directly related to objectives
   c. ____ requiring too much time
   ____ about the right length
   g. ____ poorly written, difficult
to understand
   ____ well written
   d. ____ required too much teacher help
   ____ about right
   h. ____ helpful to learning
   ____ not very helpful.
   What changes would you suggest in this the procedure section? _______

6. Were the evaluative criteria sections of each task sheet
   a. clearly related to the procedural section? ____Yes, ____No.
   b. helpful to students? ____Yes, ____No.
   c. ____ used by students
   ____ avoided if possible
PART IV - B

1. In your opinion did the series of poinsettia task sheets
   a. contribute to greater student achievement? ____Yes, ____No.
   b. help organize and structure your unit on poinsettias? ____Yes, ____No.
   c. make the job of teaching the unit easier? ____Yes, ____No.
   d. make laboratory sessions, more organized and meaningful? ____Yes, ____No.
   e. create more work for you? ____Yes, ____No.
   f. provide an easier means of generating a laboratory grade? ____Yes, ____No.
   g. cause unnecessary confusion among the students? ____Yes, ____No.
   h. prove to be too difficult for most students? ____Yes, ____No.
   i. require too high of a reading level? ____Yes, ____No.
   j. provide accurate information? ____Yes, ____No.

2. General reaction --
   a. Excellent module just as it is. I would use it again ____.
   b. Good, but needs more revision ____.
   c. Weak, needs a great deal of revision ____.
   d. I would not use it again until completely rewritten ____.
APPENDIX E

TEACHER VALIDATION QUESTIONNAIRE
TO: Eric Munson and Bob Connell  
FROM: Dennis C. Scanlon, Asst. Curriculum Materials Specialist  
DATE: July 17, 1978  
SUBJECT: Poinsettia Student Achievement Evaluation Test

Currently I am serving as director of a project sponsored by the Ohio Agricultural Education Curriculum Materials Service, which is attempting to operationalize several units of the state suggested Model Course of Study for Horticulture. Essentially, the project is involved with creating "blocks" of laboratory exercise sheets (example, page 537, the new course of study) which will supplement the laboratory portions of those units which you are teaching in related classes.

It is our desire to field test several of these "lab sheet packages" and measure their effects on student achievement in the respective units. That is to say, does using these exercise sheets actually help the student to learn more? In order to measure achievement, we must first determine what the student already knows, and secondly we must determine what the student knows after using the lab sheets.

Therefore, I have enclosed for your comments a sampling of questions which will be used to determine a student's general knowledge in the area of poinsettia production.

I respectfully ask you to read each section carefully, and provide me with as much feedback as you feel appropriate. You will note from the top of this memo, that I am sending this to a very small number of select individuals. Therefore, your comments and suggestions will be very important.

As a horticulture teacher for eleven years, I realize that time is a very precious commodity. Therefore, I wish to thank you for your time, and assure you that your efforts will result in better instructional material for all the horticulture teachers in the state of Ohio.

So that I may move forward on this project, please return this form along with your comments by August 1, 1978.

DCS:dlw

Enclosure
INTRODUCTION

The following questions are designed to evaluate a student's general knowledge in the area of poinsettia production. As with any paper and pencil test, it will be impossible to evaluate a student's actual ability to perform on any of the tasks suggested. These questions will simply provide an idea of what the student has experienced in the teaching process, and a general idea of how much he still knows.

Section I.

Following, is an outline of the major points that are usually covered when teaching a unit on poinsettia production. Carefully read each point given and decide whether you agree that these are the major points that you would cover when teaching a unit on poinsettias.

Major points to be covered when teaching a unit on poinsettia production.

I. Terminology
II. Propagation of poinsettias
III. Varieties of poinsettias
IV. Cultural practices
   A. Potting and soil media
   B. Control of flowering dates
   C. Pinching
   D. Application of growth regulators
   E. Fertility
   F. Temperature control
   G. Spacing
   H. Pest control
   I. Disease control
V. Merchandising

I agree that these are the major points that should be covered
I do not agree that these are the major points to be covered. I would suggest the addition of deletion of the following main points:

A.

B.

C.

D.

Section II.

The following section contains a list of the main points to be covered, plus a list of the questions that could be used to evaluate a student's knowledge on each of the main points.

Please read the points and the questions carefully and decide whether each question relates closely to the point that it is measuring. Space has been provided after each set of points and questions for your comments. Please feel free to suggest additional or alternative questions that you feel might be more appropriate for each objective.

Major Points and Questions for Each Point

Terminology

The major cultivars from which the majority of poinsettia varieties are propagated are:

A. Croft and Ace
B. Yader and Pan-Am
C. Ecke and Mikkelsen
D. Fischer and Aztec

The term "bract" when used in reference to finished poinsettias refers to:

A. brightly colored, leaf-like structures surrounding the true flower of the poinsettia
B. the true flower of the poinsettia plant
C. green leaves emerging from the main stem of the poinsettia plant
D. none of the above
Propagation of poinsettias

Poinsettias are propagated from:
A. hardwood cuttings
B. softwood cuttings
C. semi-hardwood cuttings
D. leaf cuttings

The basic criteria which must be met to successfully propagate poinsettias is/are:
A. freedom from disease
B. elimination of moisture stress, once cuttings have been taken
C. adequate bottom heat (70 - 72°F) during rooting
D. all of the above

Poinsettias are generally propagated from stock plants in:
A. May and June
B. June and July
C. August and September
D. September and October

Varieties of Poinsettias

Poinsettias are grown in various shades of:
A. pink
B. white
C. red
D. all of the above

A variety of poinsettias, commonly grown for the Christmas market is
A. May Shoesmith
B. Annette Hegg
C. Red Tausendschon
D. Sprinter Scarlet
Cultural practices

A. Potting and soil media:

When potting poinsettias, it is extremely important to remember that the roots of poinsettia plants are:

A. long and need to be trimmed
B. brittle and break easily
C. soft and easily bent
D. short and especially rugged

"Panning" is a term which has the same meaning as the word:

A. pinching
B. watering
C. potting
D. lighting

A soil mixture suitable for growing poinsettias might consist of:

A. one part loamy soil, one part peat moss
B. one part loamy soil, one part peat moss, one part perlite
C. two parts peat moss, one part perlite
D. two parts perlite, one part peat moss

B. Control of flowering date:

The flowering date of poinsettias may be controlled by regulating the amount of light a plant receives in a twenty-four hour period. This principle is called:

A. Geotropism
B. Photoperiodic control
C. Photosynthesis
D. none of the above

Poinsettias form flower buds only if the dark portion of a twenty-four hour day is twelve hours or longer. Therefore poinsettias are said to be:

A. short day -- short night plants
B. short day -- long night plants
C. Pinching:
The process of removing terminal growth to produce a branched plant with several blooms is called:
A. disbudding
B. grafting
C. pinching
D. stemming

D. Application of growth regulators:
A chemical commonly used to control the height of poinsettias is:
A. B-Nine
B. Cycocel
C. Phosphon
D. all of the above

The chemical growth regulator identified in the above question may be applied as:
A. a soil drench
B. a foliar spray
C. both A and B above
D. none of the above

E. Fertility:
The term "constant feed" as it is used in reference to growing poinsettias means:
A. Fertilizer is applied weekly through the water system.
B. When water is required, fertilizer is supplied also.
C. Fertilizer is applied biweekly at specific intervals.
D. Application of slow release fertilizers at the beginning of the growing cycle.
E. (continued)

A slow release fertilizer commonly incorporated into the poinsettia soil mix is:

A. Phosphon  
B. Osmocote  
C. Benlate  
D. Termik

F. Temperature control:

The optimum night temperature range for poinsettias which have already been rooted and panned is:

A. 57°F - 61°F  
B. 62°F - 66°F  
C. 67°F - 70°F  
D. 71°F - 75°F

Severe reduction of night temperature (50-55°F) during the first ten weeks of growth will cause the poinsettia to:

A. bloom earlier with increased bract size  
B. show increase color in bracts  
C. bloom later with reduced bract size  
D. It doesn't matter, temperature has no effect on bloom date or bract size.

G. Spacing:

Single stem poinsettias grown in 6" pots at three plants/pot are usually spaced at approximately 1.5 sq. ft./pot. Overcrowding the poinsettias often results in:

A. poorer quality plants  
B. increased bract size  
C. higher profits per sq. ft. of bench space  
D. all of the above
H. Pest Control:
A small, white, flying insect which frequently attacks poinsettias is:
A. Aphids
B. Mealybugs
C. White Fly
D. Thrips

Both sucking and chewing insects can be controlled by the application of a systematic insecticide. An example of a systematic insecticide typically used on poinsettias is:
A. Termik
B. Malthion
C. Sevin
D. Pentac

I. Disease control:
A good fungicide combination, effective against root rot problems is:
A. Cygon and Thiodon
B. Benlate and Trubon
C. Copton and Sevin
D. Phospon and A-Rest

A fungus which attacks roots, and is associated with poorly drained and overwatered soil conditions is:
A. Botrytis
B. Rhizoctonia
C. Gray Mold
D. Smut

Many chemicals used in and around the greenhouse contain "W.P." in their labels. "W.P." is the abbreviation for wettable powder, and indicates that the chemical should be mixed with:
A. oil,
B. other chemicals with the same abbreviation
C. water
D. nothing can, should be used as it is
Additional Questions for Poinsettia Achievement Test

Poinsettia cutting can be purchased from a supplier as:
A. Cottonseed cuttings
B. rooted cutting
C. rooted cutting in 2½" pots
D. all of the above

Considering all cultural factors involved in growing a crop of poinsettias, the factor which has the most effect on the bloom date of the poinsettias is:
A. potting date
B. fertilization
C. photoperiod schedule
D. temperature

When potting with an unsterilized soil medium, you might anticipate problems with:
A. rhizoctonia
B. botrytis
C. aphids
D. white fly

To apply a large volume of water without washing or compacting the soil you might use:
A. a misting nozzle
B. a water breaker
C. a fogger
D. none of the above
Single stem poinsettias are generally potted:

A. three per 5" pot
B. one per 5" pot
C. one per 6" pot
D. three per 6" pot

Given an experimental situation in which a bed of poinsettias were lit till October 31, you would expect the extended lighting period to cause the poinsettias to:

A. bloom before Christmas
B. bloom right on schedule
C. bloom after Christmas
D. not be affected at all

Flower bud initiation in the poinsettia is counteracted by:

A. excessive fertilizer
B. low light intensity
C. excessive water
D. high night temperatures

Failure to space poinsettias early enough will cause them to:

A. stretch
B. wilt
C. bloom early
D. none of the above

Lowering temperatures during the final one or two weeks of growing will:

A. retard the growth of the crop
B. save considerable amounts of fertilizer
C. enhance bract color
D. cause the crop to bloom later
The introduction of CO₂ to the greenhouse atmosphere will cause poinsettias to:

A. grow faster and bloom earlier  
B. grow faster but bloom later  
C. grow slower but bloom earlier  
D. grow slower and bloom later

How much additional growing time must be allowed for a pinched poinsettia?

A. one week  
B. two weeks  
C. three weeks  
D. four weeks

Frequent misting of poinsettias after pinching is done to:

A. supply extra fertilizer  
B. prevent excessive moisture loss  
C. prevent fungus problems  
D. all of the above

A side effect frequently experienced with the application of growth regulators, particularly when they are applied as a drench is:

A. a slight yellowing of the leaves  
B. a noticeable wilting of the leaves  
C. dropping of the bottom leaves  
D. none of the above

Poinsettias are generally pinched within _____ of the potting date:

A. two weeks  
B. four weeks  
C. six weeks  
D. eight weeks
Merchandising

Poinsettia sleeves are cone shaped pieces of paper or plastic used to:
A. support the plant while it is growing
B. cover the plant at night
C. apply fertilizer to the plant
D. protect the flowers and foliage of the plant when it is sold
TO: Participating Schools in Horticulture Learning Center Evaluation Project

FROM: Dennis C. Scanlon, Assistant Curriculum Materials Specialist

SUBJECT: Poinsettia Production Posttest

Enclosed in the brown envelope you will find 25 copies of the Poinsettia Production Posttest. At the conclusion of your unit on poinsettias, administer the posttest. Grade and record the results for each student on the code sheet you were given, at my last visit. Report the Posttest scores as the number of correct answers given. Tear the code sheet on the appropriate line, and return it to me in the enclosed self-addressed envelope. Your code sheet should include the posttest grade for each student, as well as his assigned I.D. number and G.P.A. Do NOT open the posttest packet until you are ready to administer the test. Please administer the posttest to every student for whom we have obtained a reading score.

Let me offer a sincere thanks for your cooperation in this project. I am sure that our joint efforts will produce better curriculum materials for all the horticulture teachers in Ohio.

On my next visit, I will be looking forward to discussing the Learning Center Skill Sheets with you. Your comments, opinions and criticisms will provide additional guidance, for future development of similar materials.
Poinsettia Production Posttest

**KEY**

2. A 20. B
3. B 21. A
4. D 22. A
5. C 23. B
7. D 25. A
9. C 27. B
11. B 29. D
12. C 30. C
15. C 33. D
16. A 34. A
17. C 35. A
18. A
DIRECTIONS: Carefully read each question and then carefully circle the letter of the most accurate answer for each question. Each question has only ONE correct answer.

1. The major cultivars from which the majority of poinsettia varieties are propagated are:
   A. Croft and Ace
   B. Yoder and Pan-Am
   C. Ecke and Mikelson
   D. Fischer and Aztec

2. The term "bract" when used in reference to finished poinsettias refers to:
   A. brightly colored, leaf-like structures surrounding the true flower of the poinsettia
   B. the true flower of the poinsettia plant
   C. green leaves emerging from the main stem of the poinsettia plant
   D. none of the above

3. Poinsettias are propagated from:
   A. hardwood cuttings
   B. softwood cuttings
   C. semi-hardwood cuttings
   D. leaf cuttings

4. The basic criteria which must be met to successfully propagate poinsettias is/are:
   A. freedom from disease
   B. elimination of moisture stress, once cuttings have been taken
   C. adequate bottom heat (70-72°F) during rooting
   D. all of the above
5. Poinsettias are generally propagated from stock plants in:
   A. May and June
   B. June and July
   C. August and September
   D. September and October

6. A variety of poinsettias, commonly grown for the Christmas market is
   A. May Shoesmith
   B. Annette Hegg
   C. Red Tausendschon
   D. Sprinter Scarlet

7. Poinsettia sleeves are cone shaped pieces of paper or plastic used to:
   A. support the plant while it is growing
   B. cover the plant at night
   C. apply fertilizer to the plant
   D. protect the flowers and foliage of the plant when it is sold

8. When potting poinsettias, it is extremely important to remember that the roots of poinsettia plants are:
   A. long and need to be trimmed
   B. brittle and break easily
   C. soft and easily bent
   D. short and especially rugged

9. "Fanning" is a term which has the same meaning as the word:
   A. pinching
   B. watering
   C. potting
   D. lighting
10. A soil mixture suitable for growing poinsettias might consist of:
   A. one part loamy soil, one part peat moss
   B. one part loamy soil, one part peat moss, one part perlite
   C. two parts peat moss, one part perlite
   D. two parts perlite, one part peat moss

11. The flowering date of poinsettias may be controlled by regulating the amount of light a plant receives in a twenty-four hour period. This principle is called:
   A. Geotropism
   B. Photoperiodic control
   C. Photosynthesis
   D. None of the above

12. Poinsettias form flower buds only if the dark portion of a twenty-four hour day is twelve hours or longer. Therefore poinsettias are said to be:
   A. short day -- short night plants
   B. short day -- long night plants
   C. long day -- short night plants
   D. long day -- long night plants

13. A slow release fertilizer commonly incorporated into the poinsettia soil mix is:
   A. Phosphon
   B. Osmocote
   C. Benlate
   D. Temik

14. The optimum night temperature range for poinsettias which have already been rooted and panned is:
   A. 37° - 61°F
   B. 62° - 66°F
   C. 67° - 70°F
   D. 71° - 75°F
15. Severe reduction of night temperature (30-55°F) during the first ten weeks of growth will cause the poinsettias to:

A. bloom earlier with increased bract size
B. show increase color in bracts
C. bloom later with reduced bract size
D. It doesn't matter, temperature has no effect on bloom date or bract size.

16. Single stem poinsettias grown in 6" pots at three plants/pot are usually spaced at approximately 1.5 sq. ft. / pot. Overcrowding the poinsettias often results in:

A. poorer quality plants
B. increased bract size
C. higher profits per sq. ft. of bench space
D. All of the above.

17. A small, white, flying insect which frequently attacks poinsettias is:

A. Aphids
B. Mealybugs
C. White Fly
D. Thrips

18. Both sucking and chewing insects can be controlled by the application of a systematic insecticide. An example of a systematic insecticide typically used on poinsettias is:

A. Temik
B. Malthion
C. Sevin
D. Pentac

19. A good fungicide combination, effective against root rot problems is:

A. Cygon and Thiodon
B. Benlate and Daxan
C. Captan and Sevin
D. Phospon and A-Resit
20. A fungus which attacks roots, and is associated with poorly drained and overwatered soil conditions is:
   A. Botrytis
   B. Rhisoctonia
   C. Gray Mold
   D. Smut

21. Poinsettias are generally pinched within _____ of the potting date:
   A. two weeks
   B. four weeks
   C. six weeks
   D. eight weeks

22. A side effect frequently experienced with the application of growth regulators, particularly when they are applied as a drench is:
   A. a slight yellowing of the leaves
   B. a noticeable wilting of the leaves
   C. dropping of the bottom leaves
   D. none of the above

23. Frequent misting of poinsettias after pinching is done to:
   A. supply extra fertilizer
   B. prevent excessive moisture loss
   C. prevent fungus problems
   D. all of the above

24. Lowering temperatures during the final one or two weeks of growing will:
   A. retard the growth of the crop
   B. save considerable amounts of fertilizer
   C. enhance bract color
   D. cause the crop to bloom later
25. The introduction of CO₂ to the greenhouse atmosphere will cause poinsettias to:
   A. grow faster and bloom earlier
   B. grow faster but bloom later
   C. grow slower but bloom earlier
   D. grow slower and bloom later

26. Given an experimental situation in which a bed of poinsettias were lit until October 31, you would expect the extended lighting period to cause the poinsettias to:
   A. bloom before Christmas
   B. bloom right on schedule
   C. bloom after Christmas
   D. not be affected at all

27. How much additional growing time must be allowed for a pinched poinsettia?
   A. one week
   B. two weeks
   C. three weeks
   D. four weeks

28. To apply a large volume of water without washing or compacting the soil you might use:
   A. a misting nozzle
   B. a water breaker
   C. a fogger
   D. none of the above

29. Single stem poinsettias are generally potted:
   A. three per 5'' pot
   B. one per 5'' pot
   C. one per 6'' pot
   D. three per 6'' pot
30. The process of removing terminal growth to produce a branched plant with several blooms is called:
   A. disbudding
   B. grafting
   C. pinching
   D. stemming

31. A chemical commonly used to control the height of poinsettias is:
   A. B-Nine
   B. Cycocel
   C. Phophon
   D. All of the above

32. The term "constant feed" as it is used in reference to growing poinsettias means:
   A. Fertilizer is applied weekly through the water system.
   B. When water is required, fertilizer is supplied also.
   C. Fertilizer is applied biweekly at specific intervals.
   D. Application of slow release fertilizers at the beginning of the growing cycle.

33. Poinsettia cutting can be purchased from a supplier as:
   A. Calloused cuttings
   B. rooted cuttings
   C. rooted cuttings in 2½" pots
   D. all of the above

34. Failure to space poinsettias early enough will cause them to:
   A. stretch
   B. wilt
   C. bloom early
   D. none of the above
35. When potting with an unsterilized soil medium, you might anticipate problems with:

A. rhizoctonia
B. botrytis
C. aphids
D. white fly
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