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DEVELOPMENT AND TESTING OF A SERIES OF HORTI-
CULTURE UNITS OF INSTRUCTION BASED ON
PERFORMANCE OBJECTIVES TO BE USED
BY LOCAL 4-H LEADERS

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TABLE OF CONTENTS

Chapter	Page
I. INTRODUCTION	1
Problem	2
Purpose	3
Objectives	3
Scope.	3
II. REVIEW OF LITERATURE	4
Development of Literature into Instructional Units.	4
Using Performance Objectives in Developing Instructional Units	9
Levels of Objectives.	11
Limitations of Performance Objectives	12
Current Use of Performance Objectives in 4-H Literature	13
Use of 4-H Literature by Leaders.	14
Similar Studies	15
Summary	17
III. DESIGN AND METHODOLOGY OF THE STUDY	20
Collection and Analysis of Data	21
IV. RESULTS AND DISCUSSION	23
V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS	41
Introduction	41
Summary	42
Conclusions	43
Recommendations	48
BIBLIOGRAPHY	50
APPENDIX A - LIST OF PROPOSED PROCEDURES	52
APPENDIX B - LETTER TO JURY WHO EVALUATED PROCEDURES	54
APPENDIX C - LIST OF NAMES OF JURORS WHO EVALUATED PROCEDURES	56
APPENDIX D - LIST OF COUNTIES AND AGENTS ASSISTING IN DETERMINING AREAS IN WHICH TO DEVELOP UNITS.	58

Chapter	Page
APPENDIX E - SURVEY SENT TO AGENTS, LEADERS, AND MEMBERS.	60
APPENDIX F - METHOD TO FOLLOW IN SELECTING MEMBER TO RESPOND	62
APPENDIX G - LETTER REQUESTING LITERATURE FROM OTHER STATES.	64
APPENDIX H - COPIES OF THE FOUR HORTICULTURE UNITS.	66
APPENDIX I - PROCEDURES FOR TEACHING UNITS	111
APPENDIX J - DEFINITION OF TERMS USED IN REVIEW OF LITERATURE FROM OTHER STATES	113
APPENDIX K - COMMENTS BY JURY WHO EVALUATED DEVELOPMENTAL PROCEDURES.	116
APPENDIX L - MEMBER INFORMATION SHEET	119
APPENDIX M - EVALUATION SENT TO LEADERS AFTER COMPLETION OF THE UNITS	121

LIST OF TABLES

Table	Page
I. Assessment of Selected Aspects of 4-H Horticulture Materials from Other States	24
II. Jury Assessment as to Possible Effectiveness of Proposed Procedures or Steps to Be Used in Development of the Instructional Units	26
III. Judgments of Selected Extension Agents, 4-H leaders, and 4-H Members as to the Relative Importance of Selected Items for Preparation of Instructional Units in Horticulture	27
IV. Mean Score Differences Between Pre-Test/Post-Test for Participating 4-H Members in Four Counties	30
V. Comparison of Horticulture Gain Scores of Members Aged Fourteen Years and Over as Compared to Those Aged Under Fourteen in Testing Four Horticulture Units of Instruction	32
VI. Comparison of Horticulture Gain Scores of Members Having Three or More Years Experience in Horticultural Activities as Compared to Those Having Less than Three in Testing Four Horticulture Units of Instruction	33
VII. Comparison of Horticulture Gain Scores Between 4-H Members in Rural Counties and Urban Counties in Testing Four Horticulture Units of Instruction.	35
VIII. Comparison of Horticulture Gain Scores of Members Having Four or More Years of Club Work as Compared to Those with Less Than Four Years in Testing Four Horticulture Units of Instruction	36
IX. Leader Evaluation of Four Selected Horticulture Units of Instruction	37
X. Non-Directed Responses Regarding Specific Units	39
XI. Non-Directed Responses of a General Nature Concerning the Units	40

CHAPTER I

INTRODUCTION

In 1965 the state 4-H club department began what is known as a volunteer leader led 4-H program concept. Under this concept local 4-H leaders are responsible for 4-H club programs in their community. Involved in this leadership responsibility is providing guidance for the clubs organization, participating in activities, and providing for learning experience in various project areas. In order to be able to do this, they received training and project literature through the local county extension office. In some project areas adequate literature has been developed and organized for this purpose. However, in the area of horticulture little attempt has been made to evaluate existing material for this use, to write needed material, or to assemble it into instructional units for use by the local leaders. This has left local leaders and county extension agents with fragmented literature in that it is not organized in such a manner that it can be submitted to them as a package with suggestions for its use.

The 4-H staff as well as the Oklahoma State University horticulture department staff agree that potential for involving youth in horticulture programs is unlimited if personnel, time, literature, and methods can be developed or made available to place emphasis on this program.

One possible area for further development of youth horticulture programs is within the existing 4-H clubs. In this situation, present 4-H

leadership could use instructional units in conducting horticulture programs in their local 4-H clubs. In 1972 there were 9,500 regular 4-H club members enrolled in horticulture type projects. With an emphasis on development of literature and program development, this number could be increased by one third in two years according to Oklahoma State 4-H office personnel.

A second area for development of the youth horticulture program is youth not currently enrolled in 4-H work. Some discussion has been held concerning the development of programs that would be suitable for presentation to groups of youth living in a particular urban housing area or in a community within an urban area.

In either of the above situations instructional units in horticulture, if available, could be selected that fit the particular situation. Their use would allow agents to train leaders in less time and would give leaders the project material needed to assist them in developing their local program with a limited amount of technical knowledge in their particular project area.

Problem

Leaders in the 4-H program are being asked to conduct the 4-H program in their community. In the area of horticulture, there is a need for development and organization of literature for use by these leaders. Agents must have this type of material if they are to train leaders in the areas of horticulture.

Purpose

The purpose of this study was to develop and evaluate a series of instructional units in the area of horticulture to be used by local leaders in county 4-H programs.

The units were modules, each developed around performance objectives. Instructions and directions on use of the modules was given to leaders and county extension agents.

Another purpose was the development of a format for use in the designing of literature in other areas.

Objectives

1. To identify and rank the horticulture areas in which instructional units should be developed.
2. Develop instructional units and visual aids in four of these areas.
3. Identify four county 4-H programs having organized horticulture clubs to assist in testing these units with their 4-H leaders and members.
4. To determine the effectiveness of these units in teaching 4-H members.

Scope

1. Four instructional units were developed in the area of horticulture.
2. Testing was done in four different county situations.

CHAPTER II

LITERATURE REVIEW

The development of instructional materials involves not only an understanding of the subject matter but also an understanding of the purpose it is to serve, how learning takes place, and the process of change both in instructional material and the students themselves.

This literature review is intended to assist the reader in understanding the situation, principles, and problems surrounding the development of local 4-H leader materials in the area of horticulture.

This discussion covers three areas. First is the development of the literature into instructional units. Second is the use of performance objectives in developing literature. Third is the use of 4-H literature by leaders.

Development of Literature into Instructional Units

A large portion of literature available for instruction in horticulture and other areas was not developed with 4-H members in mind. In many cases it was developed for adult use. Another problem is that the literature available often covers broader areas than leaders can be expected to cover with 4-H members. This is particularly true with club members in the nine to eleven year age range.

Traditionally project literature developed specifically for 4-H

members has been in booklet or manual form and included all information offered in that particular project for a given age group. Information about a specific area of the projects is often difficult to develop into a lesson plan from the literature. Furthermore, most of the literature could better be called a series of activity sheets rather than instructional units.

In recent years some work has been done toward developing literature into "packages" that are somewhat self-contained. This material is presented as a series of lesson plans that cover an entire area. One example of this is the chick embryo project literature [1] developed for use in grade school classrooms. Another example of this type instructional unit is a series of eight plant science lessons [2] developed for the same use.

Although these materials are developed in such a manner that individual lessons can be called individual instructional units, no effort was made to develop them around performance objectives and no allowance is made for methods of evaluating the amount of learning that takes place by the student.

As one begins to seriously consider the problems in developing instructional units, a search of literature points to the problem from several different views.

The development of instructional design theories is not a new endeavor in any respect. Tyler [3] in 1950 put forth ideas that continue to be considered relevant by authorities in the field. He lists three questions that he feels must be answered when developing curriculum and instructional material. These are (a) what are the educational purposes; (b) what educational experiences can be provided to attain these

purposes; and (c) how can a determination be made as to whether or not these purposes are being attained.

In question one the purpose of broad educational goals becomes the criteria by which materials are selected, content is outlined, and test and examinations are prepared. These overall objectives can be developed in part by studying the learner to determine what his interest, feelings, and needs are.

A point of confusion may occur if we fail to distinguish between the needs that should be met by the instruction and those met by other agents such as home, church, community, etc.

In order to provide the proper learning experiences, Tyler [3] indicates a need for the teacher to know the students and to understand their background. Experiences that are made available should always allow the student to deal directly with information relating to the objectives and thus, be satisfying to him and within the range of possibility for each student. There are usually many experiences that can be provided to achieve each objective and likewise it should be pointed out that any particular learning experience may bring about several outcomes.

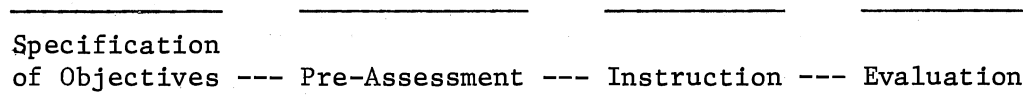
Organization of learning experiences refers to their being presented in such a way as to reinforce each other. It is important to consider the relationships of the experiences to each other as well as to other areas. Three major areas to consider when organizing experiences are continuity, sequence, and intergration. By considering these three items, the learning experiences will relate to the student's objectives, the teacher's objectives, objectives of the system, and other areas of instruction within the system.

Evaluation is a process for determining whether or not the learning

experiences as developed and organized are producing the desired results. It becomes the process of identifying the strengths and weaknesses of the total program of instruction. Evaluation can also be used to determine the effectiveness of teachers and materials being used in instruction.

Two conditions that enhance the student's likelihood of perceiving the similarity between life situations are (1) when the learning situations and life situations are alike in as many ways as possible; (2) the student is given practice in seeking illustrations in his life outside school for the application of things learned in school. Consideration of these conditions should be kept in mind when developing instructional models.

Popham [4] indicates that he feels a need for a more simple approach to the development of instructional models than most authors use. His goal referenced instructional model contains four parts or phases; they are as follows:



(1) The objectives in the model are learner objectives, that is, they are stated in terms of learner behavior. (2) The student pre-assessment is to determine his current status with respect to the objectives. (3) The instructional activities are conducted in such a manner as to bring about the objectives. (4) Evaluation of the objectives provides a basis for making changes in instruction as needed to better meet the objectives.

This model emphasizes the teacher's decision making role, which he

or she performs before and/or after instruction. It also provides a basis for supervisor's evaluation of teachers other than the supervisor basing his evaluation on personal experience and/or bias alone. Two other advantages Popham [4] lists of this type model are (1) it aids the teacher in the initial selection of instructional activities; (2) it allows the teacher, over time, to improve the quality of an instructional sequence. In some respects the teacher becomes his own evaluator when goal referenced objectives are used as a basis for instruction.

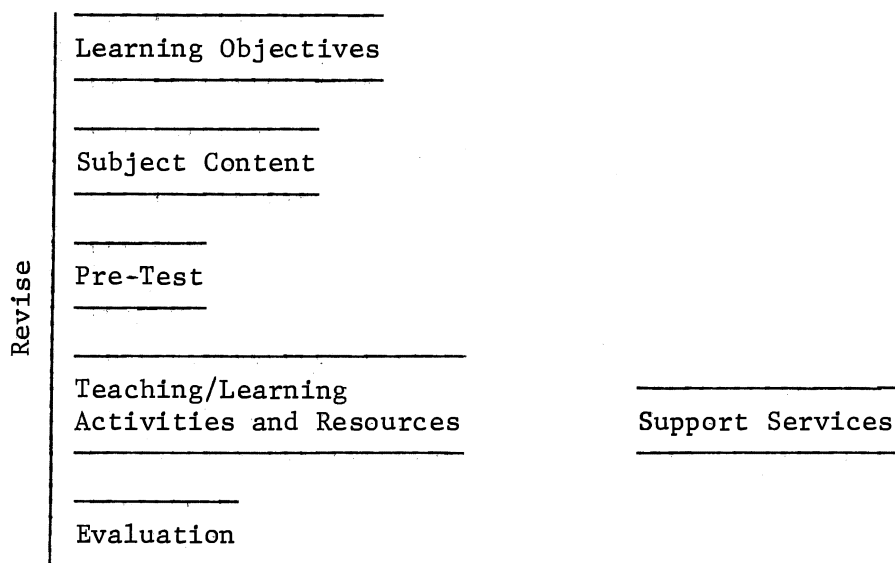
Kemp [5] has summarized the work of several authors into his instructional design plan that lists three questions that should be considered when developing instructional material. These questions are (1) what must be learned; (2) what procedures and materials will work to reach the desired learning levels; (3) how to determine when the required learning takes place.

Material developed with these three questions as a guide has the students' needs in mind and has a built-in evaluation system in that after use of each unit students can be tested for how well they have accomplished the objectives.

Kemp [5] sets forth an eight step plan for the development of instructional material that takes these three questions into consideration. The following diagram illustrates the relationship of each step in the plan to the other steps.

Topics and General Purposes

Student Characteristics



In some cases the above listed steps may be simplified or re-ordered and still provide for the organized development of instructional material. However, the only logical place to begin is with an examination of a total plan. A total plan or general purpose statement deals with the broad idea or area within which the instructional units are to be developed.

General terms are used to describe topics and general purposes. Terms such as to understand, to appreciate, to acquire, and to become aware of are the type of phrases often used in general purpose statements. These broad general statements define general areas which provide a frame of reference within which the learning objectives are written.

Using Performance Objectives in Developing Instructional Units

A great deal of discussion has taken place in the past regarding the use of performance objectives when developing literature. However, when attempts are made to locate instructional material based on

performance objectives, little can be found in many areas. Patton [6] indicates that stating objectives so they can measure the observable outcome of the student is not a difficult task. However, the development of content information needed in order to reach the stated objectives is a different matter. Developing instructional material to meet a series of objectives sometimes causes instructional material to seem fragmented and hard to tie together as a single unit.

Renewed interest in performance objectives in the last several years has brought about a great amount of writing concerning the rationale for their use. McAshan [7] states the primary reasons for the current emphasis upon writing behavioral objectives are to (1) aid in curriculum planning, (2) promote increased pupil achievement, (3) improve the techniques and skills of program evaluation. Each area of study has its own unique problems and objectives, but the processes used for development and evaluation can be essentially the same.

Griffith [8] says the rationale behind performance objectives is that students, upon completing the learning intended, will exhibit a behavior that indicates a high degree of familiarity with the desired achievement; however, Popham [4] indicates that teachers have always been concerned with the importance of instructional objectives but that the objectives they have endorsed have failed to cause any change in their instruction content or methods. The reason for this is that the objectives are usually stated in terms that are too broad and cannot be given a definite definition for use in a specific situation.

Unless objectives definitely and directly communicate what the teacher intends to accomplish in relation to the student they are of little educational value. In the past, many objectives written and used

have dealt with what the teacher is to do rather than with what effect the instruction will have on the student. A common practice of teachers is to tell students what is expected of them at the beginning of the instructional period with the expectations being based upon what the teacher plans to teach. It is easy to see that student needs could be neglected in situations such as this.

Although it is important that objectives be developed in the early stages of planning, it is evident that in actual practice this cannot always be done in their most complete form. In many cases, clear-cut objectives cannot be defined immediately after general purpose statements are made because full content of instruction possibilities may not be clear that early. This emphasizes the fact that writing and up-dating of objectives is a continuing process.

Questions continually arise as to whether the individual teacher should have the total responsibility of developing objectives pertaining to his or her area of instruction or whether it should be a team effort of several teachers. In addition to those quoted above, other students of curriculum have indicated that in the future more development of a listing of objectives prepared by professional writers will become available so that teachers can use these to select objectives that fit their situation. In either case it was pointed out that it was advantageous to involve students in developing or selecting objectives.

Levels of Objectives

Authors seem somewhat divided when they discuss levels of objectives. Kemp [5] identifies the two levels of objectives as terminal and enabling objectives. The terminal objectives state what the student will be able

to do as a total product of his learning experience. The enabling objectives list simple activities or learning steps required to accomplish the terminal objective. An example of the use of this definition is a terminal objective of "to be able to prune ornamental trees" and enabling objectives of "learning to identify ornamental trees" and "learn how to identify and use pruning tools."

Neagley [9] speaks of levels of objectives or goals as a differentiation to accommodate different levels of learners. This interpretation of levels of objectives could be beneficial when writing objectives for class involving a wide range in age or for classes with a wide range of experiences in the subject area.

A third way of defining levels of objectives is to categorize them. There exists a sizable agreement among students of curriculum development upon the areas of importance as being (1) cognitive area which refers to objectives that require naming, listing, solving, etc.; (2) motor skills or psychomotor which refers to performing, manipulating, and constructing; and (3) the affective areas which involve enjoying, conserving, respecting, and the like. The cognitive and motor skill areas are much easier to work with in that objectives in the affective area deal with feelings and emotions that are expressed as attitudes and appreciations.

Limitations of Performance Objectives

Development of curricula around performance objectives receives its strongest support from those who have a great deal of success with curricular development and use. For the most part, this support comes from vocationally oriented people. Some of those who are and have been in

opposition to the use of performance objectives feel that their use leaves no room for innovative teaching and that they dictate what the teacher is to do and when it is to be done. Literature developed for use in writing objectives [10] for total school programs points out clearly that performance objectives do not tell the teacher how to teach or what time to teach particular subject matter.

There is feeling among some that use of performance objectives causes some unintended consequences in that they cause students to try only to reach the stated objectives and to refuse to set their own objectives or do more than is absolutely required.

Some teachers express their concern in that they themselves experience difficulty in writing measurable objectives. This may well be due to an advocated criterion, this being that when completed, objectives must convey the same idea and perhaps elicit very similar responses in each person reading them. Again, many teachers are not accustomed to application of the exactness which is required to develop objectives in truly measurable terms.

Although performance objectives can and should be an integral part of the instructional planning, they should be kept in their proper place. Objectives should not become the end product but rather be a tool to be used to reach the end product which is the highest quality instruction possible for each student.

Current Use of Performance Objectives

in 4-H Literature

Requests for information concerning the use of performance objectives in 4-H literature were sent to 4-H personnel with the Federal Extension

Service in Washington D. C. Reply to the request was in the form of copies of the most recent literature developed for 4-H members and leaders. A review of the literature [11] indicated that performance objectives were being considered in the development of new literature. The objectives, however, were located only in the leader's literature. The objectives were presented in the form of questions which the leaders were encouraged to ask members during instruction. The questions that are suggested for teachers to ask members relate to a teaching objective that is associated with the title of the instruction unit. No reference is made in the member's manual to any learning objective. The only knowledge the member has of them is what the teacher tells him.

Use of 4-H Literature by Leaders

The methods and the degree to which 4-H leaders use literature are as varied as the leaders themselves. Some leaders who find themselves needing or wanting to teach project information have little knowledge of the technical information relating to it. Others may have degrees, special training, or years of experience working in the area they are teaching. With this difference in background, the problem of developing instructional units that fit every situation becomes seemingly insurmountable. The problem is further complicated when we realize that in many cases those receiving instruction may range from nine years to 19 years of age. Furthermore, the range in understanding of the members may be from a general awareness to those with a great deal of expertise and several years of experience in the project.

The usefulness of instructional units used by 4-H leaders is dependent upon its adaptability to different situations. According to leader's

literature prepared by the University of Missouri [12], few leaders find all the instructional material they need in 4-H manuals. Other things used to assist in instructions include resource persons, junior leaders, subject matter specialists, and material written for purposes other than 4-H.

Leader material for 4-H developed by the California Agriculture Extension Service [13] indicates there are many ways the 4-H leader can improve his ability to use the knowledge, information (literature), etc. which they already have. Two methods that are suggested are attending county leader's meetings and project training meetings. Meetings give insight regarding potential use of instructional material as well as assist in the location of additional helpful material.

Williams [14] has indicated that the involvement of 4-H members in a particular project is directly related to agent and leader interest in a project area and in the availability of resource material for teaching in that area.

Similar Studies

The majority of studies that have been made that deal with the development of instructional units in horticulture relate to vocational occupational training. Although not directly related to the development of 4-H horticulture literature, there are some important findings that should be considered in this study.

A developmental study by Lark [15] pointed out that the testing or evaluation of instruction units can be used as a basis for determining the usefulness of the units as well as a basis for revision of existing units and writing new units. His study dealt with the development of

instructional units on agricultural occupations. The units were taught to ninth grade vocational agricultural classes in six experimental and six control schools. Pre-testing and post-testing were used to determine the effectiveness of the units. Based on the results of the testing, the units were revised. After final revision further testing was done to determine effectiveness. Testing showed that students participating in the program had better insights into the possible opportunities and benefits available in those occupations taught. They were also better able to relate the occupations to their abilities and to identify their strengths and weaknesses as they related to specific occupations.

Henderson [16] did a follow up study on Lark's [15] work and asked people who were knowledgeable in the development of instructional material to evaluate the material and make suggestions for improvement. One reply indicated the development of some material around a game or the use of cartoon characters increased student interest in the units. There also was an indication of approval of the use of behavioral or performance objective approach to instructional unit development. There was caution that the use of objectives not be restricted to those that are easily measured. It was pointed out that changes in attitudes and values are important but sometimes are not considered because they are difficult to measure.

Other problems that were indicated in the study were (1) reading level too high; (2) units needed to be consolidated; (3) units were too long and took too much time; (4) need for variety between the different units; (5) units needed progressive difficulty built in.

One of the major problems in developing instructional units is the identification of the areas in which to develop the units. A

questionnaire developed by Beach [17] was sent to owners and managers in the nursery industry to determine competencies needed for entry and advancement in the industry. Although his study dealt with occupational horticulture on a higher level than is normally included in the 4-H program, several competency areas studied may relate to areas of developing the instructional units in this study.

The competencies studied by Beach were rated on a four point scale with four being the highest possible rating for a desired competency. Those competencies receiving ratings as high as 3.0 were (1) identifying varieties of trees and shrubs; (2) spraying; (3) pruning; (4) fertilizing; and (5) planting.

Another problem area that must be considered is the identification of the performance objectives around which the instructional units are developed. Griffith [8] identified behavioral or performance objectives in seven areas of horticulture. The areas were (1) plant production; (2) landscape maintenance; (3) sales; (4) management; (5) record keeping; (6) equipment operation; and (7) equipment maintenance.

As is true of other studies, Griffith's list of objectives deal directly with the vocational occupational aspects of instructional development. It is well recognized that some of the areas in which Griffith has developed performance objectives may be applicable to 4-H literature development such as that attempted in this study.

Summary

The traditional methods of 4-H literature development have not been concerned with instructional units as such, rather they have focused more directly on entire project areas. In those situations where the

literature was divided into units, performance objectives are not considered as a major guideline for its development.

Several models have been developed as guidelines for the development of instructional material. The more widely accepted models began with identification of objectives and allowed for revision of the objectives, instructional material, and testing procedures as the last step.

The development of instructional units around performance objectives allows the learner to be the focal point of the instruction. Objectives identified for the learner and instruction developed to satisfy those objectives provide opportunity for evaluation of the amount of learning that takes place and also allow for the revision of instructional units or teaching methods if those objectives are not met.

As performance objectives are identified for use in the development of instructional units, there are certain limitations that should be kept in mind. Many of these limitations related to the ability and interest of those who have the responsibility for development. However, for those who are strong supporters of performance objectives, there is the caution that objectives themselves could become an end product rather than a tool to be used to reach the end product which is quality instruction.

Current use of performance objectives in 4-H literature is somewhat limited in that many times the members are not aware of the objectives that are written for them. This is partially due to the fact that if objectives are stated, they seldom are found in the member's literature.

The degree to which leaders use 4-H literature varies with leader knowledge of the literature available and with the leader expertise in the particular project area that is being taught. Few 4-H leaders depend entirely upon 4-H literature for all the information they use in providing

instruction to their members. Leaders' meetings and project training meetings are two methods most leaders use to increase their knowledge in their respective project areas.

CHAPTER III

DESIGN AND METHODOLOGY OF THE STUDY

This study was developmental in nature and designed to determine the effectiveness of units of instruction in horticulture based on behavioral objectives in teaching 4-H club members.

A list of proposed procedures was developed as a guide in the development and testing of the units (Appendix A). Seventeen people with experience and expertise in curriculum development were asked to serve as a jury to review the proposed procedures to determine their possible effectiveness (Appendices B and C). Their responses indicated the proposed procedures were adequate.

A survey was sent to agents in ten selected counties to determine the areas of horticulture in which the four units should be developed (Appendices D and E). One agent, one 4-H leader, and one 4-H member were asked to complete the survey. The agent selected the leader to respond and the member was selected by random sample (Appendix F).

In order to determine the extent to which behavioral objectives are used in 4-H horticulture literature, state 4-H leaders in all 50 states were asked to send copies of their 4-H horticulture literature for review. The state leader of Oklahoma 4-H clubs made this contact (Appendix G).

Based on the survey of agents, 4-H leaders, and 4-H members, instructional units were developed on (1) plant identification, (2) horticulture

judging, (3) hobby greenhouse, and (4) plant propagation (Appendix H). At Oklahoma State University, certain horticulture specialists were asked to check technical information for accuracy.

Four counties with organized 4-H horticulture clubs were selected to test the units. Office conferences were held with the county extension director of each of the counties to explain the study and gain support for their participation. The purposes and use of the units were explained to the agents and the leaders who taught them. The leaders were given a list of suggested procedures for teaching the units to guide them in the order in which the units were taught (Appendix I).

Leaders pre-tested the members on each unit and then taught the units in a classroom situation. Members were post-tested at the next week's class period.

Upon completion of teaching the four units, the leaders were asked to complete an evaluation form to determine their opinion of the instructional units.

Collection and Analysis of Data

Differences in pre-test and post-test scores of members indicate that ability of members to improve their scores after receiving instruction from the units. These gain scores are an indication of the effectiveness of the units. In order to further determine the effectiveness of the units, gain scores were stratified in four areas: (1) 14 years of age and over as compared to those under 14 years, (2) those having three or more years of experience in horticulture activities as compared to those having less than three, (3) members from rural counties as compared to members from urban counties, (4) members having four or more

years of club work as compared to those having less than four years.

Data on the above comparisons were tested at the 0.05 level of significance by the T-test.

CHAPTER IV

RESULTS AND DISCUSSION

As indicated in Chapter III state 4-H leaders in all 50 states were asked to send copies of their 4-H horticulture literature for review. Thirty-four of the state 4-H leaders responded. Table I displays the results and assessment of the material. None of the states used behavioral objectives as a basis for writing the literature. Twenty-six states (76.47 percent) were rated fair in that they in some manner expressed what the members could or should learn through use of the material. Literature from eight states (23.53 percent) made no attempt to indicate what should be learned through use of the literature.

Nine states (26.47 percent) responded with literature that was originally developed for adult use and literature from 25 states (73.53 percent) was developed specifically for 4-H members.

Program ideas or literature with information about a single activity was sent by 19 (55.88 percent) of the responding states and 15 states (44.12 percent) used no program ideas.

Literature from ten states (29.41 percent) was developed for specific grade levels and five states (14.71 percent) responded with some literature that was grade leveled and some with no grade level indicated. Nineteen states (55.88 percent) responded in which no attempt to grade level appeared in any of the literature.

Twelve states (35.29 percent) responded with literature that covered

TABLE I

ASSESSMENT OF SELECTED ASPECTS OF 4-H HORTICULTURE MATERIALS FROM OTHER STATES

Item	<u>Yes</u>		<u>No</u>		<u>Some</u>		<u>Good</u>		<u>Fair</u>		<u>None</u>		<u>Broad</u>		<u>Narrow</u>		<u>Both</u>	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Use Behavioral Objectives as a Writing Base	--	--	--	--	--	--	--	--	26	76.47	8	23.53	--	--	--	--	--	--
Use Adult Materials for Youth	9	26.47	25	73.53	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Use Program Ideas	19	55.88	15	44.18	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Extent Materials Are Grade Leveled	10	29.41	19	55.88	5	14.71	--	--	--	--	--	--	--	--	--	--	--	--
Scope of Field Covered	--	--	--	--	--	--	--	--	--	--	--	--	12	35.29	8	23.53	14	41.18
Use National 4-H Foundation Material	8	23.53	26	76.47	--	--	--	--	--	--	--	--	--	--	--	--	--	--

broad areas of horticulture in a single publication and literature from eight states (23.53 percent) covered narrow areas of horticulture in a single publication. Respondents from 14 states comprising 41.18 percent of states from which responses were received submitted literature that covered broad areas in some publications and narrow areas in others.

Eight states (23.53 percent) were reported as using National 4-H Foundation plant science literature, while 26 states (76.47 percent) gave no indication that they use National 4-H Foundation materials.

Review of this existing literature from different states indicates considerable variation in literature used to teach horticulture to 4-H members.

Definition of terms used in the literature review can be found in Appendix J.

A list of proposed procedures or steps were developed to serve as a guide in developing and testing instructional units. This list was sent to a jury of 17 people who have experience and expertise in curriculum development. This jury was asked to assess the possible effectiveness of the proposed procedures. Table II displays the results of their assessment. The jury was in general agreement that the proposed procedures were adequate guides for development of the units. There were comments by the jury which are displayed in Appendix K.

Results of the survey of agents, 4-H leaders, and 4-H members to determine the areas of horticulture in which instructional units should be developed indicated the four areas with the highest priorities were (1) plant identification, (2) horticulture judging, (3) hobby greenhouse, and (4) plant propagation. Table III displays the results of that survey.

TABLE II

JURY ASSESSMENT AS TO POSSIBLE EFFECTIVENESS OF PROPOSED PROCEDURES OR STEPS
TO BE USED IN DEVELOPMENT OF THE INSTRUCTIONAL UNITS

Procedures or Steps	Response					
	Approve as Written		Approve with Modification		Consider Questionable	
	N	%	N	%	N	%
1. Survey agents, 4-H leaders, & members from 10 selected counties to determine 4 areas in which to develop horticulture units	13	76.5	4	23.5	--	--
2. Review literature on writing instructional units based on behavioral objectives	16	94.1	1	5.9	--	--
3. Review 4-H horticulture literature from as many states as possible to determine the extent to which 4-H literature is written with behavioral objectives as a base	14	82.3	1	5.9	1	5.9
4. Write the 4 units indicated as needed by the survey	13	76.4	4	23.5	--	--
5. Conduct readability level study on units and adjust to the desired reading level	14	82.3	3	17.6	--	--
6. Select 4 counties with organized 4-H hort clubs as testing centers	16	94.1	1	5.9	--	--
7. Instruct agents and/or 4-H leaders in use of units	15	88.2	2	11.8	--	--
8. Pre-test 4-H members	14	82.3	2	11.8	--	--
9. Leaders use units to teach members	15	88.2	--	--	--	--
10. Post-test 4-H members	15	88.2	--	--	--	--
11. Evaluate material based on test and make revisions as need indicates	15	88.2	1	5.9	1	5.9

TABLE III

JUDGMENTS OF SELECTED EXTENSION AGENTS, 4-H LEADERS, AND 4-H MEMBERS AS TO THE RELATIVE IMPORTANCE OF SELECTED ITEMS FOR PREPARATION OF INSTRUCTIONAL UNITS IN HORTICULTURE

Horticulture Area	Agent Score*	Rank	Leader Score*	Rank	Member Score*	Rank	Total Score*	Total Rank
Plant Propagation	21	--	35	5	38	4(t)	95	4
Window Box Garden	33	6(t)	19	--	21	--	73	--
Plant I. D.	20	--	43	2	47	1	110	1
Importance of Horticulture	17	--	33	7	37	6	87	7
Terrariums	27	8	22	9	43	2	92	5(t)
Horticulture Soils	19	--	49	1	24	10(t)	92	5(t)
Fert. of Hort Crops	14	--	34	6	13	--	61	--
Hobby Greenhouses	37	2(t)	21	10(t)	41	3	99	3
Plant Pollination	15	--	6	--	11	--	32	--
Drawing Landscape Plans	9	--	7	--	0	--	16	--
Preparing Seedbed	16	--	21	10(t)	38	4(t)	75	--
Experiments To Do	33	9(t)	23	8	19	--	75	--
Plant's Use of Light	13	--	13	--	30	8	56	--
Vegetables for Oklahoma	25	9(t)	36	4	21	--	82	8
Community Landscape Projects	37	2(t)	7	--	35	7	79	10
Types and Kinds of Vegetables	41	1	21	10(t)	18	--	80	9

TABLE III (Cont.)

Horticulture Area	Agent Score*	Rank	Leader Score*	Rank	Member Score*	Rank	Total Score*	Total Rank
Greenhouse Vegetable Production	5	--	14	--	11	--	30	--
Herbarium Collection	15	--	18	--	10	--	43	--
Horticulture Judging	34	5	42	3	24	10(t)	100	2
Growing Small Fruits	3	--	14	--	5	--	22	--
Flower Arrangements	2	--	14	--	5	--	21	--
Growing Animals	3	--	0	--	0	--	3	--
Pruning Ornamental Plants	4	--	3	--	0	--	7	--
Insects and Diseases of Ornamentals	25	9(t)	15	--	0	--	40	--
The Lawn and Its Care	15	--	6	--	14	--	35	--
Care of House Plants	35	4	20	--	15	--	70	--
Basic Home Landscape Improve- ment, Cleanup, Planting Flowers,, etc.	21	--	14	--	29	9	64	--

* Agents, leaders, and members were asked to select and rank the top ten items they considered to be of greater relative importance. Cumulative scores were then determined for each area by assigning score points as follows: 1 = 10; 2 = 9; 3 = 8; etc.

Both leaders and members ranked plant identification in their top four choices, while agents did not place it in the top ten. Leaders and agents did rank horticulture judging 3 and 5, respectively, while members ranked it as in a tie for 10 and 11. Hobby greenhouse was ranked in the top four by agents and members, while it was ranked in a three way tie for 10, 11, and 12 by the leaders. Plant propagation received a rank of 5 by leaders and a tie for 4 and 5 by members. Leaders did not rank plant propagation in the top ten.

When development of the units was completed, four counties with organized 4-H horticulture were selected to teach and test the effectiveness of the units with 4-H members; the counties selected were Oklahoma, Bryan, Pottowatomie, and Washington. Leaders were given a suggested procedure for order in which the units were to be taught (see Appendix I).

Those who received the instruction included 36 members of organized 4-H horticulture clubs. Age ranged from nine years to seventeen years and grade in school ranged from fourth to twelfth grade. Years in club work ranged from first year members to those who were in their ninth year of work. Information collected regarding years of participation in horticulture activities placed the participants in categories of (1) less than one year; (2) one year; (3) two years; (4) three years; (5) over three years. A copy of the member information sheet is displayed as Appendix L.

Participants were pre-tested prior to receiving instruction and post-tested one week after receiving instruction. Differences in the pre-test and post-test scores were obtained to provide a gain score to be used in comparisons. Table IV displays the mean score differences

between pre-test and post-test for members from the four counties.

TABLE IV
MEAN SCORE DIFFERENCES BETWEEN PRE-TEST/POST-TEST FOR
PARTICIPATING 4-H MEMBERS IN FOUR COUNTIES*

Counties	Units of Instruction			
	Hobby Greenhouse	Hort Judging	Hort ID	Plant Propagation
Oklahoma	31.83	15.10	32.00	47.53
Bryan	53.33	13.32	34.32	20.97
Pottawatomie	50.87	30.44	31.91	73.06
Washington	31.67	13.82	16.87	40.07
All Counties	42.61	19.58	28.72	43.73

* Mean scores for the respective units were determined by the process of securing the percentage of the total possible correct scores which each item represented.

Example 75.0 = Highest possible score
50.0 = Actual score made by participant
66.6 = Adjusted raw score

In order to test the effectiveness of the units in different situations, the gain scores were stratified in four areas: (1) 14 years of age and older as compared to those under 14, (2) those having three or more years experience in horticulture activities as compared to those having less than three, (3) members from rural counties as compared to

urban counties, and (4) members having four or more years of club work as compared to those with less than four years. The T-test at the 0.05 level was used to determine if there was a significant difference in the effectiveness of the units when taught to the different groups.

When the gain scores of those 14 years and older were compared with those under 14 years of age, there was no significant difference for the hobby greenhouse, horticulture judging, or horticulture identification.

There was, however, a significant difference in the gain scores between the two groups for the plant propagation unit. This indicates that members of both age groups made a similar amount of improvement in scores on the hobby greenhouse, horticulture judging, and the horticulture identification units. It also indicates there was a difference in the ability of the two groups to improve their score on the plant propagation unit. The gain scores of members under 14 years of age were significantly greater than the gain scores of members 14 years and older, as indicated by the T-test. Table V displays the comparison of the gain scores for these two groups.

Testing of gain scores of members having three or more years experience in horticulture activities compared to those with less than three years experience showed no significant difference in any of the units. This indicates that members of both groups made a similar improvement in scores after instruction in all of the units. Table VI displays the comparison of gain scores for these two groups.

When gain scores of members from urban counties were compared with gain scores of members from rural counties, there was no significant difference for units in horticulture judging, horticulture identification, or plant propagation. There was, however, a significant difference for

TABLE V

COMPARISON OF HORTICULTURE GAIN SCORES OF MEMBERS AGED FOURTEEN YEARS AND OVER AS COMPARED TO THOSE AGED UNDER FOURTEEN IN TESTING FOUR HORTICULTURE UNITS OF INSTRUCTION

	Hobby Greenhouse		Hort Judging		Hort ID		Plant Propagation	
	13 & Under	14 & Older	13 & Under	14 & Older	13 & Under	14 & Older	13 & Under	14 & Older
	32	32	20.0	1.5	7.8	26.5	48.7	11.6
	38	30	11.5	17.2	40.7	36.3	42.9	37.7
	26	32	15.7	--	5.9	30.1	40.6	56.5
	44	21	27.1	11.4	4.9	36.3	57.9	33.3
	42	66	7.1	27.2	33.3	17.6	40.6	60.1
	38	23	35.7	17.2	-1.0	12.8	24.1	45.3
	44	14	-1.4	10.0	59.8	39.2	68.2	16.0
	61	23	2.9	14.3	12.5	20.6	62.3	30.1
	49	63	41.5	12.8	18.6	45.1	82.7	23.2
	62	46	61.5	11.4	27.5	31.4	81.2	2.9
	--	43	21.4	15.7	26.5	30.4	52.1	8.7
	--	47	20.0	5.7	43.1	39.2	85.5	40.6
	--	62	54.3	20.0	32.4	61.8	--	28.3
	--	59	17.2	17.1	45.1	19.7	--	67.8
	--	59	--	47.1	--	--	--	--
	--	52	--	21.4	--	--	--	--
N	10	16	14	16	14	14	12	14
\bar{x}	43.6	42	23.89	15.63	25.51	31.93	57.23	33.01
σ	11.45	17.18	18.53	10.97	18.09	12.69	19.36	19.80
t		.26		1.51		1.06		3.14*
T.05		2.064		2.048		2.056		2.064

* Designates the scores which were significant.

TABLE VI

COMPARISON OF HORTICULTURE GAIN SCORES OF MEMBERS HAVING THREE OR MORE YEARS EXPERIENCE IN HORTICULTURAL ACTIVITIES AS COMPARED TO THOSE HAVING LESS THAN THREE IN TESTING FOUR HORTICULTURE UNITS OF INSTRUCTION

	<u>Hobby Greenhouse</u>		<u>Hort Judging</u>		<u>Hort ID</u>		<u>Plant Propagation</u>	
	0 - 2	3 or More	0 - 2	3 or More	0 - 2	3 or More	0 - 2	3 or More
	30	32	15.7	20.0	40.7	7.8	42.9	48.7
	26	32	27.1	1.5	4.9	26.5	40.6	11.6
	14	38	7.1	11.5	33.3	5.9	37.7	57.9
	44	32	35.7	17.2	-1.0	36.3	40.6	56.5
	23	21	17.2	0	17.6	30.1	24.1	33.3
	46	66	-1.4	11.4	59.8	36.3	68.2	60.1
	43	23	10.0	27.2	12.8	39.2	45.3	30.1
	59	63	12.8	14.3	20.6	31.4	62.3	8.7
	42	47	11.4	15.7	45.1	30.4	16.0	40.6
	44	62	20.0	5.7	39.2	27.5	23.2	67.8
	49	38	2.9	17.1	12.5	43.1	2.9	81.2
	62	59	41.5	21.4	18.6	61.8	20.3	--
	--	61	61.5	47.1	26.5	--	82.7	--
	--	52	20.0	--	32.4	--	52.1	--
	--	--	21.4	--	19.7	--	85.5	--
	--	--	54.3	--	45.1	--	--	--
	--	--	17.2	--	--	--	--	--
N	12	14	17	13	16	12	15	11
\bar{x}	40.17	44.71	22.02	16.16	26.74	31.36	42.96	45.14
σ	14.36	15.75	17.26	12.10	16.48	14.83	24.08	22.76
t		.763		1.042		.766		.233
T.05		2.064		2.048		2.056		2.064

the hobby greenhouse unit. This indicates that members from both urban and rural counties made the same amount of improvement in scores after instruction in the units on horticulture judging, horticulture identification, and plant propagation. It also indicates there was a difference in the two groups' ability to improve their gain scores for the unit on hobby greenhouses. Rural county gain scores were significantly greater than the urban county gain scores as indicated by the T-test. Table VII displays the comparison of gain scores for these two groups.

A comparison of gain scores of members having four or more years of club work to members with less than four years revealed there was no significant difference in the scores for any of the units. This indicates that members of both groups essentially achieved a similar amount of improvement in scores after instruction in each of the units. Table VIII displays the comparison of gain scores for these two groups.

Upon completion of the teaching of all units, leaders were asked to complete an evaluation form (Appendix M). Results of this evaluation are displayed in Table IX. Leaders were asked to express their general feelings about 21 items concerning the units. Possible responses concerning these items were (1) excellent, (2) good, (3) needs adjustment, and (4) poor. A rating scale of 4.0 for a response of excellent to 1.0 for a response of poor was assigned to responses on the evaluation. An average rating was computed for each of the 21 items on the evaluation.

The highest possible average rating was 4.0 and the lowest possible rating was 1.0. Seven of the items received an average rating of 4.0, and nine items received an average rating of 3.75. One item received an average rating of 3.50, and two of the items received a rating of 3.25. Two items received an average rating of 3.0.

TABLE VII

COMPARISON OF HORTICULTURE GAIN SCORES BETWEEN 4-H MEMBERS IN RURAL COUNTIES AND URBAN COUNTIES
IN TESTING FOUR HORTICULTURE UNITS OF INSTRUCTION

	<u>Hobby Greenhouse</u>		<u>Hort Judging</u>		<u>Hort ID</u>		<u>Plant Propagation</u>	
	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
	21	42	17.2	2.9	36.3	12.5	33.3	82.7
	66	38	0	41.5	30.1	18.6	68.2	67.8
	23	44	35.7	61.5	36.3	27.5	60.1	81.2
	14	59	11.4	17.1	17.6	26.5	45.3	52.1
	44	61	27.2	21.4	59.8	43.1	62.3	85.5
	23	52	17.2	47.1	12.8	61.8	16.0	30.1
	32	49	-1.4	20.0	7.8	32.4	48.7	23.2
	32	62	10.0	21.4	40.7	19.7	42.9	2.9
	38	63	20.0	54.3	26.5	45.1	11.6	8.7
	30	46	1.5	17.2	5.9	39.2	40.6	40.6
	32	43	11.5	14.3	4.9	20.6	57.9	20.3
	26	47	15.7	12.8	33.3	45.1	37.7	--
	--	62	27.1	11.4	-1.0	31.4	56.5	--
	--	59	7.1	15.7	--	30.4	40.6	--
	--	--	--	5.7	--	39.2	24.1	--
	--	--	--	20.0	--	--	--	--
N	12	14	14	16	13	15	15	11
\bar{x}	31.75	51.93	14.30	24.02	23.92	32.87	43.05	45.04
σ	13.42	8.82	10.89	17.38	17.65	12.93	16.79	30.57
t		4.607*		1.80		1.545		.213
T.05		2.064		2.048		2.056		2.064

* Designates the scores which were significant.

TABLE VIII

COMPARISON OF HORTICULTURE GAIN SCORES OF MEMBERS HAVING FOUR OR MORE YEARS OF CLUB WORK AS COMPARED TO THOSE WITH LESS THAN FOUR YEARS IN TESTING FOUR HORTICULTURE UNITS OF INSTRUCTION

	<u>Hobby Greenhouse</u>		<u>Hort Judging</u>		<u>Hort ID</u>		<u>Plant Propagation</u>	
	0 - 3	4 or More	0 - 3	4 or More	0 - 3	4 or More	0 - 3	4 or More
	14	21	35.7	17.2	17.6	36.3	68.2	33.3
	44	66	17.2	0	59.8	30.1	45.3	60.1
	23	23	-1.4	11.4	12.8	36.3	62.3	48.7
	26	32	10.0	27.2	40.7	7.8	16.0	11.6
	42	30	15.7	20.0	4.9	26.5	42.9	57.9
	38	38	27.1	1.5	33.3	5.9	40.6	37.7
	44	32	7.1	11.5	-1.0	39.2	40.6	56.5
	49	32	2.9	17.1	31.4	20.6	24.1	30.1
	62	59	41.5	21.4	45.1	45.1	8.7	23.2
	47	61	61.5	47.1	32.4	30.4	20.3	2.9
	59	52	20.0	21.4	26.5	39.2	82.7	40.6
	--	63	54.3	14.3	27.5	19.7	52.1	67.8
	--	46	17.2	12.8	18.6	61.8	85.5	81.2
	--	43	15.7	11.4	12.5	43.1	--	--
	--	62	20.0	5.7	--	--	--	--
N	11	15	15	15	14	14	13	13
\bar{x}	40.73	44	22.97	16	25.86	31.57	45.33	42.43
σ	14.73	15.55	18.12	11.39	16.42	14.95	24.49	22.51
t		.542		1.263		.962		.314
T.05		2.064		2.048		2.056		2.064

TABLE IX

LEADER EVALUATION OF FOUR SELECTED HORTICULTURE UNITS OF INSTRUCTION

Response	Ex- cellent	Good	Needs Ad- justment	Poor	Avg. Rating	Comments
1. What are your general feelings about leader material based on behavioral objectives?	XXXX	--	--	--	4.0	A. Sorry I'm not sure. If that is what this material is, then I like it. B. If this question means "was there enough interest to eliminate behavioral problems," yes. G. I as a leader had no trouble following material guides; very well organized.
2. What are your feelings about the lesson on propagation?	XXX	X	--	--	3.75	A. Every one of our members is interested in propagation and enjoyed this lesson.
3. What are your feelings about the lesson on judging?	XXX	--	--	--	4.0	A. Field trip to supermarket was fun and a good learning experience for our youth.
4. What are your feelings about the lesson on greenhouse construction?	XXX	X	--	--	3.75	A. Really great
5. What are your feelings about the lesson on plant I. D.?	XXXX	--	--	--	4.0	A. I think it difficult for most members to absorb all this in one lesson. B. Would really like to have more examples listed under leaf shapes.
6. Are the materials adequate to teach the lessons?	XXX	X	--	--	3.75	A. None
7. Are objectives stated in an acceptable manner?	XXX	X	--	--	3.75	A. Yes, if you are working with beginners 10 to 12 years old.
8. Are the suggested activities helpful?	XXX	X	--	--	3.75	A. Yes and I suggest others.
9. Was the list of additional materials helpful?	XXX	X	--	--	3.75	A. We used several; would like some suggestions for judging.
10. Was the list of additional materials adequate?	X	XX	X	--	3.0	A. Would like to see more suggested for members who have special interests. B. For beginners it was excellent.
11. Did you find the list of additional materials available if you requested them?	X	XX	X	--	3.0	A. Yes B. Only 1--in limited number--available through our office. C. All we requested were.
12. Are the information sheets adequate to answer the objectives?	XXXX	--	--	--	4.0	A. Nine

TABLE IX (Cont.)

Response	Ex- cellent	Good	Needs Ad- justment	Poor	Avg. Rating	Comments
13. Can the same lesson be adapted by the leader to different age groups?	XX	X	X	--	3.25	A. We have different age groups in our club and all benefited (even parents). B. We had ages 8 through 16 and they all were attentive and interested throughout. C. For a junior high 4-er who had a course in biology, some of this would be repetitious.
14. Does the information and examples used relate to your actual situation?	XXX	X	--	--	3.75	A. Hort was somewhat unseasonal but the group was awed that each plant had its own I. D. characteristic. B. All worked fine for our group; we can always add more examples.
15. Do the Tour Guidesheets, Job Sheets, etc. add to the lessons?	XXX	X	--	--	3.75	A. Most of the group declared they would include these interests on vacations. B. Yes, I think these are great teaching tools.
16. Are the sketches, diagrams, etc. helpful?	XXXX	X	X	--	4.0	A. Especially good in hobby greenhouse and humidity chambers in propagation.
17. Are sketches and diagrams adequate?	XX	X	X	--	3.25	A. Would rather have larger diagram of methods of propagation--more sketches in judging lesson.
18. Is the test at the end of the lesson useful?	XXX	X	--	--	3.75	A. Helps members realize what they have and have not learned; test is also a teaching method. Sometimes they remember an answer even better after missing an answer and going back and looking it up.
19. What was your members' general reaction to your use of the new Instruction Units?	XXXX	--	--	--	4.0	A. Would you believe? Everyone was excited and anxious to take the test. B. At first they didn't like the idea of test, but when we explained tests were for them to see what they already knew and then to see how much they learned as a result of the study, no protest. C. They found this exciting; had many questions, "how do we, can we, etc."
20. Do the developed modules answer the question: "What do I do at the meeting?"	XXXX	--	--	--	4.0	A. The challenge was sparked in the material; I was eager to see the results of my teaching through the tests. B. Really a big help. C. It helped in keeping the program organized.
21. Is one meeting period adequate time to teach the Unit (without pre-test, etc.)?	XX	XX	--	--	3.5	A. I think two meetings would do this material greater justice. B. Depends on how long the meeting is; two would be better. C. I think by going into more depth all could be expanded 2 or more sessions. But they can be effectively used in a single session for groups that have only a limited time to study horticulture. D. All lessons developed enough interest to justify added periods and follow-up projects.

The two items receiving the lowest rating were in regard to a suggested list of additional material that was used in the units. Leaders were given the opportunity to make comments on the units. Some of these comments indicated the leaders did not have complete understanding of the concept of behavioral objectives. Tables X and XI display these comments.

TABLE X
NON-DIRECTED LEADER RESPONSES REGARDING SPECIFIC UNITS

Unit	Comments
Plant ID	The most difficult lesson for our members. This lesson should be two or even three sessions. Unit should also include collecting and mounting leaf specimens.
Hobby Greenhouse	Our members were very interested in this session. We had never had a lesson on greenhouses though we had discussed them some. This is a very good addition to teaching materials for members with any interest in plants.
Horticulture Judging	We have had several sessions on judging in the past in preparation for judging contest. However, all members felt this unit was helpful. We visited both a supermarket and a greenhouse. These activities were enriched by the Horticulture Judging Activity Sheets.
Plant Propagation	This unit has great interest for all. This can easily be expanded into several sessions. We had members demonstrate the different propagation methods. A slide program on parts of seed and seed germination would be great.

TABLE XI
NON-DIRECTED LEADER RESPONSES OF A GENERAL NATURE
CONCERNING THE UNITS

Responses

1. This evaluation may seem critical; I didn't mean it that way. This is the best we have ever had available. For the beginning horticulturist, there is nothing I could suggest to improve upon it.
 2. I enjoyed the project; the booklets were perfect in outlining our meeting. Since I don't know anything about horticulture, I know it helped me and I'm sure it did the members.
 3. We only wish we had a big drawer full of this type of material on a wide range of material available to us. They are so complete and easy to use. To give a good test of the material, I did not begin to prepare any of the lessons more than 2 days before the meeting. I had no problems at all, even in selecting items to demonstrate or illustrate the lessons.
-

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Introduction

As given in Chapter I, objectives of the study were (1) to identify and rank the horticulture areas in which instructional units should be developed; (2) to develop instructional units and visual aids in four of these areas; (3) to identify four county 4-H programs having organized horticulture clubs to assist in testing these units with their 4-H leaders and members; (4) to determine the effectiveness of these units in teaching 4-H members.

Methodology established for this study involved the following:

1. An assessment of a list of proposed procedures for development of the units by a jury of 17 people with experience in curriculum development.
2. A survey of agents, 4-H leaders, and 4-H members in ten selected counties to determine the areas in which instructional units should be developed.
3. An assessment of 4-H horticulture literature from other states to determine the extent to which behavioral objectives are used.
4. A testing of members' gain scores to determine if there were significant differences when gain scores were stratified in the four following areas: (1) 14 years of age and over as compared to those under 14 years, (2) those having three or more years

experience in horticultural activities as compared to those having less than three, (3) members from rural counties as compared to members from urban counties, (4) members having four or more years of club work as compared to those having less than four years.

5. An evaluation by leaders of the instructional units.

Summary

Summaries of the major findings for each established category are:

1. Responses of the jury who assessed the possible effectiveness indicated the proposed procedures were adequate.
2. The survey of agents, 4-H leaders, and 4-H members to determine horticulture areas in which instructional units should be developed indicated the four areas with the highest priorities were (1) plant identification; (2) horticulture judging; (3) hobby greenhouse; (4) plant propagation.
3. Assessment of literature from other states indicated that no state was currently using behavioral objectives as a basis for writing 4-H horticulture literature. Twenty-six states (76.47 percent) did, however, in some manner express what the member could or should learn from the literature.
4. Testing for significant differences between the gain scores of members having three or more years experience in horticulture activities as compared to those having less than three revealed no significant difference for any of the units. Testing of members having four or more years of club work as compared to those with less than four revealed no significant difference in

any of the units. Testing of gain scores of members aged 14 years and over as compared to those aged under 14 revealed a significant difference for the plant propagation unit. The gain scores of members under 14 years of age were significantly greater than the gain scores of members 14 years and older as indicated by the T-test. Testing of gain scores of members in rural counties compared to members in urban counties revealed a significant difference for the hobby greenhouse unit. Rural county gain scores were significantly greater than the urban county gain scores as indicated by the T-test.

5. An assessment of the evaluation of the units made by the leaders would tend to indicate that their feelings can be considered as favorable toward the units. However, their comments indicated they did not fully understand the concept of behavioral objectives.

Conclusions

The following conclusions are based on findings of the study.

Procedures for Developing Units

Although many different procedures or guidelines could be developed to follow when writing curricula, there are some important points that should be kept in mind. These points include: (1) legitimacy of the kind or type of material being developed by potential users, (2) review of similar literature as well as an understanding of how to write the literature itself, (3) a method of testing the material for possible effectiveness, and (4) a plan that allows for check points as development

of the literature progresses. The procedures used in the development of the units in this study not only did this but also provided a concise explanation of the author's intentions to those who assisted with the study.

Survey to Determine Needed Literature

Present interest in accountability at all levels of education has brought forth many considerations. One of these is the importance of involving those who will actually use literature in the developmental process. The survey of agents, 4-H leaders, and 4-H members to determine the horticultural areas in which units should be developed was an attempt to do this.

The survey revealed that the four areas with the highest priorities were (1) plant identification, (2) horticulture judging, (3) hobby greenhouse, and (4) plant propagation. The competitive nature of Oklahoma 4-H club members would seem to suggest that plant identification and horticulture judging could be expected to receive high priorities. Both of these areas are closely related to the competitive activities in the 4-H horticulture program. Both hobby greenhouses and plant propagation are currently high interest areas with all ages.

The fact that limited literature is available in any of these areas may have also contributed to their receiving high priority ratings, although national 4-H Foundation literature does cover plant propagation.

Survey data showed that while members and leaders rank plant identification first and second, respectively, agents failed to rank it in the top ten. Similarly a rank of fourth for members with regard to plant propagation, while agents and leaders failed to rank this item within the

top nine. Agents and members ranked hobby greenhouse high, while leaders ranked it as a tie for place 10. Again, a high ranking was given horticulture judging by agents and leaders as contrasted to a member ranking of a tie for place 10. In a possible explanation of this diverse pattern of ranking, the following is submitted: (1) plant propagation--agents may have felt the existing national 4-H Foundation literature was adequate, while leaders and members may have felt unable to adapt it to their situation; (2) plant identification--agents may view plant identification as a strict and detailed area that is difficult to teach through the use of publications, while leaders and members may have viewed literature as a starting place to teach identification; (3) hobby greenhouse--leaders may have ranked hobby greenhouse low because they did not view it as a typical project available to a high percentage of their members. They also may see hobby greenhouses as a project they would have to supervise without available time and knowledge to do so. Members may view hobby greenhouses as a new and interesting 4-H project. Agents may have ranked it high because hobby greenhouses can be used as a project to give indepth training to older members; and (4) horticulture judging--agents and leaders may have ranked horticulture judging high because of the demand to prepare judging teams and a feeling of inadequacy in that area. Members possibly ranked it low due to the fact that they are accustomed to receiving instruction in judging from practice sessions, rather than from literature.

Assessment of Literature From Other States

The fact that none of the other states used behavioral objectives as a basis for writing horticulture literature points out the newness of the

concept in 4-H writing. However, the fact that literature from 26 states (76.47 percent) did express what the member could or should learn, indicated a high percentage of the writers did consider potential performance of the member.

Most writers of 4-H horticulture literature are trained as horticulture specialists and may have no formal training in writing other than at a technical or adult level. They may also have no experience as a 4-H agent, leader, or member. Added to this is the fact that the 4-H responsibility is usually a secondary assignment and adequate time is not allowed for development of 4-H literature.

Testing of Units with Different Groups

Testing for significant differences in gain scores when they were stratified in the areas of years of experience in horticulture activities and years in club work revealed no significant difference. This indicates the material is suitable for use with members regardless of the number of years in club work and the number of years experience in horticultural activities.

Testing for significant differences between gain scores when they were stratified as to those from rural counties as compared to those from urban counties revealed a significant difference only for the unit on hobby greenhouses.

The T-test indicated members from rural counties had significantly higher gain scores than members from urban counties on the hobby greenhouse units. This difference might be explained by the fact that members from the urban counties have more experience in the area of hobby greenhouses. Four members of each of the urban counties have hobby

greenhouses at their homes. They had also visited hobby greenhouses as a club. No members from the rural counties had hobby greenhouses at home and only a small percentage of members from one rural county had visited a hobby greenhouse. This situation gave the members from urban counties a greater base of understanding of hobby greenhouses before the test was conducted. This greater understanding of hobby greenhouses decreased the members from urban counties opportunity to make gains in their scores. The T-test indicated the pre-test scores of members from urban counties were significantly higher than pre-test scores of members from rural counties for the hobby greenhouse unit.

Testing for significant difference between gain scores when they were stratified as to those aged 14 years and over as compared to those under 14 revealed a significant difference in the plant propagation unit.

The T-test indicated members under 14 years of age had significantly higher gain scores than those 14 years and older. This difference might be explained by the fact that the majority of members 14 years and older have been exposed to junior high and high school science classes that have taught the principles of plant propagation. This raises their level of understanding of plant propagation to a much higher level than the younger members. This greater understanding of plant propagation decreases the older members' opportunity to increase their gain scores.

The T-test indicated the pre-test scores of members 14 years and older were significantly higher than pre-test scores of members under 14 years of age for the plant propagation unit.

Evaluation of the Units by Leaders

Leaders were asked to express their general feelings about 21 items

concerning the units. Possible responses concerning these items were (1) excellent, (2) good, (3) needs adjustment, and (4) poor. A rating scale of 4.0 for a response of excellent to 1.0 for a response of poor was assigned on the evaluation.

An average rating was computed for each of the 21 items on the evaluation. The highest possible average rating was 4.0, and the lowest possible rating was 1.0. Only two items received a rating as low as 3.0. Those two items were (1) was the list of additional materials adequate? and (2) did you find the list of additional materials available if you requested them?

Possible explanations for low ratings on these items are that no material was written specifically to support these units and no effort was made to make sure they were available in the extension offices of the counties tested.

Comments by the leaders regarding their general feelings about leader material based on behavioral objectives revealed they lacked an understanding of what behavioral objectives actually are.

A possible explanation for this lack of understanding is that their most common use of the word "behavior" refers to members' conduct.

Recommendations

The following recommendations are based on the findings of this study.

It is recommended that more units based on behavioral objectives be developed in horticulture. The areas ranked by agents, 4-H leaders, and 4-H members could serve as a guideline as to the areas which should be developed first. It is further recommended that more units be developed

in the same areas as the four units developed in this study. For example, the unit on hobby greenhouse covers only hobby greenhouse construction. Other units could cover hobby greenhouse operation and producing income from the hobby greenhouse.

Indications from this study that units based on behavioral objectives are effective for teaching 4-H members suggest further study in other 4-H project areas. As in this study, agent, 4-H leaders, and 4-H members should be used in determining the units that should be developed. They could also be used to help determine the project areas in which units should be developed.

Comments by leaders on their evaluations of the units indicated a lack of understanding of behavioral objectives. It is, therefore, recommended that units be developed to teach leaders and agents the principles of behavioral objectives.

BIBLIOGRAPHY

1. Newell, George et al. Chick Embryo Science Program Lesson Plans. Stillwater, Oklahoma: Oklahoma State University Extension Service, Undated Extension Publication.
2. LeGrand, F. E. et al. Plant Science Program Lesson Plans. Stillwater, Oklahoma: Oklahoma State University Extension Service, Undated Extension Publication.
3. Tyler, Ralph W. Basic Principles of Curriculum and Instruction. Chicago, Illinois: The University of Chicago Press, 1950.
4. Popham, James W. and Eva L. Baker. Establishing Instructional Goals. Englewood Cliffs, New Jersey: Prentice-Hall, 1970.
5. Kemp, Jerrold E. Instructional Design, A Plan for Unit and Course Development. Belmont, California: Fearon Publishers, 1971.
6. Patton, Bob. Writing a Unit of Instruction. Stillwater, Oklahoma: State Department of Vocational and Technical Education, 1972.
7. McAshan, H. H. Writing Behavioral Objectives. New York: Harper & Row, Publishers, 1970.
8. Griffith, Henry Vieth. "Formulation of Behavioral Objectives for Training in Selected Ornamental Horticulture Jobs." (Unpublished Ed.D dissertation, Oklahoma State University, 1971.)
9. Neagley, Ross L. and N. Dean Evans. Handbook for Effective Curriculum Development. Englewood Cliffs, New Jersey: Prentice Hall Inc., 1967.
10. Commission on Educational Planning. A Programed Course for the Writing of Performance Objectives. Bloomington, Indiana: Phi Delta Kappa, Inc., 1972.
11. National 4-H Petroleum Power Development Committee. Leaders Guide, North American 4-H Snowmobiling. Washington, D.C.: Federal Extension Service, Undated Extension Publication.
12. Lindsay, Charline. The 4-H Project Leader. Columbia, Missouri: University of Missouri Extension Division, 1972.
13. University of California 4-H Staff. Member Involvement Your Key to Success. Edited by Gladys L. Boone. Berkley, California: University of California Agricultural Extension Service, 1969.

14. Williams, Eugene. Director of 4-H and Youth Development, Oklahoma State University Extension Service. Personal Interview with Writer, Fall, 1973.
15. Lark, Floyd James. "Development and Testing of Selected Curriculum Units for Agricultural Career Awareness in Oklahoma." (Unpublished Ed.D dissertation, Oklahoma State University, 1972.)
16. Henderson, Billie Louis. "Implementation and Evaluation of a Curriculum for Agricultural Career Awareness in Oklahoma." (Unpublished Ed.D dissertation, Oklahoma State University, 1973.)
17. Beach, James Wayne. "A Study of Employment Opportunities and Competencies Needed for Horticultural Occupations in the Tahlequah Area." (Unpublished M.S. thesis, Oklahoma State University, 1972.)

APPENDIX A

LIST OF PROPOSED PROCEDURES

**Proposed Procedures for Developing Units of
Instruction in Horticulture for 4-H Members**

Procedures or Steps

1. Survey agents, 4-H leaders and 4-H members from ten selected counties to determine four areas in which to develop horticulture units.
2. Review literature on writing instructional units based on behaviorial objectives.
3. Review 4-H horticulture literature from as many states as possible to determine the extent to which 4-H literature is written with behaviorial objectives as a basis.
4. Write the four units that were indicated as needed by the survey.
5. Conduct a readability level study on the units and adjust to the desired reading level.
6. Select four counties with organized 4-H horticulture clubs as testing centers.
7. Instruct agents and/or 4-H leaders in the use of the units.
8. Pretest 4-H members.
9. Leaders use the units to teach the members.
10. Post test 4-H members.
11. Evaluate the material based on the tests and make revisions as need indicates.

Approve as written	Approve with modification	Consider questionable	Comments

APPENDIX B

LETTER TO JURY WHO EVALUATED PROCEDURES

COOPERATIVE EXTENSION SERVICE

OKLAHOMA STATE UNIVERSITY
EXTENSION PROGRAMS IN AGRICULTURE



UNIVERSITY EXTENSION
STILLWATER 74074

September 9, 1974

Dear

As a person experienced in curriculum development and course construction, I am requesting your assistance to review proposed procedures for developing units of instruction (semi self-instruction modules) in horticulture for use with 4-H club members.

An attempt is being made to make maximum use of the performance or behavioral objectives concept as a basis for their development. The enclosed eleven steps are proposed as guidelines in developing this project.

Would you review these steps and indicate the degree to which you may approve of each proposed step, considering them as to be followed in sequence.

If you feel other steps should be taken, please indicate them in the space provided.

A self addressed, stamped envelope is enclosed for returning your response.

Thank you for your assistance in this matter.

Sincerely,

Joe M. Maxson
4-H Specialist - Horticulture

cls
Enc.

Mr. Maxson is a doctoral student in Agriculture Education and is attempting to develop these modules as a portion of his research efforts. As his advisor, we will appreciate your response.

Dr. Robert Price, Head
Agriculture Education Department

APPENDIX C

LIST OF NAMES OF JURORS WHO EVALUATED PROCEDURES

LISTING OF INDIVIDUALS SERVING AS A JURY TO ASSESS POSSIBLE
EFFECTIVENESS OF PROPOSED PROCEDURES OR STEPS TO BE
USED IN DEVELOPMENT OF THE INSTRUCTIONAL UNITS

Dr. Bob Resibeck
Exten. Communications Spec.
536 Ag Hall
Stillwater, OK

Merl Miller
4-H Program Spec.
451 Ag Hall
Stillwater, OK

Dr. Eugene Williams
Dir., 4-H & Youth Dev.
449 Ag Hall
Stillwater, OK

Wilma Wendt
4-H Program Spec.
446 Ag Hall
Stillwater, OK

Dr. Bob Patton
Curriculum Spec.
Vo-Tech Educ.
1010 Perky Building
Stillwater, OK

Dr. Pete Braker
Curriculum Spec.
Vo-Tech Educ.
109 Perky Building
Stillwater, OK

Mr. Ronald Meek
Vo-Tech Educ.
1015 Perky Building
Stillwater, OK

Dr. Lloyd Wiggins
Prof., Occu & Adlt. Educ.
406 Classroom Building
Stillwater, OK

Dr. Lloyd Briggs
Dir., Occu & Adlt, Educ.
406 Classroom Building
Stillwater, OK

Dr. Thomas Johnsten
Prof., Curric. & Instruc.
103 Gundersen
Stillwater, OK

Dr. Russell Dobson
Prof., Curric. & Instruc.
306 Gundersen
Stillwater, OK

Dr. Elaine Jorgenson
Prof., Home Economics
110 HEW
Stillwater, OK

Dr. Clyde Knight
Prof., Trade & Ind. Educ.
104 Industrial Arts Bldg.
Stillwater, OK

Dr. Robert Terry
Prof. & Hd., Agri. Educ.
235 Ag Hall
Stillwater, OK

Dr. Robert Price
Prof. & Hd., Emeritus
Ag Educ. Dept.
235 Ag Hall
Stillwater, OK

Dr. James P. Key
Prof., Agric. Educ.
235 Ag Hall
Stillwater, OK

Dr. Jack Pritchard
Asst. Prof., Ag. Educ.
235 Ag Hall
Stillwater, OK

APPENDIX D

LIST OF COUNTIES AND AGENTS ASSISTING IN
DETERMINING AREAS IN WHICH TO
DEVELOP UNITS

COUNTY PERSONNEL FROM WHOM ASSISTANCE WAS SOLICITED IN IDENTIFYING
THOSE AREAS IN HORTICULTURE WHERE THE GREATER NEED FOR THE
DEVELOPMENT OF INSTRUCTIONAL UNITS IS TO BE FOUND

<u>County</u>	<u>Personnel</u>
Garfield	L. D. Warkentin
Woodward	George Salwaechter
Roger Mills	Freddie Smith
Kay	James Thomas
Oklahoma	L. B. McClure
Tulsa	Tom Stiles
Bryan	Cecil Dowell
LeFlore	Hugh Hepgen
Comanche	Lyndal Whitworth
McClain	Charles Philps
Jackson	Robert Reeder

APPENDIX E

SURVEY SENT TO AGENTS, LEADERS,
AND MEMBERS

To: Selected Extension Agents, 4-H Leaders and 4-H Members

Name _____

Check One: Agent _____ Leader _____ Member _____

An effort is being made to develop new and more motivating units of study in 4-H horticulture. Plans are to develop this study materials into self-contained instructional units that will include reference material, visuals, lesson plans and objectives for each unit.

Efforts are being made to determine the areas around which instructional units should be developed. Enclosed is a list of potential areas for instructional units. As a person who has had experience in both horticulture and 4-H, would you rate the areas you feel are most important by numbering them 1 through 10, that is place #1 beside the area you feel the most important, #2 by the next most important, etc. Remember, importance in this case means the ones most needed to be developed into instructional units for 4-H.

- | | |
|--|---|
| <input type="checkbox"/> Plant Propagation | <input type="checkbox"/> Community Landscape Programs, Playground Renovation, Rest Stop, Cleanup and Planting, etc. |
| <input type="checkbox"/> Window Box or Mini Garden | <input type="checkbox"/> Types or Kinds of Vegetables |
| <input type="checkbox"/> How to Identify Plants | <input type="checkbox"/> Greenhouse Vegetable Production |
| <input type="checkbox"/> Importance of Horticulture in Oklahoma | <input type="checkbox"/> Herbarium Collection |
| <input type="checkbox"/> Terrariums | <input type="checkbox"/> Horticulture Judging |
| <input type="checkbox"/> Horticulture Soils | <input type="checkbox"/> Growing Small Fruits |
| <input type="checkbox"/> Fertilization of Horticulture Crops | <input type="checkbox"/> Flower Arrangement |
| <input type="checkbox"/> Hobby Greenhouses | <input type="checkbox"/> Growing Annuals |
| <input type="checkbox"/> How Plants are Pollinated | <input type="checkbox"/> Pruning Ornamental Plants |
| <input type="checkbox"/> Scale Drawing Landscape Plans | <input type="checkbox"/> Insects and Diseases of Ornamentals |
| <input type="checkbox"/> Preparing A Seedbed | <input type="checkbox"/> The Lawn and Its Care |
| <input type="checkbox"/> Experiments You Can Do With Plants. (Self Determined) | <input type="checkbox"/> Care of House Plants |
| <input type="checkbox"/> How Plants Use Light, Water, Air | <input type="checkbox"/> Basic Home Landscape Improvement Cleanup, Planting Flowers, etc. |
| <input type="checkbox"/> Vegetables for Oklahoma | Others (Specify) |
| | _____ |
| | _____ |
| | _____ |

Please place this form in the envelope provided and place it in the mail. Thank you for your assistance.

APPENDIX F

METHOD TO FOLLOW IN SELECTING
MEMBER TO RESPOND

Dear Agent:

Thank you for agreeing to assist in completing the enclosed survey. Please complete one copy yourself and use the following outline for selecting the leader and member who complete it.

1. Select a leader based on his or her willingness to participate.
2. Ask the leader to list their club members in alphabetical order.
3. From the table below pick the number which is nearest to the total number of club members with horticulture projects--but which does not exceed this number. From the alphabetical list select the student with the number corresponding to the number selected.

<u>Number of Members With Hort. Projects</u>	<u>Number of the Student Who Is to Respond</u>
Over 35	7
35	21
25	9
15	11
5	2

Example:

The number of club members enrolled in horticulture is 17. This is nearest to 15 but it does exceed 15. Therefore give the form to No. 2.

Thank you for your willingness to assist in this survey.

Sincerely,

Joe Maxson

APPENDIX G

LETTER REQUESTING LITERATURE FROM OTHER STATES

COOPERATIVE EXTENSION SERVICE

OKLAHOMA STATE UNIVERSITY

4-H AND YOUTH DEVELOPMENT PROGRAMS



UNIVERSITY EXTENSION

STILLWATER 74074

January 22, 1974

TO ALL STATE LEADERS OF 4-H YOUTH DEVELOPMENT

Dear Co-worker:

We are in the process of attempting to organize and develop 4-H programs and literature in the area of horticulture and plant science here at Oklahoma State University. As a part of this effort, we are reviewing as much existing literature as possible, both in an effort to avoid duplication and seeking new ideas.

To help us with this study, we would appreciate single copies of any material that your state is now using in these areas. We are especially searching for:

1. General plant science literature for 4-H and other youth.
2. Horticulture literature for 4-H and other youth
3. Information on special programs, short term programs, camp themes, urban programs, etc., dealing with 4-H horticulture programs

I realize that you don't handle the literature development in this area, so please hand this to the individual responsible. In the event any of you would like a copy of our summary, let us know and we will oblige.

Please send the material to me at Oklahoma State University, Room 448 Agricultural Hall, Stillwater, Oklahoma 74074.

Sincerely,

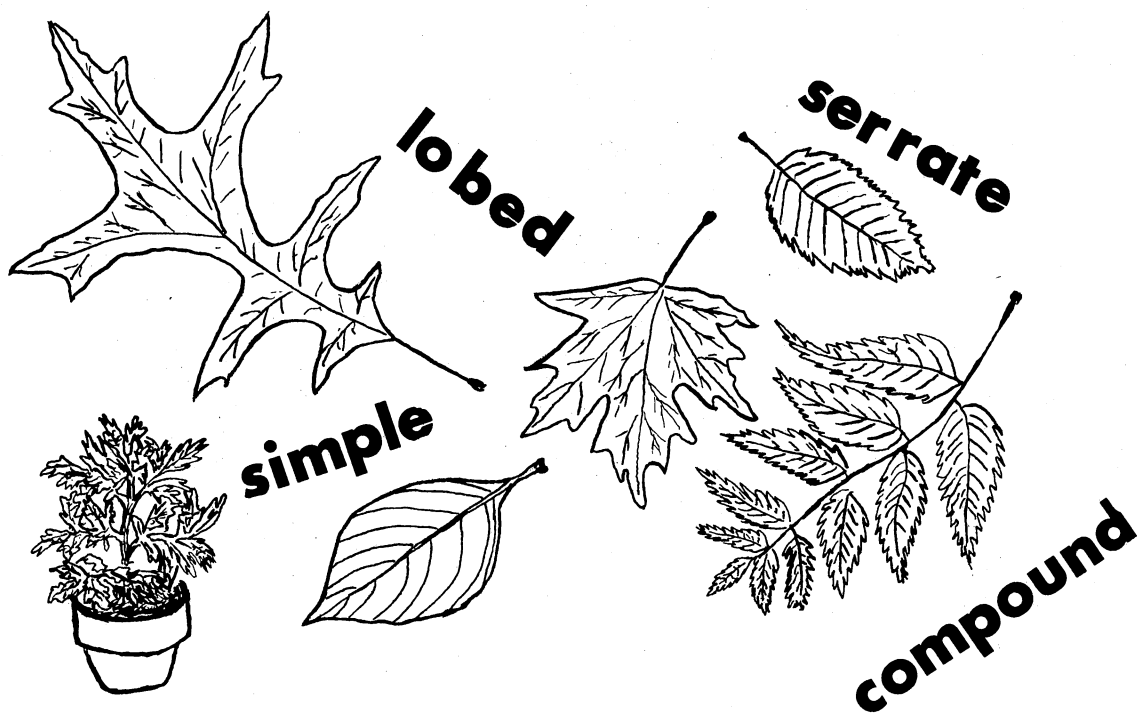
Eugene Williams, Director
4-H and Youth Development Programs

EW:rh

APPENDIX H

COPIES OF THE FOUR HORTICULTURE UNITS

4-H HORTICULTURE



PLANT IDENTIFICATION

UNIT - PLANT IDENTIFICATION
by Joe Maxson

OVERALL OBJECTIVES

After completion of this unit, the member should have a general knowledge of how leaves, plant types, and growth forms are used to describe and identify plants.

SPECIFIC OBJECTIVES

After completion of the unit, the member should be able to:

1. Tell how to select a whole leaf.
2. Label the parts of a leaf on a sketch.
3. List 4 characteristics of leaves that can be used to describe or identify plants.
4. List the difference between deciduous and evergreen leaves.
5. List the difference between simple and compound leaves.
6. Draw two types of compound leaves.
7. Match the 7 leaf shapes with sketches made of that shape.
8. Name three types of leaf margins.
9. Sketch and name three leaf vein types.
10. Define or sketch alternate and opposite leaves.
11. Name three growth forms plants can be divided into.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

- A. Objective sheet.
- B. Activity sheet.
- C. Information sheet.
- D. Test.

SUGGESTED ACTIVITIES

I. Instructor:

- A. Provide students with objective, assignment, and information sheets.
- B. Discuss terminal and specific objectives with students.
- C. Collect samples of leaves to use when discussing leaf types, parts, etc.
- D. Encourage students to begin a leaf collection as a part of this lesson.
- E. Assign older members the job of helping collect samples of leaf types, shape, etc.

II. Student:

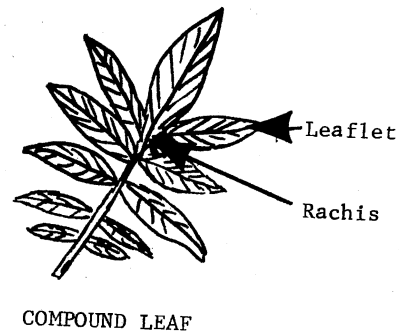
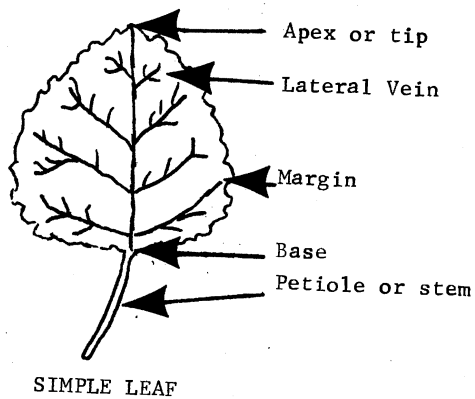
- A. Study objectives.
- B. Study information sheet to answer objectives.
- C. Learn the name of a plant that has leaves of both types discussed.
- D. Begin a herbarium collection.
- E. Select leaves that show the different characteristics.

ADDITIONAL MATERIALS

- I. Landscape Plant Materials for Oklahoma, by J. C. Garrett. Available through O.S.U. Extension Center.
- II. 4-H Horticulture Literature - The Herbarium Card. Available through O.S.U. Extension Center.

INSTRUCTION SHEET

1. Many plants such as pecan, Nandina, and Rose, have compound leaves. When describing leaves you must describe the whole leaf rather than just a leaflet. To know whether or not you have collected a whole leaf or just a part of the leaf, start at the tip of the leaf and trace backward to the stem. Where the leaf stem attaches to the main twig of the plant, it will spread out and grasp the branch, or it will be enlarged or swollen at the point of attachment. If the leaf is either joined without a stem to the twig, or if the stem is perfectly straight and there is no obvious stem swelling or change in size, then you do not have an entire leaf.
2. Parts of a leaf.



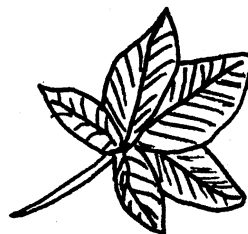
3. Characteristics of leaves that can be used for identification:
 1. Size
 2. Color
 3. Shape
 4. Compound or simple
 5. Surface texture - (waxy, hairy, smooth, rough)
 6. Veins
 7. Spines
4. Deciduous plants are those that drop or lose their leaves in winter. Evergreen plants are those that normally keep their leaves all year.

5. Compound leaves - consist of a number of separate blades called leaflets. Simple leaf - a leaf with only one blade.

6. Two types of compound leaves are:

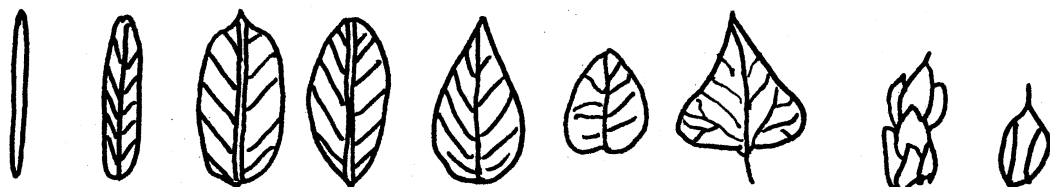


PINNATELY-COMPOUND LEAF



PALMATELY

7. Leaf shapes and plants having those leaf shapes:



NEEDLE
Pine
Fir

LINEAR
Willow

OBLONG
Burford
Holly

ELLIPTIC
Rose

OVATE
Lilac

HEART-
SHAPED
Redbud
Heartleaf
Philodendron

DELTOID
Cottonwood

AWL or SCALE
Cedar
Juniper

8. Leaf margins:



ENTIRE or
SMOOTH

Dogwood
Magnolia



SERRATE
or
TOOTHED

Elm



LOBED

Oak
Maple
Sweetgum

9. Leaf vein types:



PARALLEL

Most plants with
blade type leaves



NET

Most plants other
than those with
blade type leaves

10. Leaf arrangement - alternate leaves are those in which only one leaf attaches to the stem in one location. Opposite leaves are those in which a leaf is attached on each side of the stem.



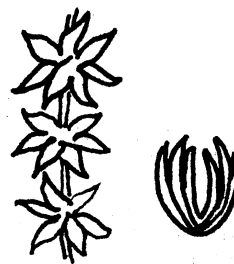
ALTERNATE

Firethorn
Holly
Begonia



OPPOSITE

Forsythia
Euonymus



WHORLED or ROSETTE

Airplane Plant
Mother-in-laws Tongue
Cabbage

11. Growth forms or habits:

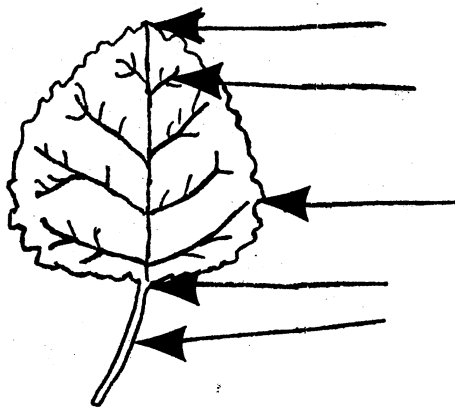
Tree - plants with a single stem whose mature size usually exceeds 20 feet.

Tree-Shrub - plants with single or multiple stems whose mature size is usually below 20 feet.

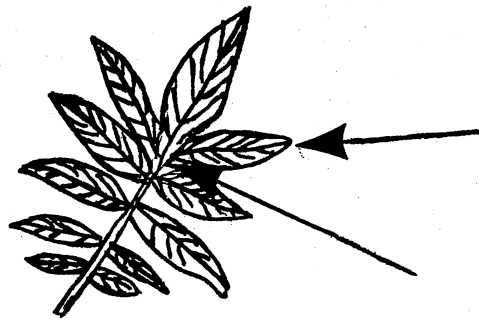
Shrubs, multiple stem plants of varying heights, vines, plants with climbing, flexible stems, ground covers, low spreading or scrambling plants that usually spread aggressively.

TEST

1. How can you tell a whole leaf from a leaflet?
2. Label the leaf parts on the sketches below.



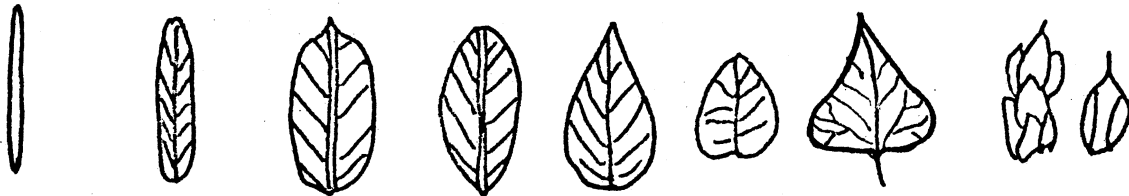
SIMPLE LEAF



COMPOUND LEAF

3. List 4 characteristics of leaves that can be used to describe or identify plants.
 1. _____
 2. _____
 3. _____
 4. _____
4. What is the difference between evergreen and deciduous plants?
5. What is the difference between simple and compound leaves?
6. Sketch and label two types of compound leaves.

7. Match the name of the leaf shape with the sketches below:



-
- | | | | |
|------------|------------------|------------|------------------|
| (a) Oval | (c) Needle | (e) Ovate | (g) Deltoid |
| (b) Linear | (d) Heart-shaped | (f) Oblong | (h) Awl or Scale |

8. List three types of leaf margins:

- 1.
- 2.
- 3.

9. Sketch and name two leaf vein types:

10. Define or sketch alternate and opposite leaves:

11. Name and describe 3 growth forms plants can be divided into:

- 1.
- 2.
- 3.

BONUS QUESTIONS

A. Name a plant that has a leaf shape listed below:

Oval	_____	Ovate	_____
Linear	_____	Oblong	_____
Needle	_____	Deltoid	_____
Heart-shaped	_____	Awl or Scale	_____

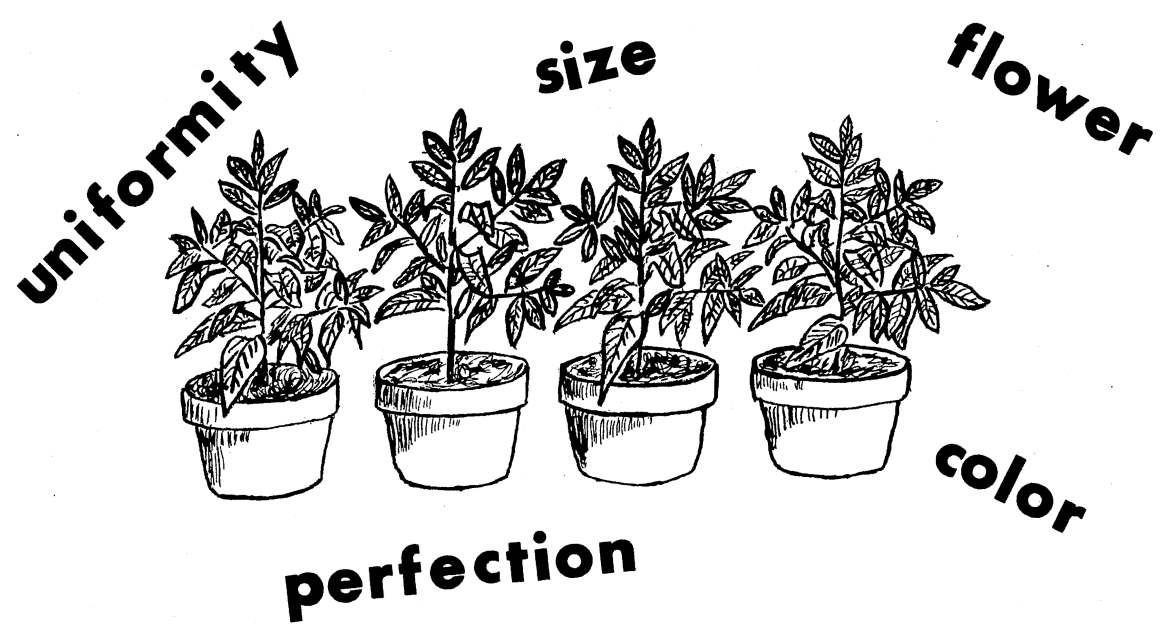
B. Name a plant with each of the following leaf margins:

1. Lobed _____.
2. Serrate or toothed _____.
3. Entire or smooth _____.

C. Name a plant with the following leaf arrangement:

1. Alternate _____.
2. Opposite _____.

4-H HORTICULTURE



HORTICULTURE JUDGING

UNIT - HORTICULTURE JUDGING
by Joe Maxson

TERMINAL OBJECTIVES

After completing this unit, the member should have an understanding of the factors to be considered when judging food crops and ornamentals.

SPECIFIC OBJECTIVES

Upon completion of this unit, the member should be able to:

1. Describe or sketch how a class of horticulture produce is set up to be judged.
2. Demonstrate the procedures to follow when judging a class of ornamentals or food crop. This should be done to the leader's satisfaction.
3. Name 5 factors to be considered when judging ornamentals and match them with their definition.
4. Tell which of these 5 factors is the most important.
5. Name 5 factors to be considered when judging food crops and match them with their definition.
6. Tell which of these 5 factors is most important.
7. Define quality as you use in in judging.
8. Name 3 of the 5 things that would cause you to place a plate of apples low.
9. Name 3 of the 5 things that would cause you to place a plate of onions low.
10. Describe a can of cut flowers that would place high.

SUGGESTED ACTIVITIES**Instructor:**

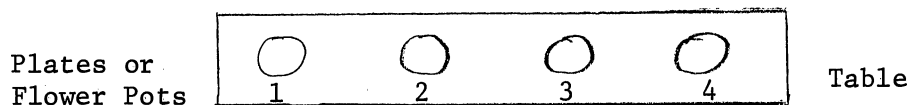
1. Pass out information sheets and discuss objectives with members.
2. Set up a class of a horticulture food crop (apples, potatoes, or onions) and a class of ornamentals (canned nursery stock, cut flowers, or pot plants) to discuss when teaching this unit. Look over these judging classes and be ready to discuss the good points and/or bad points of each specimen.
3. Pass out judging cards and explain the use of them. (May wish to let older members do this).
4. Discuss the information sheet with members.
5. Allow students to take the information sheets home for study. Advise them they will be tested over it at the beginning of the next class.
6. Give the test at the beginning of the next class.

Student:

1. Study the objectives and information sheet.
2. Ask instructor questions about those objectives you do not understand.
3. Look over the judging classes the instructor sets up and pick out the good points and bad points about the different specimens.
4. Go to the supermarket and nursery or greenhouse and fill out the activity sheet.
5. Take the objective sheet and information sheet home and prepare for a quiz to be given at the next meeting.

INFORMATION SHEET

1. A horticulture judging class consists of 4 specimens or plates numbered 1 through 4, which the member placed in order of quality. The specimens are numbered 1 through 4, or A through D, from left to right.



2. When learning to judge you should develop a method to use for selecting your placings. Here is one procedure you might use:
- a. Back away from the table and look at all the specimens at once. Compare their overall appearance.
 - b. Look at each specimen individually. Notice for good and bad points about each specimen.
 - c. Pick out the one you think is best and write its number on your card. For example, let's say #3 looked like the best of the 4. Write #3 on your card.
 - d. Select the specimen you think is poorest of the 4 and write that number down about 1 inch from the first number. For example, let's say #1 was the poorest specimen. #3 #1
 - e. Next you have to decide which of the remaining specimens are second and third best. For example, let's say #2 is better than #4. Write #2 next to #3 and then write #4 next. Your placings would be 3 2 4 1.
 - f. Look over the specimens closely to make sure you have them placed like you want them.
 - g. Place a check or X on the judging card next to the 3 2 4 1 placing.
 - h. Before turning in your card make sure all information is given that is required on the card.
3. Five factors to consider when judging ornamentals are:
- a. Cultural Perfection: refers to quality, uniform growth, and development; strong stems, healthy foliage, and/or fresh, well-formed flowers; freedom from bruise, blemish, nutritional

deficiency, insect or disease damage. Pots or containers should not be rusty or rotten.

- b. **Uniformity of Foliage and Flower:** leaves and flowers well developed and distributed over or through the plant. No gaps in flower mass or long bare spaces on stems. Pot plants or shrubs should be multi-branched or stemmed with foliage uniformly covering the stems.
 - c. **Color:** uniform, intense, clear color of flower and foliage; true to variety.
 - d. **Size of Plant:** deduct points for oversized or undersized development in relation to pot size.
 - e. **Flower Size or Plant Form:** deduct points for oversized or undersized flowers or poor plant habit (one sidedness, etc.) in pot.
4. Cultural perfection is the most important factor in judging ornamentals. This is the most important factor in determining quality or salability of the plant.
5. Five quality factors to consider when judging food crops are:
- a. **Market Condition:** refers to firmness, freedom from sprouts or regrowth, shriveling. Also freedom from insect, disease, and mechanical damage.
 - b. **Uniformity:** same size, shape, color, degree of maturity, etc.
 - c. **Color:** the most acceptable commercial color shall be ranked highest. Color should be bright and lively.
 - d. **Size:** the most acceptable commercial size for the particular fruit or vegetable will be considered ideal.
 - e. **Form:** typical form for the particular variety of fruit or vegetable will be considered ideal.
6. Condition is the most important factor in judging food crops. Condition determines quality and how well the produce will keep.
7. Quality refers to the market condition of the specimen being judged. Is it the kind of food crop or ornamental that you would buy yourself?
8. Reasons for placing a plate of apples low are:
- a. Bruises, cuts, or other mechanical injury.
 - b. Color variation.
 - c. Apples not uniform.

- d. Stem removed from apple
 - e. Evidence of insect damage.
9. Things that would cause you to place a plate of onions low are:
- a. Softness at the stem.
 - b. Cuts or other mechanical damage.
 - c. Outer skin peeled off.
 - d. Mud or dirt.
 - e. Some of the onions too small or too large.
10. Things that would cause cut flowers to be placed high are:
- a. Flowers have good, even color.
 - b. Foliage has crisp, fresh look.
 - c. No insect damage to flower or foliage.
 - d. All flowers open the same amount.
 - e. Flowers have fresh appearance; not wilted.

HORTICULTURE JUDGING ACTIVITY SHEET

- I. Go to the produce department of a supermarket and look at the fruits and vegetables listed below. Check those things you find wrong with them.

Apples

- | | |
|---|---------------------------------------|
| <input type="checkbox"/> Mechanical damage. | <input type="checkbox"/> Rotten spots |
| <input type="checkbox"/> Stems removed | <input type="checkbox"/> Over ripe |
| <input type="checkbox"/> Insect damage. | <input type="checkbox"/> Bad color |
| <input type="checkbox"/> Dirty or unclean. | |

Potatoes

- | | |
|--|--|
| <input type="checkbox"/> Mechanical damage | <input type="checkbox"/> Sprouting |
| <input type="checkbox"/> Insect damage | <input type="checkbox"/> Warts or knobs indicating regrowth. |
| <input type="checkbox"/> Disease or rot | <input type="checkbox"/> Dirty or unclean. |

Onions

- | | |
|---|--|
| <input type="checkbox"/> Mechanical damage. | <input type="checkbox"/> Outer skin removed or peeled. |
| <input type="checkbox"/> Insect damage | <input type="checkbox"/> Dirty or unclean. |
| <input type="checkbox"/> Rot or soft around stem. | |

- II. Go to a nursery or greenhouse and look at plants. Check the items you find wrong that are listed below.

Canned Nursery Stock

- | | |
|--|--|
| <input type="checkbox"/> Insects or insect damage | <input type="checkbox"/> Container old and rusting. |
| <input type="checkbox"/> Mechanical damage (broken limbs, bark damage, etc.) | <input type="checkbox"/> Plants appear old and shabby. |
| <input type="checkbox"/> Dull leave indicating need for fertilizer and/or water. | <input type="checkbox"/> Plants lack rich green color. |
| <input type="checkbox"/> Plant too large for container | <input type="checkbox"/> Plants not well filled out. |

_____ Container root bound.

II. Cont.

Pot Flowers or Cut Flowers

_____ Plants wilted from lack of water.

_____ Mechanical damage.

_____ Insect damage.

_____ Discolored leaves.

_____ Petals falling from flowers.

_____ Flowers drooping.

_____ Flowers not uniform in size or same plant.

_____ Lack of good color of foliage or flower.

POST TEST

1. Describe or sketch how a horticulture judging class is set up.

2. Write in the factors to consider when judging ornamentals next to their definitions.

Cultural perfection
 Uniformity of foliage and flowers
 Color
 Size of plant
 Flower size and plant form

- _____ Refers to quality, uniform growth and development, long stems, healthy foliage, and/or fresh, well formed flowers; freedom from bruises, blemish, nutritional deficiency, insect or disease damage. Pots or containers should not be rusty, dirty, or rotten.
- _____ Uniform, intense, clear color of flower and foliage, true to variety.
- _____ Deduct points for oversized or undersized development in relation to pot size.
- _____ Deduct points for oversized or undersized flowers or poor plant habit (one-sidedness, etc.) in pot.
- _____ Leaves and flowers well developed and distributed over or through the plant. No gaps in flower mass or long, bare spaces on stems. Pot plants should be multi-stemmed, with foliage uniformly covering the stems.
3. Which of these five factors is most important?

 4. Write in the factors to consider when judging food crops next to their definition.

Market condition
 Uniformity
 Color
 Size
 Form

_____ Typical form for the particular variety of fruit or vegetable will be considered ideal.

_____ The most acceptable size for the particular fruit or vegetable will be considered ideal.

_____ Same size, shape, color, degree of maturity, etc.

_____ The most acceptable color shall be ranked the highest. Color should be bright and lively.

_____ Refers to firmness, freedom from sprouts or regrowth, shriveling. Also freedom from insect, disease, and mechanical damage.

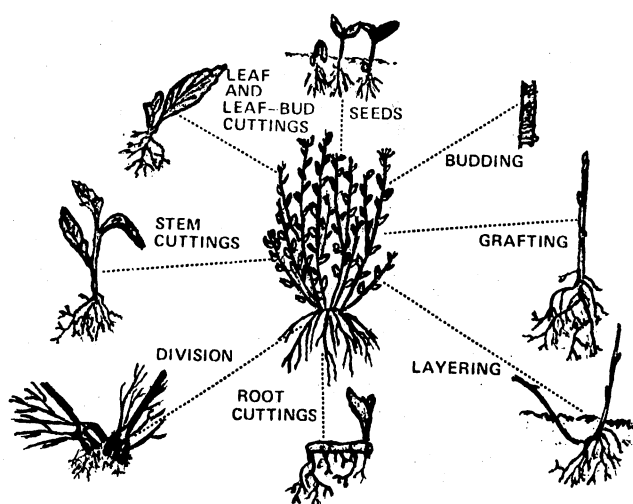
5. Which of these five factors is most important?
6. Define quality as you use it in judging.
7. Name 3 of the 5 things that would cause you to place a plate of apples low.
8. Name 3 of the 5 things that would cause you to place a plate of onions low.
9. Describe a can of cut flowers that would place high.

JOB SHEET

1. Demonstrate to your 4-H leader (or someone assigned by the leader) procedures to follow when judging a class of ornamentals or food crop.

Check #2 on your information sheet for instructions.

4-H HORTICULTURE



PLANT PROPAGATION

UNIT - PLANT PROPAGATION
By Joe Maxson

TERMINAL OBJECTIVES

Upon completion of this unit, the member should have a general knowledge of the different methods of Plant Propagation. They should also be able to construct growth chambers for rooting cuttings and germinating seeds.

SPECIFIC OBJECTIVES

Upon completion of this unit, the member should be able to:

1. Define propagation.
2. Match the methods of plant propagation with a sketch showing the different parts of a plant.
3. List the parts of a seed on a sketch.
4. Name three things required to germinate seed.
5. What is the best temperature for most seed to germinate?
6. Tell why some plants are not reproduced by seed.
7. Tell why high humidity is important to rooting cuttings.
8. Describe one method of constructing a humidity chamber for rooting cuttings or germinating seeds.
9. Name four plants that root easily from cuttings.
10. Name two different mixes or media that can be used for rooting cuttings.
11. Demonstrate the procedures for propagating plants by two methods. May use seeds, cuttings, layering, division, etc.

SUGGESTED ACTIVITIES

I. Instructor:

- A. Provide members with objectives, assignment, and information sheet.
- B. Discuss terminal and specific objectives with members.
- C. Demonstrate different methods of propagation (resource people or older members may do this). Check information sheet and 4-H Plant Reproduction Booklet for guidelines.
- D. Show samples of plants that are easy to propagate.
- E. Instruct members to try at least 2 methods of propagation.
- F. Instruct members to take units home and study for a quiz at the next meeting.

II. Members:

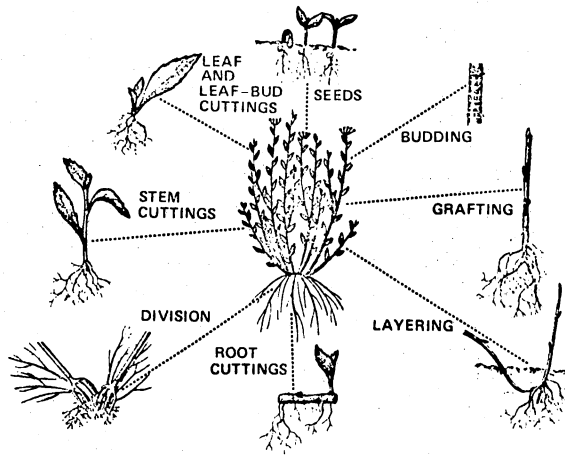
- A. Study objectives.
- B. Study information sheet to answer objectives.
- C. From what you learn in class and from instructions in your information sheet, propagate plants using two different methods. You may do this at home.
- D. Take the unit home and prepare for a quiz at the next meeting.

INSTRUCTIONAL MATERIALS

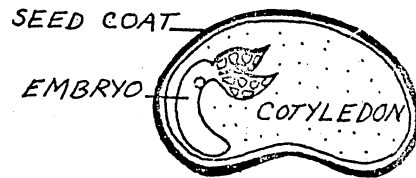
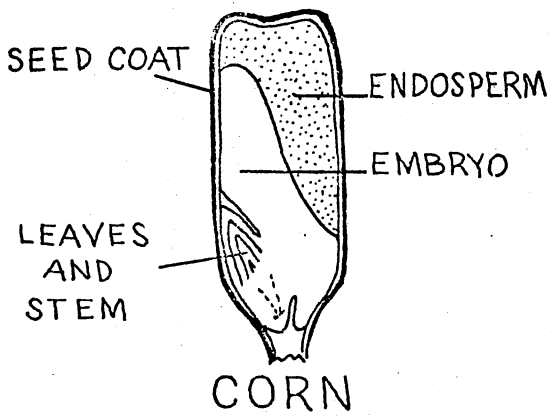
- I. Included in this unit:
 - A. Objective Sheet
 - B. Information Sheet
 - C. Test
- II. Additional Materials:
 - A. 4-H Club Members Manual #2, Plant Propagation
 - B. O.S.U. Fact Sheet #6200, A Calendar for Pecan Growers
 - C. O.S.U. mimeograph, Starting a Seed Flat

INFORMATION SHEET

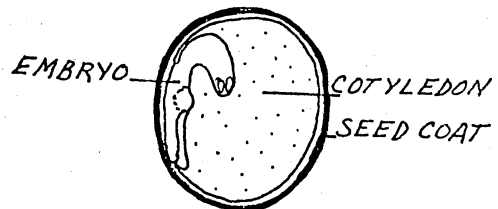
1. The word propagation means to reproduce plants by seeds or vegetative means.
2. The methods of plant propagation are:



3. The parts of a seed are:

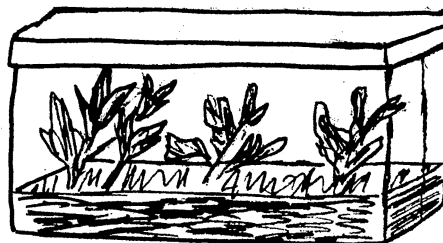
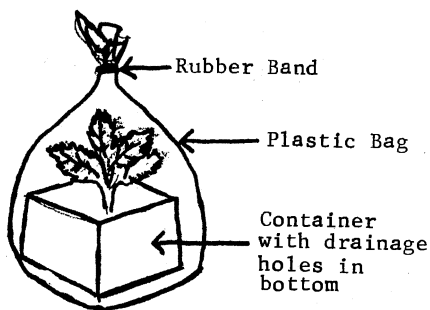


BEAN

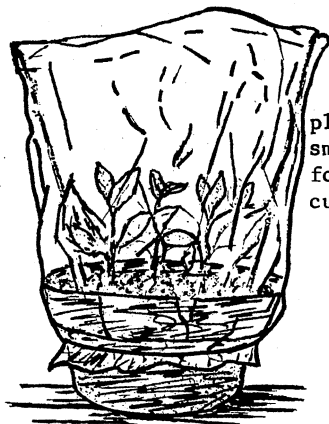


PEA

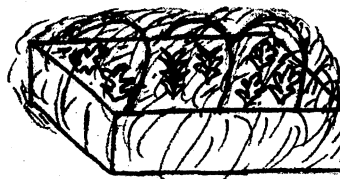
4. Three things required for seeds to germinate are:
1. Moisture
 2. Correct temperature
 3. Air
5. Most seed germinate best at a temperature of 60° to 65°F.
6. Some plants cannot be reproduced from seed because their seed do not produce plants true to variety. An example is if you plant improved varieties of (paper shell) pecans, the plants that grow from these seed may produce small native pecans.
7. High humidity is important to rooting cuttings to keep cuttings from drying out. If air around the cutting is dry, the leaves give off more moisture than the unrooted stem can take up.
8. The following are four types of humidity chambers that will make rooting cuttings and germinate seeds.



Plastic refrigerator box makes a good rooting chamber for cuttings.



Flower pot covered with plastic bag makes small "greenhouse" for rooting a few cuttings.



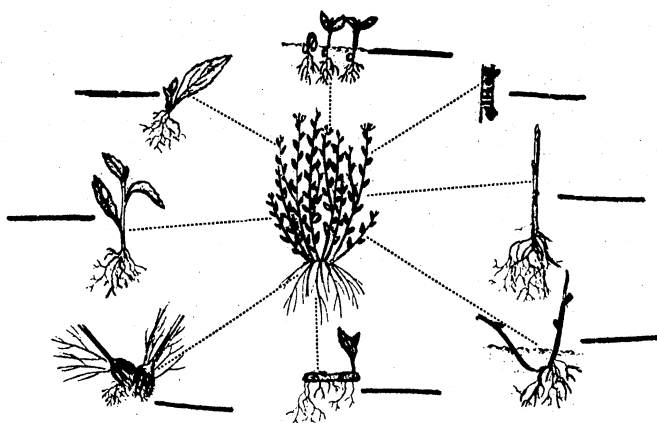
A box 4" deep, filled with sand or soil and covered with plastic can be used to root cuttings or start seeds.

9. Some plants that root easily from cuttings are: Jews, Begonia, Swedish Ivy, Coleus, Needle Point Ivy, Geranium, Artillery Plant, and Velvet Plant.
10. Rooting mixes or media that can be used to root cuttings in are:
 - A. 1/2 peat moss and 1/2 vermiculite
 - B. Builders sand (from lumber yard)
 - C. Vermiculite
 - D. 5 parts sand, 1 part peat moss

POST TEST

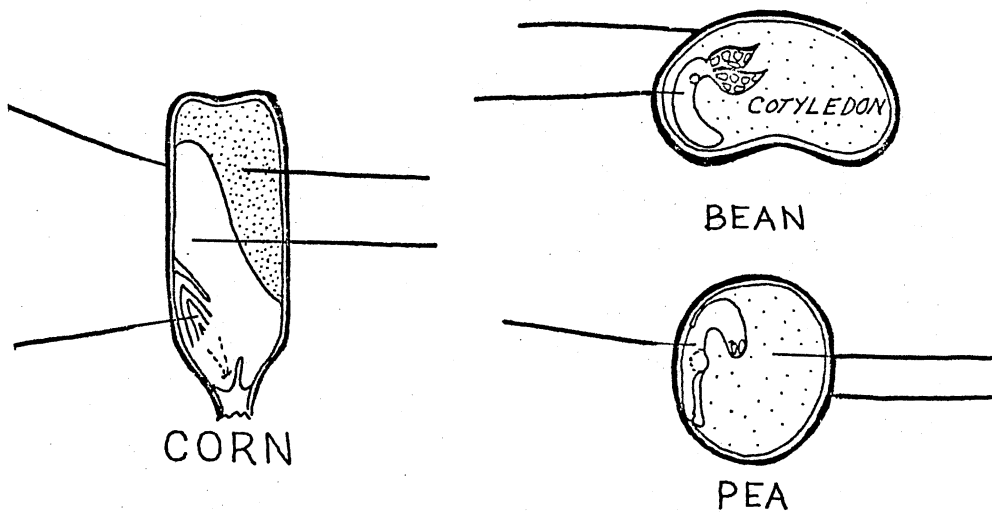
1. Define propagation.

2. Match the methods of plant propagation with this sketch.



- A. Seeds
- B. Budding
- C. Grafting
- D. Root Cuttings
- E. Division
- F. Layering
- G. Leaf and Leaf-bud cuttings
- H. Stem Cuttings

3. Name the parts of the seed below:



4. Name three things required for seeds to germinate.
5. What temperature is best for most seeds to germinate?
6. Why are some plants seldom, if ever, reproduced by seed?
7. Why is high humidity important to rooting cuttings?
8. Name four plants that root easily:
 - 1.
 - 2.
 - 3.
 - 4.
9. Name two different media that can be used to root cuttings.
 - 1.
 - 2.

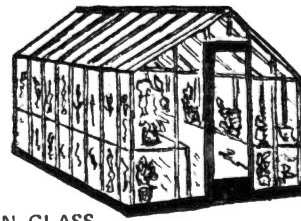
JOB SHEET

1. Demonstrate to your leader's satisfaction your ability to build a humidity chamber for rooting cuttings or germinating seeds. (Check #8 in your information sheet for ideas.)

4-H HORTICULTURE



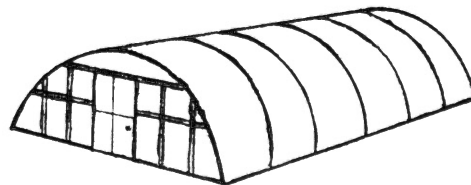
FULL-SPAN
WITH WALLS



FULL SPAN GLASS
TO GROUND



LEAN-TO



QUONSET

HOBBY GREENHOUSE CONSTRUCTION

UNIT - HOBBY GREENHOUSE CONSTRUCTION
By Joe Maxson

TERMINAL OBJECTIVES

After completion of this unit, the member should have a general knowledge of construction, heating, and cooling of a hobby greenhouse.

SPECIFIC OBJECTIVES

After completion of the unit, the member should be able to:

1. Tell the difference between a hobby and commercial greenhouse.
2. Name three of the four types of hobby greenhouses listed in the information sheet.
3. List three things that influence the location of the greenhouse.
4. Name three kinds of lumber that are somewhat resistant to rot.
5. Name a material used to treat pine to make it more resistant to rot.
6. Name three covering materials that can be used on a hobby greenhouse.
7. Tell why two layers of film plastic are sometimes used to cover greenhouses.
8. Define U.V. Resistant film plastic.
9. List three types of energy used to heat a greenhouse and list one advantage and one disadvantage of each energy type.
10. List two methods of cooling a hobby greenhouse.
11. Identify size lumber used for hobby greenhouse framing.
12. What should be the pitch of a greenhouse roof?
13. Name three things to consider when planning the arrangement inside the greenhouse.
14. Name three things that help determine size of a hobby greenhouse.
15. Name three benefits of a hobby greenhouse.

INSTRUCTIONAL MATERIALS

I. Included in this unit:

- A. Objective sheet
- B. Information sheet
- C. Test
- D. Field trip work sheet

II. Additional materials:

- A. Building Hobby Greenhouses, U.S.D.A. Agricultural Information Bulletin #357, U.S. Department of Agriculture.
- B. Slides and mimeographs available from OSU, Horticulture Department.

SUGGESTED ACTIVITIES

I. Instructor:

- A. Provide members with objective, assignment, and information sheets.
- B. Discuss terminal and specific objectives with members.
- C. Discuss hobby greenhouses located in your area.
- D. Secure and show to members types of lumber, plastic, fiberglass, etc. used in greenhouse construction.
- E. Plan a field trip to a local hobby greenhouse and discuss the field trip work sheet before leaving.
- F. Have members individually or as a group build a model hobby greenhouse from balsa wood or other material.
- G. Instruct members to take unit home and study for a quiz at the next meeting.

II. 4-H Member:

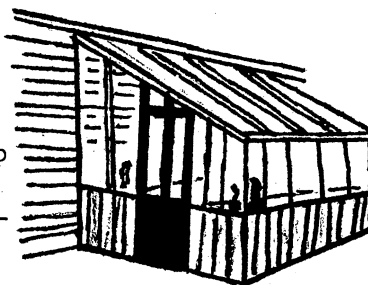
- A. Study objectives.
- B. Study information sheet to answer objectives.
- C. Attend class field trip if planned.
- D. Take unit home and prepare for a quiz at next meeting.

INFORMATION SHEET

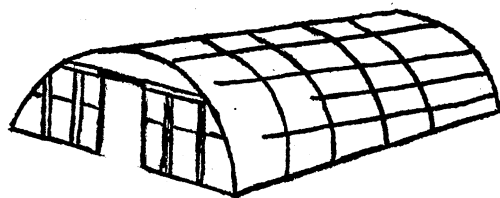
1. A hobby greenhouse is usually considered to be one that is used to take up leisure time and is operated for enjoyment. Although one may sell some of the plants produced, it is not a major source of the family income. A commercial greenhouse is one that is operated as a business and is a major source of family income.
2. There are many types of hobby greenhouses. The kind used depends upon personal preference, cost, material available, space and what you wish to do with the house.

Some Types of Hobby Greenhouses:

- A. Lean-to: This house is built on to the side of an existing building. It is usually cheap to build and is closer to electric, water, and heat outlets.

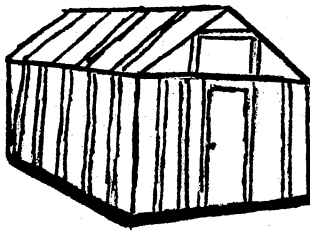
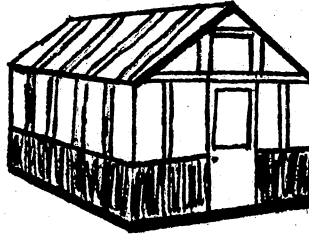


When possible, lean-to houses should be on the south side of the existing building. The north side of buildings should be avoided because they do not provide enough light.



- B. Quonset or Semicircle houses are usually cheap to build and easy to cover.

- C. Full-span with walls:
 This type greenhouse is free standing and has wood or concrete walls to bench height. Plants cannot be grown under benches due to lack of light. This space can be used for storage.



- D. Full-span glass to ground: This type house has glass or other type covering extending all the way to the ground. Plants can be grown under the benches or in ground beds.

3. Greenhouse Location.

Some of the things you should consider in locating your greenhouse are light, availability of utilities such as gas, electricity, and water, distance from the house, and building codes.

Light - You should avoid building where the house will be shaded unless you are growing only shade-loving plants. Avoid building it too close to tall trees or other buildings.

Availability of Utilities - If you have a choice, locate the greenhouse close in so you will not have to run electric, gas, and water lines a long distance.

Distance from the House - You will be going to the greenhouse quite often. Locate it so you can get there easily and quickly.

Local Building Codes - All cities and many rural areas have requirements with regard to how close to property lines, streets, etc. you can build. Be sure to check these codes before building.

4. Lumber.
Cypress, cedar, and redwood are all resistant to rot and are good greenhouse construction materials. They are expensive and quite often people wish to use pine.
5. If pine is used, it can be treated with a 2 percent solution copper naphthenate.
6. Covering Materials.
Hobby greenhouses can be covered with glass, film plastic or fiberglass. Glass is cheaper than fiberglass but must be replaced when broken. Film plastic is the cheapest cover but must be replaced each year. Fiberglass is the most expensive but will last for up to 20 years.
7. Often two layers of film plastic are used to save on heating cost. An outside layer of 6 mil plastic and an inside layer of 2 or 4 mil plastic with a 2 inch air space between is recommended. This can save up to 40 percent on the heating cost.
8. When using film plastic covering, you may wish to consider U.V. Resistant plastic. This material is resistant to the ultraviolet sun rays that cause the deterioration in regular plastic. U.V. film plastic will last up to two years.
9. Heating Energy.
The three major energy sources for heating hobby greenhouses are natural gas, electricity, and LP gas.
Natural Gas is usually considered the best source due to lower cost. However, problems can arise if stoves are not properly regulated and vented.
Electricity is more expensive when buying stoves but is often as cheap to operate as natural gas. There is no problem of fumes or unburnt gas.
LP Gas is expensive and must have properly regulated and vented stoves. However, in some cases, it may be all that is available.
10. Cooling and Ventilating the Greenhouse.
Hobby greenhouse cooling and ventilating is usually accomplished with two or three methods used together. The house should contain windows or vents that can be opened to allow air movement through the house on mild days. Exhaust fans can be installed that will pull fresh air through the house even in bad weather. Evaporative coolers (home window water coolers) can be used to simply and inexpensively cool the house in hot weather. For larger hobby greenhouses, an evaporative pad and fan system can be used.
Household fans can be used to increase air movement and prevent cold spots when outside air and other methods cannot be used due to cold weather.

11. Size lumber.
The frame of the hobby greenhouse is usually of 2" x 4" or 2" x 2" lumber with 4" x 4" posts. Rafters may be of 2" x 2" spaced 24" apart or 2" x 4" spaced 36" apart.
12. The pitch of the roof is approximately 27° or 6" rise for each 1 foot from the side to the center of the house. This means the rise is about 1/4 the width of the house.
13. Arrangement Inside the House.
When planning for bench space and arrangement, you should consider several things that will take up space. Some of these are equipment storage, supply storage, soil mixing and storage, potting area, and general work area. You will also want to consider size of containers you are going to grow in and what plants you are going to grow.
14. Greenhouse Size.
Things that influence size of the greenhouse are (1) time you plan to spend in it, (2) what you want to grow in it, (3) space you have to put it, and (4) how much money you want to spend on it.
15. A hobby greenhouse can be just what you want it to be. Some benefits of hobby greenhouses are:
 1. Save money on plants.
 2. Enjoy leisure time.
 3. Can give some income.
 4. Can garden in bad weather.
 5. Learn more about plants.

HOBBY GREENHOUSE CONSTRUCTION

FIELD TRIP WORK SHEET

When the club takes a field trip to a hobby greenhouse, take this sheet along and fill in the answers as you get the answers. There may be other questions you wish to ask. You may ask the owner to help you answer the questions.

1. How large was the hobby greenhouse?
2. What were the major plants grown?
 - A. Mixture of different kinds and types.
 - B. Spring bedding plants.
 - C. Vegetable plants.
 - D. Vegetables for the table.
 - E. _____
3. What covering material was used?
4. What was the source of heat?
5. How would you change the greenhouse to fit your own needs or what would you do differently?

6. Do you see anything that would have been best done some other way? Example--better location, better heat or ventilation, etc.

NAME OF MEMBER _____

TEST

1. What is the difference between a hobby greenhouse and a commercial greenhouse?
2. What are three of the four types of greenhouses listed in your information sheet?
 - 1.
 - 2.
 - 3.
3. List three things that influence location of the greenhouse.
 - 1.
 - 2.
 - 3.
4. List three kinds of lumber somewhat resistant to rot.
 - 1.
 - 2.
 - 3.
5. What is copper naphthenate used for?
6. Name three materials used to cover greenhouses and give one advantage and one disadvantage of each.
 - 1.
 - 2.
 - 3.
7. Why use two layers of film plastic on a greenhouse?
8. What is U.V. Resistant plastic.

9. List three types of energy used to heat a greenhouse and give one advantage and a disadvantage of each.

1. _____ Advantage: _____

 Disadvantage: _____

2. _____ Advantage: _____

 Disadvantage: _____

3. _____ Advantage: _____

 Disadvantage: _____

10. Two methods of cooling a hobby greenhouse are _____
 and _____.

11. Which two of the lumber dimensions below are least apt to be found in hobby greenhouses? (Circle two)

2" x 2" 2" x 8" 4" x 4" 2" x 4" 1" x 14"

12. What should be the pitch of a greenhouse roof?

13. Name three things to consider when planning inside arrangement of a hobby greenhouse.

14. Name three things that help determine the size of a hobby greenhouse.

15. Name two ways you might benefit from a hobby greenhouse.

APPENDIX I

PROCEDURES FOR TEACHING UNITS

SUGGESTED PROCEDURE FOR TEACHING OF 4-H
HORTICULTURE UNITS

Preferred order to be taught:

- Propagation
- Judging
- Identification
- Hobby Greenhouse

Meeting #1

- A. Have members fill out information sheets
- B. Pretest on propagation (in back of book)
- C. Teach lesson propagation

Meeting #2

- A. Post test on propagation
- B. Pretest on judging
- C. Teach lesson on judging

Meeting #3

- A. Post test on judging
- B. Pretest on identification
- C. Teach lesson on identification

Meeting #4

- A. Post test on identification
- B. Pretest on hobby greenhouse
- C. Teach lesson on hobby greenhouse

Meeting #5

- A. Post test on hobby greenhouse

APPENDIX J

DEFINITION OF TERMS USED IN REVIEW OF
LITERATURE FROM OTHER STATES

DEFINITION OF TERMS

(1) Use of Objectives

Good - Behavioral objectives are used as a basis for writing the literature. They are expressed as objectives and the information in the literature pointedly answers the objectives.

Fair - Behavioral objectives are not stated as such but are implied. They may be stated as: Things to do; what you will learn; or suggested activities. They are usually broadly stated without a definite pattern for answering the objectives.

None - No information in the literature could in any way be described as indicating what the 4-H member is expected to learn.

(2) Use of Adult Material

Yes - Those states responding sent material that was written on adult level and written for adults.

No - Those states responding sent only material that was designed and identified as 4-H literature.

(3) Use of Program Ideas -- Program ideas are identified as 1 to 4 page publications that are information on a single phase of horticulture. They cover information on a single activity such as making terrariums, corsages, or planting a seed flat.

Yes - At least a part of the literature sent was program ideas.

No - None of the material sent was program ideas.

(4) Grade Leveled Material -- This indicates that the literature sent was written at different levels of difficulty as Unit I, Unit II, etc.

Yes - All literature sent was written with indications as to the grade or age level at which it should be used.

No - None of the literature sent was written on grade levels.

Both - Some of the literature sent was written on grade levels, some was not.

- (5) Broad or Narrow in Scope -- Refers to broadness of the information covered in the individual publications.

Narrow - All publications sent were written on small areas of a particular area of horticulture. Each area would correspond to one instructional unit for classroom use.

Broad - All publications sent covered a large area of horticulture such as vegetable production, home landscaping or one publication including all horticulture information.

Both - Some publications sent were broad in scope and some narrow in scope.

- (6) Use of National Material

Yes - At least a part of the material sent was developed at the national level, or correspondence indicated they used it in addition to what was sent.

No - There was no indication that national material was used by the responding state.

NOTE - With reference to item one, behavioral objectives, the following expressions were used to indicate what was expected of the member.

1. Activities
2. Why study this
3. What is expected
4. Things to do
5. Steps to complete project
6. What you can learn
7. Project requirements
8. Some stated there were no specific objectives.

APPENDIX K

COMMENTS BY JURY WHO EVALUATED

DEVELOPMENTAL PROCEDURES

RESPONSES AND COMMENTS OF JURY MEMBERS REGARDING POSSIBLE
EFFECTIVENESS OF PROPOSED PROCEDURES OR STEPS TO BE
USED IN DEVELOPMENT OF THE INSTRUCTIONAL UNITS

Procedure or Step No.	Responses/Comments
1.	<ol style="list-style-type: none"> 1. Use a suggested list of options. 2. Also survey industry people 3. How many of each?
2.	<ol style="list-style-type: none"> 1. Will help avoid duplication. 2. Only if necessary.
3.	<ol style="list-style-type: none"> 1. Why? 2. Review Oklahoma Vocational Agriculture Core Curriculum and talk to curriculum people at the State Office. 3. Units need to be revised by curriculum people before readability or testing procedures begin. 4. Develop or accept a format for the unit development. 5. Can this be combined with number two, or does it have to be a separate step?
4.	<ol style="list-style-type: none"> 1. Why not more than four? 2. Are the units on the same or different subject, and are all on the same reading level? 3. Would like more explanation of the four units. 4. Four areas or four units on a single area. 5. Only four indicated? 6. What about the behavioral objectives? 7. Validate unit content by the use of experts in the field also in number eleven.
5.	<ol style="list-style-type: none"> 1. Do this as units are written. 2. Repeat steps after rewriting. 3. Very, very important. 4. What is the desired reading level? 5. How about a pre-post test of agents and/or leaders?
6.	<ol style="list-style-type: none"> 1. Secure approval of supervisors. 2. Why four? Are you going to use control groups?
7.	<ol style="list-style-type: none"> 1. Identify who is to conduct the program. 2. And behavioral objectives.
8.	<ol style="list-style-type: none"> 1. Based on behavioral objectives?
9.	<ol style="list-style-type: none"> 1. Based on behavioral objectives.

Procedure
or
Step No.

Responses/Comments

10. None

11. 1. How?
 2. Should be based on student, leader, and agent reactions as well as tests.
 3. Evaluate by whom?
 4. Summarize and analyze findings from evaluation efforts.

APPENDIX L

MEMBER INFORMATION SHEET

MEMBER INFORMATION SHEET

NAME _____

AGE _____

GRADE IN SCHOOL _____

YEARS YOU HAVE BEEN IN 4-H _____

HOW LONG HAVE YOU BEEN IN 4-H HORTICULTURE ACTIVITIES? (Check one)

_____ just started

_____ 1 year

_____ 2 years

_____ 3 years

_____ longer

APPENDIX M

EVALUATION SENT TO LEADERS AFTER
COMPLETION OF THE UNITS

4-H HORTICULTURE UNIT EVALUATION

	Excellent	Good	Needs Adjustment	Poor	Comments
1. What are your general feelings about leader material based on behavioral objectives?					
2. What are your feelings about the lesson on propagation?					
3. What are your feelings about the lesson on judging?					
4. What are your feelings about the lesson on greenhouse construction?					
5. What are your feelings about the lesson on plant I. D. ?					
6. Are the materials adequate to teach the lessons?					
7. Are objectives stated in an acceptable manner?					
8. Are the suggested activities helpful?					
9. Was the list of additional materials helpful?					
10. Was the list of additional materials adequate?					
11. Did you find the list of additional materials available if you requested them?					
12. Are the information sheets adequate to answer the objectives?					
13. Can the same lesson be adapted by the leader to different age groups?					
14. Does the information and examples used relate to your actual situation?					
15. Do the Tour Guidesheets, Job Sheets, etc. add to the lessons?					
16. Are the sketches, diagrams, etc. helpful?					
17. Are the sketches and diagrams adequate?					
18. Is the test at the end of the lesson useful?					
19. What was your members' general reaction to your use of the new Instruction Units?					
20. Do the developed modules answer the question: "What do I do at the meeting?"					
21. Is one meeting period adequate time to teach the Unit (without pretest, etc.)?					

Please indicate below any need for change, improvement, etc., or other comments you have about each module.

Plant I. D. -

Plant Propagation -

Horticulture Judging -

Hobby Greenhouses -

VITA

Joe M. Maxson

Candidate for the Degree of
Doctor of Education

Thesis: DEVELOPMENT AND TESTING OF A SERIES OF HORTICULTURE UNITS OF INSTRUCTION BASED ON PERFORMANCE OBJECTIVES TO BE USED BY LOCAL 4-H LEADERS

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Professional Organizations: American Horticulture Society, National Council for Therapy and Rehabilitation Through Horticulture, and Oklahoma Horticulture Society.