OLIVER, Craig Stanley, 1934-
INFLUENCE OF SELECTED FACTORS UPON
THE LEARNING OF LANDSCAPE DESIGN
CONCEPTS.

The Ohio State University, Ph.D., 1968
Education, adult

University Microfilms, Inc., Ann Arbor, Michigan
INFLUENCE OF SELECTED FACTORS UPON
THE LEARNING OF LANDSCAPE
DESIGN CONCEPTS

DISSERTATION

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

By
Craig Stanley Oliver, B.S., M.Ed.

*****

The Ohio State University
1968

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ACKNOWLEDGMENTS

The author wishes to express his sincere appreciation to the many persons who contributed to this study.

To Dr. Ralph E. Bender for his encouragement, support and guidance given throughout my graduate program and the successful completion of this study.

To Dr. Kenneth Reisch, Dr. Robert W. McCormick and Dr. Ralph Woodin who served on the author's graduate committee and gave many helpful suggestions.

To Dr. Richard Craig, Department of Horticulture at The Pennsylvania State University, for his assistance with the statistical analysis.

And especially to my wife, Dorothea, and our children, Deborah and Linda, for without their faith, encouragement and patience this graduate program could not have been completed.
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CHAPTER I
THE PROBLEM AND ITS SETTING

The movement of people to suburban areas and the increasing affluence of our society has kindled an interest in attractive home grounds. Many homeowners face problems of establishing a new lawn, planting shrubs and maintaining landscape plantings. To the homeowner, landscaping presents a problem which he must handle soon after moving into his home. Sources of technical information to aid in the solution of his problems becomes one of his major concerns.

The Agricultural Extension Service, with its commitment to help people with agricultural problems, is an agency dedicated to the task of aiding the farmer and the urban dweller. The rapid movement of our society from the farm to suburbia forced the extension worker to adapt his program to meet some of the subsequent needs of urban people.

Extension workers have become cognizant of the pressing need for improvements in teaching techniques. They recognize a need for working technical subject matter into forms easily understood by the homeowner. The number of requests for this information is increasing rapidly as urban homeowners become aware of the availability of the Agricultural Extension Service.

Until recently, extension teaching methods consisted primarily of demonstration techniques and individual contacts with farmers and other citizens who requested their help. Today's demands make necessary
the development of mass media communication techniques which can be used effectively to disseminate information. The written circular, newsletter, television and workshops or clinics have proven effective in spreading information. However, the interpretation and use of extension information by the homeowner still presents a major problem.

Sorenson states, "to have a good transfer of learning that taught must be meaningful, understood, and complete."\(^1\)

Hartman concludes that, "information simultaneously presented by the audio and printed (visual) channels is more effective in learning than is the same information in either channel alone."\(^2\)

The above quotes underline the need for a combination of teaching techniques to convey educational information to the homeowner at the cognitive level. This is especially true in the area of landscape design.

Landscape design involves the ability to conceptualize how plants and structural features will blend together into a total design composition. Each homeowner landscaping his property is confronted with an individual situation. Therefore, extension teaching materials must be developed to help the homeowner solve his problems.

As extension workers look forward in search of better ways to present educational information, they must make changes. Changes which

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will result in the adoption of new training techniques to be utilized in helping the urban dweller solve his problems. Thus, this study involves an appraisal of a new approach in teaching landscape design techniques to interested adult groups.

**Statement of the problem**

The basic premise of this study is that the effective use of visual aids and an illustrated circular in presenting landscape information to adult groups will assist in the transfer of knowledge to a meaningful situation. In turn, the knowledge so transferred will increase the individual's ability to cope with his own landscape problems.

Therefore, this study is concerned with three basic questions:

1. **What amount of information recall takes place in an adult group when landscape design information is presented with the use of visual aids supplemented by an illustrated circular as compared to the use of visual aids without a supplemental circular?**

2. **What comparative amount of learning can be transferred to a practical situation when landscape design information is presented with the use of visual aids supplemented with an illustrated circular as compared to the use of visual aids and no supplemental circular?**

3. **What effect does an individual's spatial aptitude have on his ability to comprehend landscape design information and seek sound solutions to his problems?**
Specific objectives

The following specific objectives facilitated the pursuit of this study:

1. To determine the amount of cognitive and affective learning that takes place in an adult group when landscape design information is presented with the use of visual aids and supplemented with an illustrated circular as compared to the use of visual aids and no supplemental circular.

2. To determine the differences in the amount of cognitive and affective learning that takes place by age levels and by different levels of formal schooling.

3. To determine whether or not there is a correlation between the ability to transfer landscape design information to a practical situation and the spatial aptitude of the individual.

Hypotheses

Five hypotheses were formulated in the development of this study. The alternate hypothesis or the operational statement of the research hypothesis was stated first, followed by the statement of the null hypothesis. They were as follows:

1. Research hypothesis. Adult groups presented landscape design information supplemented with a circular will have a significantly higher mean score as measured by a recall test than adult groups presented the same information without a circular.

2. Null hypothesis. There will be no significant difference in
the level of understanding among adult groups presented landscape design information supplemented with a circular as compared to adult groups presented the same information without a circular as measured by a recall test.

2. **Research hypothesis.** Adults with a higher level of formal education will have a significantly higher mean score on a test of recall measuring understanding of landscape concepts than adults with a less formal education following participation in a series of landscape meetings.

**Null hypothesis.** There will be no significant difference among adults with different levels of formal education in the amount of recall following a series of landscape meetings.

3. **Research hypothesis.** Adults in the higher age groupings will have significantly higher mean scores on a test of recall to measure understanding of landscape concepts than adults in the lower age groupings following the presentation of a series of landscape meetings.

**Null hypothesis.** There will be no significant difference between lower age groupings and higher age groupings in the amount of recall following a series of landscape meetings.

4. **Research hypothesis.** Adults with a higher spatial aptitude will have a significantly higher mean score on landscape development plans than adults with a lower spatial aptitude following participation in a series of landscape meetings.
Null hypothesis. There will be no significant difference between adults with high spatial aptitude and adults with low spatial aptitude and their ability to draw a landscape plan.

5. Research hypothesis. Adult groups presented landscape design information supplemented with a circular will have a significantly higher mean score on landscape development plans than adult groups presented landscape design information without a supplemental circular.

Null hypothesis. There will be no significant difference between adult groups in their ability to develop a landscape plan when presented landscape information supplemented with a circular as compared to adult groups presented landscape design information not supplemented with a circular.

Assumptions

The following assumptions are made as fundamental to this study.

It is assumed as follows:

1. The technical data presented to respondents represents a cross section of acceptable landscape design concepts, as reviewed by landscape architects and ornamental horticulturists.

2. The visual aids developed represent an acceptable technical procedure for presenting information, as reviewed by an extension visual aids specialist.

3. The procedures used in presenting landscape design information to the sample of respondents were procedures which should lead to an optimum transfer of learning.
4. Adults who attend the landscape meetings are motivated toward learning practical application of landscape information.

5. The instruments used in this study were valid in measuring understanding of landscape design concepts.

6. The criteria used for selecting experimental and control groups used in this study provided an adequate randomization.

7. The replies received on the instruments are valid appraisals of actual situations and opinions.

8. The instrument used in measuring spatial aptitudes is valid when used with adult groups.

Limitations of the study

This study is limited by certain inherent factors related to the conduct of the research.

1. The study is limited to a sample of respondents in the Commonwealth of Pennsylvania.

2. The study is limited to those geographic areas where county agents feel a need for a series of meetings on landscape design.

3. The study is limited to the human abilities of the researcher in presenting his subject information to the group.

4. The study is limited to the size of group in attendance.

5. The study is limited as to the type of subject matter presented.

6. The study is limited to four meetings with each sampling group.
7. The study is limited as to the type of visual aids developed.
8. The study is limited to individuals who are interested in developing a landscape plan for their own home.

Need for the study

The Smith-Lever Act of 1914 indicates that the major function of the Cooperative Extension Service is:

To aid in diffusing among the people of the United States useful and practical information on subjects relating to agriculture and home economics, and to encourage application of the same.

In view of the urban population increase, 29.6 percent from 1940-1950 and another 29.3 percent from 1950-1960, the Smith-Lever Act sheds a new light on the Cooperative Extension Service and its future role. In the years ahead much of the Extension effort will be directed towards helping that segment of the population which is not involved in production agriculture.

Kalangi points out that "change in clientele has put new demands on extension personnel, increasing their role beyond the realm of the needs of a purely agricultural population." 5

The change in extension clientele will also create a change in those subject matter competencies required by specialists and county agents.

3 Smith-Lever Act, as Amended, 1914, p. 1.


agents. Kalangi in his study indicates this need when he states, "county personnel need more training to meet the needs of the urban population particularly in horticulture and related areas."^6

In 1966 county extension personnel in Pennsylvania gave individual assistance to 20,958 individuals and held 106 home grounds meetings with a total attendance of 3,540. The number of individual contacts and meetings held for homeowners has been steadily increasing in recent years. As the number of individual contacts increase, it becomes increasingly difficult for county personnel and specialists to function effectively. This indicates that extension teaching methods need to be progressively improved to keep pace in a rapidly changing era of knowledge and communications. For the extension educator to reach optimum effectiveness, he needs to know not only the subject matter but also how to teach. Thus, problems arise concerning the relative effectiveness of various teaching methods in presenting information to the urbanite.

Acceptance of the goal of improving the aesthetic environment, to which home landscape plantings contribute, will be an added factor in the demands placed on the Agricultural Extension Service. Homeowners require not only basic information relating to the selection and care of plants but also desire information relating to landscape design.

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6 Ibid.
Several studies provide information which contribute to our knowledge of the homeowners horticultural interests. These studies help to define the extension audience and suggest several factors which point to a need for this study.

Raleigh and Smith indicated that individuals who use a prepared landscape plan spend more money and do a better job of landscaping. The need for careful planning and implementation of a well designed landscape plan was particularly stressed by homeowners who had lived in their home two years or less.

Several homeowner studies provide information on the reasons for not planning further plantings or for not having made desired plantings. The wide variety of reasons cited included responses such as "don't know what and how to plant" and "do not know how to develop an attractive design". The need for more information is frequently mentioned. The wide variety of plants, their adaptation to different uses, and the problems of plant care make landscaping complicated to the uninformed. However, the rise in the general levels of academic education and

8 S. M. Raleigh and R. C. Smith, Marketing Nursery Products, Agricultural Experiment Station Bulletin 352 (University of Delaware, Newark, Delaware, 1965).
higher income levels tend to create desires for more information from expert sources.\textsuperscript{9, 10, 11} 

One of the questions that now arises is "what value are a series of meetings illustrated with visual aids and supplemented with a circular in helping people develop a landscape plan?"

Nichols and Lewis point out, "A number of research projects based on retention of materials orally presented for a period of ten or fifteen minutes in duration show learning by listening seldom operates at more than a twenty-five percent level of efficiency."\textsuperscript{12} This statement by Nichols and Lewis suggested the need for additional research to determine whether an oral and visual presentation supplemented with a circular will increase the level of learning efficiency.

Dahle conducted a study to determine the effectiveness of five

\begin{itemize}
\item \textsuperscript{9} A. J. Garbarino, \textit{Practices and Preferences of Consumers for Horticultural Specialties in Knoxsvile and Nashville}, Agricultural Experiment Station Bulletin 382 (University of Tennessee, Knoxsvile, Tennessee, 1960).
\item \textsuperscript{10} \textit{Homeowner Views of Landscaping and Nurserymen} (Washington: Horticultural Research Institute, Inc., 1964).
\item \textsuperscript{11} H. B. Sorenson, \textit{Consumers' Sources of Information on Nursery Products and Landscape Services}, Agricultural Experiment Station Bulletin 250 (Texas A and M University, College Station, Texas, 1964).
\item \textsuperscript{12} Ralph C. Nichols and Thomas R. Lewis, \textit{Listening and Speaking} (Dubuque, Iowa: William C. Brown & Co., 1957), pp. 3-4.
\end{itemize}
methods of communication used in transmitting information from management to employees in business and industrial situations.

"The methods investigated were:

1. Presenting the information to the group orally, so no written materials or visual aids were used.

2. Presenting the information to each member of the group in written form, with no supplementary oral or visual explanation.

3. Presenting the information in both oral and written form.

4. Presenting the information on a bulletin board.

5. Making no presentation of the information in either oral or written form. (grapevine only).

Measured in terms of the results obtained, the methods of transmission tested ranked in the following order from most effective to least effective: (1) oral and written; (2) oral only; (3) written only; (4) bulletin board; and (5) grapevine only."

Dahle did not answer the question as to whether a combination of methods would result in more effective learning transfer.

Many spatial relationship concepts are utilized in planning and executing a landscape design. Unfortunately, few homeowners understand the rationale in utilizing visual perception cues in analyzing their landscape needs or in the orderly development of a landscape plan. However, many people who have poorly landscaped homes are able to make discriminating judgments about what they like in a good landscape design. This indicates that they have a preconceived spatial

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relations concept, but they are not able to transfer this appreciation at a cognitive level to their own property.

Yoakam and Simpson indicate that, "cognitive behavior means the individuals response to the flow of information coming to him through his senses, how he selects from the flow, how he applies meaning to it, and how he manipulates it."\(^\text{14}\)

Sorenson states, "if the teacher makes a conscious effort to bring about transfer, the more transfer will take place."\(^\text{15}\)

One might theorize, at this point, that a person who has a high spatial relations ability should have a high degree of cognitive transfer, if teaching methods are developed and used to create an understanding of landscape design. Therefore, there is a need for the extension worker to know whether improved teaching methods will assist adult groups in learning, and transfer of that learned, to the solution of their own problems.

Methods of investigation

The problem of identifying and developing research techniques was apparent from the early planning stages. There were few studies of a related nature to use as references.

The previous experience of the investigator, in assisting homeowners with their landscape problems indicated several factors which


\(^{15}\) Sorenson, loc. cit., p. 485.
were considered in developing a feasible method of investigation. The factors considered were: (1) homeowners who have moved into a new or older home were the most interested in landscaping; (2) to effectively convey landscape information to an adult audience a series of meetings was essential; and (3) homeowners who seek landscape information were willing to attend a series of extension meetings on this subject.

Therefore, it was arbitrarily decided to hold a series of four landscape meetings in several randomly selected Pennsylvania counties. It was further determined that the meetings scheduled should be held over a short period of time. This procedure was chosen because homeowner interest could be maintained if the intervals between meetings were short. Thus, two meetings a week over a two week period were considered appropriate.

County agents in selected counties were contacted. They were asked to assist in scheduling meetings, securing meeting facilities, and to publicize the meetings in order to secure the adult group.

It was also apparent that a four meeting sequence did not permit adequate time for a discussion of the broad area of home grounds landscaping. To use the time allocated effectively, it was decided to limit the meetings to a discussion of landscaping the public area. By limiting the topic it permitted the investigator to develop the subject area in more detail.

The information that follows describes the procedures involved in conducting the study.
Procedure for organizing the meetings. -- To assist in organizing the four meeting sequence teaching objectives were formulated. The specific teaching objectives developed were as follows:

1. To have homeowners express a general concept of landscape design that would include the functional and aesthetic value of landscaping.

2. To have homeowners analyze their home grounds to determine their landscape needs as they relate to:
   A. family needs
   B. terrain features
   C. environmental controls

3. To have homeowners relate to their own properties a general design concept that would include the following:
   A. dimension
   B. balance
   C. repetition
   D. sequence
   E. enclosure

4. To have homeowners develop for their own properties a landscape plan for the public area which would have beauty, simplicity and utility and consider the following elements:
   A. driveway approach
   B. foyer approach
   C. corner plantings
   D. enframement

5. To have homeowners select plants that are suitable for their home grounds based upon:
   A. size
   B. color
   C. form
   D. texture
   E. hardiness
   F. soil conditions
6. To have homeowners select shrubs for their home grounds that are suitable for the corner and foyer area.

7. To have homeowners select trees for their home grounds that are suitable for shade and enframement.

The teaching objectives assisted in determining the educational activities needed in planning the four meeting series. Each meeting was planned so that approximately half of the meeting time was devoted to a presentation by the instructor. The remaining time was allocated so the participants could work on their landscape plans.

The teaching objectives also assisted in determining the sequence of presentation at each meeting. The topics discussed at each meeting were as follows:

- First meeting - Elements of landscape design
- Second meeting - Design composition in the landscape
- Third meeting - Trees to fit your landscape needs
- Fourth meeting - Shrubs and ground covers to fit your landscape needs.

Securing adult groups. -- Ten counties, two from each extension supervisory district in Pennsylvania, were randomly selected by use of a table of random numbers (see Appendix A for county locations).

A letter was written to each county agent in the counties selected to determine their interest in holding a series of four landscape meetings for homeowners. The letter detailed the purpose of the meetings and briefly discussed the criteria essential for having a successful program (see Appendix B).
All county agents who were initially contacted expressed an interest in holding a series of landscape meetings. Following their initial approval, telephone contact was made with each county agent and dates were set for holding the meeting sessions. Five counties were then randomly selected as experimental counties and the remaining five served as control counties.

A follow-up letter was sent to each county agent. Each letter mailed to participating agents was identical with the exception of three paragraphs which were added in the letters sent to the county agents whose counties were selected as the experimental counties (see Appendix B). The three paragraphs detailed the information relating to the availability of a landscape circular which the agents were asked to purchase for participants in the landscape meetings. The cost of the publication and where it could be purchased was given. It was suggested to charge a nominal registration fee to cover the cost of the publication.

Enclosed with the letter to each county agent were three news releases, a packet of mimeographs describing how to prepare a planting plan sketch and an information sheet pertinent to the conducting of the landscape meetings. The preliminary information sheet detailed the topics to be discussed at each meeting, instructional materials needed by the participants, facilities required for the meeting and the criteria for participation (see Appendix C).

The county agents were requested to secure meeting facilities which would be appropriate for the meetings and provide the publicity
necessary to secure advanced registration. In the news releases which were prepared, individuals interested in attending the landscape meetings were requested to contact the county agent's office and pre-register at least five days before the start of the meetings. The county agent was also requested to limit enrollment to 20 families or individuals who were interested in developing a landscape plan for their own property.

Individuals who contacted the county agent's office were informed of the criteria for participation in the landscape meetings. Each individual was informed they should attend all four landscape meetings and bring with them to the first meeting a flat surface scale drawing of their property. This drawing was to include the location of property boundaries, house, garage, walks, drive and other existing features on the site. If the person agreed to the criteria, graph paper and the mimeograph illustrating how to prepare a planting plan sketch was forwarded to them (see Appendix D).

Preparation of visual aids. -- To assist in conveying the verbal message at each meeting, it was essential to develop clear and comprehensive visuals on the subject of landscape design. Many procedures were investigated in determining the most feasible method of visually presenting landscape concepts. It was important to develop visuals which would assist the respondents in transferring thoughts expressed in the three dimensional visual to their two dimensional plan. Therefore, two visual techniques were utilized: (1) slides and (2) model.

Three slide series were prepared. The first slide series was
entitled "Elements of Landscape Design". This slide series consisted of 41 slides. Pictures and animated illustrations prepared by the investigator were included in this slide series. The purpose of the slide series was to present visual examples of site analysis procedures, concepts of landscape design and factors to be considered when developing an attractive, functional and simple home grounds landscape plan.

The second slide series was entitled "Design Composition in the Landscape". Pictures and animated illustrations prepared by the investigator were also included in this slide series. Forty slides were included in the set. The purpose of the slide series was to develop an understanding of the major factors involved in planning the entry, corner and enframement design. The basic design concepts essential in creating a pleasing landscape composition were also detailed.

The third slide series was entitled "Selecting Plants to Fit Your Landscape Needs". This slide series included 80 pictures of common trees and shrubs suitable for landscape use. Information relating to form, texture, color, height of growth and hardiness was detailed for each plant illustrated.

A mimeograph illustrating the basic forms of the trees and shrubs illustrated in the third slide series was also prepared.

A model was developed to supplement the slide series presentation (see Appendix E). It was constructed on a plywood base and the terrain features were simulated by shaping and molding styrofoam which was attached to the base. A scale model of a split-level home was constructed and placed on the base. Plant materials constructed of lichen were
prepared and arranged on the styrofoam base to simulate a landscape scene.

The slide series and mimeograph illustrating the basic tree and shrub forms which were developed have been duplicated and can be secured from the Extension Ornamental Horticulture Section at The Pennsylvania State University.

**Developing the instrument.** -- A multiple choice test was developed from the information prepared for use at the four landscape meetings. It was designed to be used as a pre-post test to measure the gain in knowledge following the completion of the four meeting series (see Appendix F). It consisted of four pictorial questions from which the respondents were required to make a discriminating judgment concerning good and bad landscaping. The remaining 36 questions were four response multiple choice questions. The instrument was administered to all respondents in the experimental and control groups.

**Reliability of the instrument.** -- Following the development of the instrument, the test was administered to 30 volunteer adults who were attending extension landscape meetings held in two Pennsylvania counties.

The test was graded to determine the number correct. After grading the test a split-half reliability analysis was made to determine the internal consistency. A coefficient of correlation ($r$) was run on the test. Adjusting these results with the Spearman-Brown formula, a reliability of $+.81$ was obtained.$^{16}$ To determine the difficulty of

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individual test items the instrument was subjected to an item analysis. Item difficulty was measured by dividing the number who answered the questions correctly by the number who took the test. The average discriminating value of the pictorial and multiple choice questions was 63 percent and 48 percent respectively.

One difficulty encountered in administering the instrument was the length of time required for completion. Approximately, 45 minutes was necessary for the respondents to complete the instrument. Therefore, the Spearman-Brown Prophecy formula was used to determine the reliability of the instrument if one-third of the test items were eliminated. A reliability of +.61 was obtained. It was decided to use the instrument as originally developed rather than lower the reliability by deleting test items.

Selection of a spatial relations test. -- There are many tests developed which measure spatial relations. Most of them are units of mental aptitude tests which have been developed for high school age youth. Of the many tests reviewed, the space relations unit of the Differential Aptitude Test was the most appropriate for use in this study.

The space relations test selected for use in this study measures ability to think in terms of three-dimensional structure. It is a multiple-choice test using an item type that requires both the ability

17 Ibid.
18 Differential Aptitude Test Space Relations Unit (New York: The Psychological Corporation, 1960.)
to visualize a solid object from a flat pattern and the ability to imagine how the object would appear if rotated in various ways. This ability is important in the field of landscape architecture and design where there is a need to conceive how an object will appear after it is constructed.

The space relations test required 30 minutes to complete. The reliability coefficient of the test determined by the split-half method was in the high 80's or 90's. A review of the test published in the *Fifth Mental Measurements Yearbook* indicated the test was excellent in format, item construction, standardization and validation.  

The investigator corresponded with Dr. Esther R. Hollis, Manager of the Advisory Service Test Division, The Psychological Corporation, to determine the reliability of the space relations test when used with adult groups. Dr. Hollis stated, "while the standardization of this test was on high school students and the data presented are based on this group, incidental use in a number of situations indicates that it is appropriate for use with adults as well."  

The space relations unit of the Differential Aptitude Test was administered to all adults in the experimental and control groups.  

**Selection of a landscape circular.** -- A circular entitled "Landscaping Your Home" was selected by the investigator for use by

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Letter from Dr. Esther R. Hollis, Manager of the Advisory Service Test Division, The Psychological Corporation, New York, August 2, 1967.
the experimental groups. This publication was available from the University of Illinois for a nominal charge of $2.00.\textsuperscript{21}

The landscape circular was subjected to the Dale-Chall\textsuperscript{22} readability formula to determine the level of the material. The reader selected four random passages from six chapters and applied the test. The readability was determined to be at the ninth and tenth grade level.

**Procedure used in evaluating landscape plans.** -- A rating scale was developed to measure the quality of the landscape plans completed by respondents at the end of the four landscape meetings (see Appendix G). Staff members in the Departments of Horticulture and Landscape Architecture assisted in developing the rating scale.

Four primary criteria were considered in developing the rating scale for the public area landscape. The criteria considered were:

1. Corner planting design
2. Entry design
3. Enframement design
4. Plant material selection

All landscape plans completed by participants were evaluated by a landscape architect and horticulturist on the staff at The Pennsylvania State University. The evaluating team-checked each plan and affixed a score to each rating factor based upon their combined judgments. The


rating scale used ranged from a low score of 1 (poor) to a high score 4 (excellent). Each factor considered in design of the public area was given a score. The sum total of all sub-scores represented a total design score which provided a relative measure of design continuity. Using this scale, the lowest possible score which could be attained was six and the highest possible score was twenty-four.

All of the landscape plans were collected at the end of each meeting series. Shortly thereafter, the evaluating team rated each plan and in turn, the plans were returned to each participant.

**Procedure followed in conducting meetings.** -- Each of the four meetings held in the ten randomly selected counties followed a set sequence. At the first meeting the county agricultural agent introduced the investigator who reviewed the purposes of the meetings. After this brief introduction the test instrument was administered. Respondents were asked to complete all questions to the best of their ability. At the completion of the pre-test there was a short coffee break.

The slide series entitled "Elements of Landscape Design" was presented. Questions concerning the presentation were answered during and after the presentation. In the experimental counties the landscape circular was given to all respondents. The investigator suggested reading several chapters in the circular and the meeting was adjourned. The procedure followed in the control group was identical; however, the respondents did not receive the landscape circular for reference.

The spatial relations test was administered to all respondents
in the experimental and control groups at the beginning of the second meeting. A period of 30 minutes was allowed for completion.

Following a brief coffee break the second slide series was presented. This slide series was entitled "Design Composition in the Landscape". Questions concerning the presentation were answered during and after the presentation. Respondents were then instructed to begin the landscape development on their own plans. It was suggested to develop an entry design first. A landscape template was given to each respondent to assist in illustrating plant materials on his plan. At the close of the meeting suggested readings in the text were announced to respondents in the experimental groups.

The procedure followed in conducting the third meeting was similar to the previous meetings held. Following the presentation of a slide series entitled "Trees to Fit Your Landscape Needs", the respondents began work on their landscape plans. They were asked to place emphasis on the development of a corner planting design suitable for their home and to consider location of trees for enframement. Before the meeting adjourned, selected readings in the circular were announced to the experimental groups.

The fourth and final meeting of the series began with the presentation of a slide series entitled "Shrubs to Fit Your Landscape Needs". Respondents completed their landscape designs and selected plants to fit the designs they had developed.

Forty-five minutes before the end of the meeting the test instrument was administered as a post-test to the respondents in each of the
experimental and control groups. At the end of the meeting landscape plans were collected for evaluation.

Recording and analyzing the data. -- Following each set of meetings the pre- and post-tests and the spatial relations tests were scored. The face data collected and the scores were recorded on large graph paper sheets. The landscape plans were then evaluated by the experts and the total landscape evaluation score was tabulated by the investigator.

Definition of Terms

Visual Aid: A prepared visual image designed to aid the learner by making use of the sense of sight.

Adult Group: Adult homeowners who chose to participate in the series of landscape meetings held in the ten counties participating in this study.

Recall Learning: The amount of learning that took place following a series of four meetings as measured by a post-test.

Landscape Design: The development of a functional and attractive plan to make the best use of space available on the home grounds.

Circular: An educational publication written and illustrated by extension personnel to assist homeowners in developing their home landscape.

Spatial Aptitude: The ability to think and perceive how objects would look in three-dimensional structure.

Spatial Relations Test: A standardized test designed to measure spatial aptitudes.
**Spatial Skills**: The term in this study refers to the ability to create a landscape plan on a two-dimensional plan so that it would be attractive and functional when the three-dimensional form is developed.

**Experimental Group**: Adults who attended the landscape clinics and received a landscape design circular. The circular provided a supplemented reading source and illustrations which could be used for reference and home study.

**Control Group**: Adults who attended the landscape clinics and did not receive a landscape circular.

**Public Area Landscape**: The landscape development which is planned for the front of the home.

**Foyer Design**: The landscape development for the primary access area to the front door. This area includes the walk approach and landing platform at the front door.

**Corner Design**: The landscape development designed to blend the corners of the house with the surrounding terrain features.

**Enframement**: The placement of trees in the public area to frame the view of the house from the primary focal point.

**Slide Series**: A set of slides with a prepared script used to present educational information on the subject of landscape design to homeowners.

**Summary**

This was a study designed to determine whether the use of a supplemental landscape circular during a series of landscape meetings with an
adult group increased the amount of knowledge that could be immediately recalled and transferred to a meaningful landscape situation. Also, the study attempted to determine what effect an individual's spatial aptitude had on his ability to comprehend landscape design concepts.

The hypotheses proposed in this study were to test whether (1) there was a significant difference in the level of understanding among adult groups presented landscape design information supplemented with a circular as compared to adult groups presented the same information without a circular as measured by a recall test; (2) there was a significant difference in mean scores between age groupings and levels of formal education in the amount of recall following a series of landscape meetings; (3) there is a significant difference between adults with high spatial aptitude and adults with low spatial aptitude and their ability to draw a landscape plan; (4) there is a significant difference between adult groups in their ability to develop a landscape plan when presented landscape design information supplemented with a circular versus adult groups presented landscape design information not supplemented with a circular.

A total of ten landscape clinics comprised of four meetings each were held in ten Pennsylvania counties to collect research data. Extension agents in each of the ten counties secured a voluntary adult group for the four meetings held in each of their counties. The adults who were interested in the landscape clinics pre-registered and attended all of the meetings in the county where they registered. At the first meeting the adults who participated brought with them a flat surface
scale drawing of their property on which to develop their landscape plans.

The ten counties were randomly divided into two groups. Each adult attending the landscape meetings in five of the counties received a landscape circular. This circular was used to supplement the information presented at each landscape meeting. Five groups did not receive the supplemental circular.

Three slide series and a landscape model were developed by the investigator and used in presenting landscape design information. Adult groups in each of the ten counties cooperating in this study viewed the visuals prepared. Approximately 45 minutes at each meeting was spent presenting subject matter information. The remaining time at each meeting, approximately one to two hours, was utilized by the participants to develop their own landscape plans.

A 36 question multiple choice test was developed to measure recall learning. This test was administered as a pre-test and post-test to all participants attending the landscape meetings.

A standardized spatial relations test was also completed by all clinic participants. The spatial relations test was used to determine if there was a correlation between a person's ability to develop a landscape plan and their innate spatial aptitude.

The landscape plans completed by all adults in the experimental and control groups were collected and evaluated by a panel of experts. Each landscape plan was evaluated on the basis of criteria established
by the panel of experts and the investigator. The criteria used was a rating scale developed to measure the appropriateness of the plant materials selected and the design created for the public area landscape. To each plan a total score was affixed based on the rating scale used in the evaluation. This score represented a relative measure of design continuity.

The results obtained from the multiple choice test, spatial relations test and the landscape plan evaluation were recorded on a statistical information sheet for analysis.
CHAPTER II

REVIEW OF LITERATURE

Many adults are eager to learn and have the spirit of inquiry. They have more experience than high school students with which to relate their learning, however, their educability may be limited by many factors.

The traits and characteristics of the adult learner must be taken into consideration by effective extension workers when planning their program. Although the educational or teaching approach is emphasized in extension work, there are some striking contrasts between extension teaching and classroom teaching. Extension works with people in actual life situations, whereas much classroom teaching is formalized into subject-matter courses. In many cases extension teaching is so informal that it is difficult at times to distinguish educational activities from service activities.

The meaningfulness and therefore the effectiveness of adult learning depends on the principles of context, focus, socialization, individualization, sequence and evaluation. A good context of learning must be one with which the learner dynamically and strongly interacts. Effective teaching-learning focus is one that mobilizes the will to learn. A group democratically organized and conducted has a markedly better effect upon the learning than a group autocratically organized and conducted. Meaningful learning must proceed in terms of the
the learner's own purposes, aptitudes and abilities. The sequence of learning must be treated as a process of mental growth. Learning should always be organized in such a way that the learner is aware of the results he is attaining, while the job is going on, and that the results are meaningful in terms of the learner's purpose. Therefore, selection and effective use of teaching methods are important factors in the development of an extension program. An understanding of the educational process and the subject matter is basic to the intelligent selection and use of the teaching methods.

The purpose of this chapter is to summarize some of the more important research findings and literature relating to the adult as a learner and his ability to transfer the learning to a meaningful practice. Thus, this chapter has been divided into the following sections: (1) Factors influencing adult learning; (2) Factors affecting comprehension and retention; (3) Readability of verbal materials; (4) Educational effectiveness of graphic and pictorial illustrations; and (5) Spatial aptitude and its affect on learning transfer.

Factors influencing adult learning

It has been known for centuries that individuals differ in mental ability, as well as in physique and traits or personality. However, it has only been in recent years that research has been conducted on the factors influencing adult learning.

In this section some of the concepts, principles and generalizations pertaining to the adult as a learner are outlined.
Havighurst and Orr suggest that a proper goal of adult education is to help people live better. They further explain that this implies assisting them in every possible way to accomplish their appropriate development tasks. They note the urgency with which certain developmental tasks come to adults during relatively short periods of time. They state that it is at such times that one is intensely motivated to learn, and that education becomes extremely effective. They further declare that, "there are such periods whenever a person faces a developmental task in a new situation demanding a quick response". Such times are referred to as "teachable moments" in a person's life. An example of this might be the man and woman who have purchased a new home. They should be much more teachable in regard to information about home grounds landscaping than they might have been as apartment dwellers.

Havighurst and Orr indicate that the areas of living in which adults are most likely to take advantage of educational offerings are those of work, parenthood, leisure, and home-making. Here their motivation to do a good job is seen to be highest, and here their performance generally leaves ample room for improvement.

With regard to these incentives appropriate for adult learning, Knowles lists four major headings, as follows: (1) those which people wish to gain; (2) those which people wish to be; (3) those which people wish to do; (4) those which people wish to save. He further comments

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1 Robert J. Havighurst and Betty Orr, Adult Education and Adult Needs, a report (Chicago: Center of the Study of Liberal Education for Adults, 1956), pp. 40-56.

2 Ibid.
that recent experiments in adult learning indicate that it is not the capacity to learn that declines with age, but rather, the rate of learning. 3

Thorndike pointed out that adults learn less than they might partly because they underestimate their power to learn and partly because of self-limitations resulting from the narrowness of their interests and from the related attitudes and values which they held. 4

Anderson in an extensive review of research findings with respect to adult learning applicable to later maturity, draws these conclusions:

1. Principles of good pedagogy apply to adults as well as to school children.

2. Learning is more rapid and efficient when the learner is a participant rather than simply a spectator.

3. When a visible and tangible product appears as a result of a learner's activity, interest is greater and the learning will be longer continued.

4. The greater the number of sensory channels used in the learning process the greater is the actual amount of learning.

5. Learning must be used to be retained. 5


In the face of experimental results on adult learning, Lorge made these suggestions for optimizing learning:

1. The teacher must realize that learning flows primarily from the consequences of satisfaction and reward.

2. The teacher must learn to minimize error and maximize success.

3. Adults attitudes can be changed by only changing the learners concept of himself, of the task, and of the role of the teacher.

4. Plan so the adult learner gets a sense of mastery and success.

5. Make use of the learners past experience in teaching.

6. Plan lessons within the speed and scope of the learners.

Factors affecting comprehension and retention

One of the problems in presenting landscape design information to adult groups is determining the best teaching methods to use. The method or methods selected influence the comprehension and retention of the material presented. Since, in this study visual and oral presentations were used to present subject matter information, a review of factors affecting comprehension and retention was essential. The studies reviewed place major emphasis on the affects that a visual and oral presentation have on comprehension and retention.

Henneman suggests that whether visual or oral presentation proves to be superior appears to depend largely upon the specific experimental

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6 Irving Lorge, "Capacities of Older Adults," Education for Later Years (Wilma Donahue, Editor), p. 36.
condition of a particular investigation. Apparently, at least five factors influence the relative advantages of presentation through two senses: (1) the type of material presented (subject matter, form, length, etc.); (2) the method of presentation; (3) the intelligibility or comprehension measure employed (immediate recall, delayed recall, recognition, number of trials to learn, etc.); (4) characteristics of the perceiver (age, intelligence, educational level, etc.); and (5) environmental conditions of presentation.  

Carpenter presents his concepts and principles in relation to audio-visual instruction as follows:

1. A part of the responses of individuals to charts, graphs, models, photographs, words, etc. is that of adding relevant meaning and responses from the repertoire of previously acquired experience and habit systems.

2. Repetition of presentations of stimulus material for learning seems to be of the most powerful variables which has been studied experimentally. Generally, it may be said that nothing absolutely new is ever learned with one exposure. 

3. Time is an indispensible factor in learning. Therefore, the rate of presentation of information in relation to the comprehension rates of students is a fundamental consideration. The presentation-comprehension rates not only interact, but these rates interact with other variables. Of these other variables the demands made on the learners by the number, complexity and subjective difficulty of the materials are most important. 

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Nichol's study suggests that factors which seem clearly to influence comprehension include intelligence, reading comprehension, vocabulary, ability to make inferences, interest and curiosity, physical fatigue, and audibility of the speaker. He also mentions factors which may influence listening comprehension such as: susceptibility to distraction, physical facilities, speaker's effectiveness, and previous speech training.9

Beighley looked at the relationship of three factors to comprehension of meaningful material. These factors were: (1) organization of the material presented; (2) difficulty of material presented; and (3) method of presentation. The findings:

1. Easy material (as related to the Dale formula) was better comprehended than difficult material. However, interest aroused by a talk may outweigh factors of style or language.

2. Comprehension gained through silent reading was consistently greater than that gained through hearing.

3. Vocal skill of the speaker aids the audience to achieve higher comprehension test scores, especially when the material is hard or disorganized.10

Norton in his study reported that intelligence played an important part in how much a listener comprehended. He found further, that more is comprehended if illustration and comparisons are used, and


if the speaker is definite and explicit in presenting his ideas.\textsuperscript{11}

In reviewing the literature one finds several studies that have dealt with retention of information over different periods of time after initial exposure.

Jones found that tests for the content of class lectures resulted in an average score of about 60 percent in immediate recall. He also found that individual differences in immediate recall covered a wide range. The highest in each group performed about six times as well as the lowest in terms of number of points remembered. In one study Jones determined the amount of information retained by college students after hearing 30 lectures of 40 minutes each. Tests were given immediately at the close of the lecture and after intervals of varied length. Half of what was known at the end of the lecture was forgotten in one day.\textsuperscript{12}

Knower, Phillips, and Keoppel concluded that presenting information by using visual aids was more effective for immediate recall than without the use of such aids. However, on the average students

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H. E. Jones, "Experimental Studies of College Training," (The Effect on Examination of the Permanence of Learning), Archives of Psychology, Columbia University, 1923), No. 68.
retain more material from silent reading than from listening to average or poor readers and poor speakers.\textsuperscript{13}

Ulrich made this statement after a research project: Differences between lectures employing visual aids and those not employing them tend to disappear after 30 days.\textsuperscript{14}

Conby stated that the amounts of material remembered after a nine day delay from a speech was approximately one-half that remembered in immediate recall.\textsuperscript{15}

Research indicates there is a rather rapid fall-off of material remembered after a time delay. This fall-off depends on several factors. One of which is highly important is the degree to which the material is used and associated to after the initial learning experience.

Readability of verbal materials

The reading ease or difficulty of a bulletin or extension circular affects the comprehension of the presentation by the reader. Since


this study was concerned with the value of a landscape circular in aiding adult groups in learning and applying landscape information, the effects of stylistic factors upon readability were reviewed to provide a basis for determining the effectiveness of the circular selected.

Surveys of the opinions of experts and readers laid the foundation for a complete analysis of the factors which affect reading ease or difficulty. Gray and Leary classified the 82 factors from their survey into four general categories: format or mechanical features, general features of organization, style of expression and presentation, and context. Strang discovered that students rated stylistic factors most important followed by content, format and organization.

The greatest emphasis in readability studies has been on the stylistic factors affecting reading ease or difficulty. The quantitative associational studies have attempted to isolate a factor or combination of factors which will predict reading ease or difficulty of reading material. Most of these studies are confined to stylistic elements because of the difficulty of expressing the elements of content, format and organization in quantitative terms.

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Lively and Pressey reported the first significant attempt to develop a quantitative formula for determining reading ease or difficulty in 1923. They appraised each successive 1,000 words in Thorndike's list of 10,000 words to determine the relative reading ease or difficulty of eleven books and one newspaper. The reading material was evaluated by inspection and the formula was presumed to be satisfactory for measuring relative reading difficulty. 18

Ojemann investigated the importance of qualitative factors in a study of adult education materials. The criterion used was the reading-grade equivalent on a standardized test of the readers who were able to answer correctly at least one-half of the comprehension questions on the passages. The most important factor in the study was word difficulty as measured by Thorndike's word list. 19

Dale and Tyler investigated 29 factors with health literature for adults of limited reading ability. Three of the factors -- number of different technical words, number of different hard non-technical works, and number of indeterminate clauses -- had a multiple


correlation coefficient of .511 with the scores of a comprehension
test on the material.  

Flesch developed one of the most popular and easiest formulas
to apply in 1943. He questioned the importance of the value of
vocabulary as a predictor of reading difficulty for the better readers.
Average sentence length, and number of personal references were
incorporated into his formula. Flesch revised the formula in 1948
by changing the affix count to a syllable count plus the sentence
length factor for measuring reading ease.

One of the more popular formulas was devised by Dale and Chall
in a study of health materials. They found that the number of words
not included in Dale's list of 3,000 words correlated highest with
the criterion, McCall-Crabbs Standard Test in Reading. The two factors
included in their formula were the number of words not included in
Dale's list of 3,000 words and average sentence length.

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20 E. Dale and R. W. Tyler, "A Study of the Factors Influencing
the Difficulty of Reading Materials for Adults of Limited Reading

21 R. Flesch, Marks of Readable Style (New York: Bureau of
Publications, Teachers College, Columbia University, 1943).

Psychology, XXXII (November 1948), pp. 221-233.

23 Dale and Chall, loc. cit.
The surveys and the quantitative associational studies have contributed to a more refined analysis and application of readability measurement. The surveys have presented an over-all view of the factors which affect readability, and quantitative associational studies have shown the importance of specific factors for predicting reading ease or difficulty. The most important factors which can be measured quantitatively are vocabulary and sentence structure.

Some of the elements of reading ease or difficulty are not included in readability formulas because they add little to the over-all prediction. These factors have not been included because they cannot be measured effectively at the present time. It should be emphasized that all of the elements of reading ease or difficulty are not included in the present readability formulas. Therefore, the formulas can be used only as a guide in predicting reading ease or difficulty.

**Educational effectiveness of graphic and pictorial illustrations**

The trend at the present time is to include more graphic and pictorial illustrations in extension circulars, but the educational value of illustrated material is not known. Although many people have concluded that graphic and pictorial illustrations increase the educational effectiveness of landscape publications, little research is available to verify or reject this conclusion.

Halbert's investigation found that the value of pictures varies with the objectives of the presentation. Pictures alone were superior to reading material with pictures when the objective was to stimulate
a variety of new ideas. Pictures were inferior to reading material with or without pictures when the objective was to stimulate ideas directed toward a specific goal. 24

Vernon found pictures helped students remember specific facts in some cases. However, the results of the several specific cases could not be generalized for the entire experiment. The retention values of the version illustrated with pictures was not superior or inferior to the illustrated version or the version illustrated with graphs. 25

Vernon's study of the value of graphs and charts as an aid to retaining factual data for college students and airmen did not find any advantages in the use of charts and graphs. She found that comparatively intelligent and well-educated adults can learn from charts and graphs if the charts and graphs are simple, but others do not learn from them. 26


Burdick investigated the value of cross-sectional drawings in high school science textbooks. He concluded that cross-sectional drawings do not contribute to reading comprehension in high school science textbooks.  

There are many variations in graphic and pictorial illustrations. It is possible that some illustrations could increase the educational effectiveness of a presentation while other illustrations could confuse the learner. The objectives of the presentation should be considered when developing illustrations. Williams listed five criteria for the selection of appropriate illustrations: (1) illustrations have one central theme and avoid details that detract, (2) be rich in thought content, (3) supplement the text and aid in its interpretation and clarification, (4) be clear, distinct, and artistic, and (5) furnish a vicarious experience which corresponds closely with a real situation.

**Spatial aptitude and its affect on learning transfer**

The review of literature did not reveal any studies that directly relate to spatial skills and the ability to develop a landscape plan. Therefore, the review presented details with supporting evidence which

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indicates the importance of spatial skills in learning transfer and vocational success in areas where high spatial aptitude is deemed essential.

There have been many studies conducted which indicate that spatial aptitude is a learned perception. One of the earliest studies was conducted in 1898. Snyder and Pronko report that in this study monocular lenses were used to create disassociation. The experiment clarifies that harmony between sight and touch does not depend upon inversion of the retinal image. The spatial identity of tactual and visual objects is entirely relative to the conditions during the time in which a person is building up perceptual responses. Thus it follows that visual as well as other perceptions of people are merely a reflection of standard conditions that surround their development. A baby at birth, for instance, has no awareness to spatial relations until sensory associations are developed.29

The theory expressed in 1898 has received support and modification by many psychologists. Gesell and Gleannor, for example, believe that vision is thoroughly bound up with present and past behavior of an organism. Their thought is that "vision must be interpreted in terms of a total, unitary, integrated action system".30


Hurlock contends that although visual sensations may be the same for small children and adults, the spatial qualities cannot be the same. Meaning must be learned by experience. This can be interpreted as meaning that space perception is learned with increase in age and experience.

Graham postulated that there are three factors primarily responsible for what a person visually perceives and records in his memory; the organism itself, the stimulus object and light. Their effect in visual perception may be defined as follows:

1. The organism itself. Individual differences of each individual and physical condition of the human eye effect visual perception.

2. The stimulus object. The stimulus object or its setting is primarily involved in visual perception.

3. Light. The presence of light and light quality effect what a human visually perceives.

In the simplest sense the artist who paints a picture or the architect who designs a building utilizes the facts he knows about the human organism, stimulus objects and light effects to create an object that will be pleasing and satisfying to the viewed. The landscape architect uses these same principles when he designs a landscape which will be aesthetically pleasing and useful. The ability to perceive


in one's mind and to transfer, in an orderly form, design concepts requires a high degree of spatial skills. Super defines spatial skills as "the ability to judge shapes and sizes, to manipulate them mentally, and to visualize the effects of putting them together or of turning them over or around."\(^{33}\)

Hemoltz in 1924 defined the stimulus conditions of space perception as cues, and these cues, in turn, have been divided into types--monocular and binocular. Monocular cues are those that elicit spatial discriminations on the basis of vision with a single eye. Binocular cues require the coordinated activity of the two eyes.\(^{34}\)

The primary cues, definition and their relation to landscape design are as follows:

1. **Relative size.** Our discrimination of distance is dependent upon the size of the retinal image provided by an object and by our past and present experience with objects of the same class. In landscape design an attempt is made to maintain a harmonious blending of plants with the structure to create an environment which is pleasing to man. Size of the plants placed in the landscape and the ultimate height to which they grow is extremely important in

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\(^{34}\) H. L. Hemoltz, "Teatise on Physiological Optics," *Optical Society of America*, III (February, 1925), p. 43.
applying the concept of relative size. An attempt is also made to avoid sharp changes in size over short intervals of distance which would create disharmony in visual perception.

2. **Interposition.** The cue of interposition occurs when overlapping object is said to be nearer than an overlapped object. This concept is primary in the development of a three-dimensional design. The human eye when it views an overlapping object perceives depth dimension. When planning a landscape, plant groupings are arranged so that dimension is clearly defined.

3. **Linear perspective.** The stimulus condition for this cue is determined by the fact that a constant distance between points becomes a smaller and smaller angle at the eye as the points recede from the subject. The primary visual example of this concept is the visual appearance of two paralleling lines joining together as we view them in the distance. This concept is not extremely important in landscaping the average small property, but it does have some very important use in the development of large open space areas.

4. **Light and Shade.** Various combinations of shadow and highlight are reported as objects creating various dimensions. A well-developed landscape plan will include the use
of trees which will provide different shading intensity and dimension depending upon their foliage density and placement in relation to the sun angle. The proper shading effect will add to the dimensional effect of the landscape and create variations in the harmonies of colors in the landscape.

5. **Accommodations.** The cue of accommodation refers to the differential aspects of "blur circles" in a retinal image may elicit spatial discriminations, although probably not for objects at distances greater than a few yards. The landscape architect groups or masses plants rather than placing individual specimen plants throughout the landscape. This technique avoids accommodation and provides a pleasing design flow as your eyes move about the landscape.

6. **Convergence.** When an object is at a great distance, lines of fixation to the object are parallel. When the object is near at hand, the subject's eyes are turned in a coordinated manner so that the lines of fixation converge on the object. Convergence is a phenomena of binocular vision which in landscaping is utilized in the placement of specimen plants or interest areas in the garden. Creating a focal point in the garden has the purpose of directing the visual senses to this point or area.

There have been many tests developed to measure spatial aptitude and its correlation with vocational success. One of the most
significant studies was conducted by the Psychological Corporation. The study indicated that a spatial relations test is a good predictor of a person's ability to succeed in occupations requiring spatial skills. The study also indicated an interesting relationship between spatial aptitude test scores and the subsequent education received. It was observed that those who had attained college degrees were markedly superior to the average high school graduate. In addition, those who received advanced degrees were definitely superior to those who attained undergraduate degrees.  

There also have been many studies which stress the importance of high spatial aptitudes for success in careers requiring spatial skills. Most of these studies have been conducted in the fields of architecture and engineering. Bingham stressed the importance of "structural visualization" for success in architecture and engineering, and Estes concluded that success in architecture and engineering depend upon the "extent to which the individual possessed ability for perceptual thinking with the spatial aspects and relationships of objects."  


Travers reports that several engineering schools have discovered that some form of space manipulation test predicts successfully those aspects of engineering training which require the visualization of objects in three dimensional space. 38

Summary

An adult's ability to learn relates not only to his mental aptitude but to the ability of the instructor to convey his message effectively. Therefore, the previous experience of the learner and the effective use of teaching methods are important factors in the development of an extension program. The review of literature in this study was directed toward a review of the factors which were important in determining the most feasible methods of presenting landscape design information. Thus, five factors were considered important in reviewing the literature: (1) Factors influencing adult learning; (2) Factors affecting comprehension and retention; (3) Readability of verbal materials; (4) Educational effectiveness of graphic and pictorial illustrations; and (5) Spatial aptitude and its affect on learning transfer.

The principles of learning for adults are quite similar to those expressed for students in formal classroom situations. The adult, like the student, is an eager learner when motivated to learn. Therefore, if the adult is interested in the subject matter area motivation

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does not present difficulty. The problem in adult learning is to present the subject matter at a level which can be understood so that maximum learning and transfer will result.

The major consideration which affects adult learning is the ability of adults to comprehend and retain the information presented. Studies indicate that comprehension and retention are governed in part by five primary factors: (1) individual differences of the learner; (2) the subject matter area; (3) time allowed for learning; (4) the number of sensory channels involved in the learning process; and (5) organization and presentation of the subject matter. These five points indicate that the extension educator should develop teaching materials and utilize methods which will provide sequence and practice in learning.

The presentation of information through several sensory channels improves comprehension and retention by the learner. Pictorial illustrations used in conjunction with audio presentations have proven to increase knowledge recall.

Publications in the form of books, circulars and bulletins are also important media for learning. However, the readability of the material is an important factor to consider. All visual materials, whether in the pictorial or written form, which are used for learning should be developed to reinforce the audio presentation.

Several studies have been carried out to determine what effects reading ease or difficulty has on the learner's ability to comprehend written materials. The greatest emphasis has been placed on the stylistic factors. Readability formulas which are based on sentence
structure and vocabulary measure the stylistic factor. The formulas which have been developed have proven quite successful as predictors of readability. It is, of course, essential to use written publications which are equal to or below the reading level of the learner if maximum comprehension is to occur.

Spatial aptitude is another important consideration in learning when presenting information which involves a manipulation of objects in dimensional perspective. There have been many studies conducted which indicate that spatial aptitude is a learned perception. The success or failure of the learner to comprehend subject matter information which requires spatial skills will depend upon his spatial aptitude.

Several tests have been developed to measure spatial aptitude. These tests have proven effective as predictors of a person's success or failure in vocational areas requiring a high degree of spatial aptitude. Unfortunately, little is known about how spatial aptitude can be increased through learning. However, the predictors that have been developed indicated that learning of spatial skills may relate to the number of sensory channels, time and practice involved in the learning process.
CHAPTER III

ANALYSIS OF DATA OBTAINED IN MEASURING SELECTED FACTORS INFLUENCING THE LEARNING OF LANDSCAPE DESIGN CONCEPTS

The statistical analysis of the data obtained in the pursuit of measuring the influence of selected factors upon the learning of landscape design concepts is presented in this chapter. Treatment of data includes an analysis of the value of a landscape circular when used to supplement a series of meetings held for adult groups on the subject of landscape design. Statistical analysis is also presented depicting the relationship of three independent variables as influencing an adult's ability to develop a landscape plan.

The characteristics and factors chosen for the study were:

1. The use of an illustrated circular to supplement a series of meetings on landscape design as compared to not making use of a supplemental circular.

2. The effect of different levels of formal education on the amount of information recall following a series of landscape meetings.

3. The effect of age on recall following a series of landscape meetings.

4. The relationship between spatial aptitude and the ability to develop a landscape plan.

5. The effect of a landscape circular on the ability to develop a landscape plan.

Basic data analysis was performed through the use of an electronic computer. Information concerning test instrument scores, spatial
aptitude scores, age, education and landscape plan evaluation, was placed on tabulation sheets as it was gathered. After all data were collected, code cards were punched. The punched cards were processed through the IBM 360/67 computer located at Shields Building, The Pennsylvania State University.

Selection of statistical models

For assistance in selecting the appropriate statistical models for this study, the writer consulted Dr. Richard Craig of the Department of Horticulture at The Pennsylvania State University.

Analysis of variance. -- The technique of analysis of variance was used to determine whether or not differences existed within and/or between the subgroups in the study.

All variables considered in the study were first submitted to a two factor analysis of variance test. This test was followed by the use of single classification analysis of variance to determine whether or not differences existed between the experimental and control groups prior to and following the concentrated instructional period.

The data output received from the two factor analysis of variance techniques consisted of preliminary analysis of variance table with sources of variation, degrees of freedom, sums of squares, mean squares and F ratios for each table.

The data output received from the single classification analysis of variance consisted of the analysis of variance, degrees of freedom,
sums of squares, mean squares and F ratio. In addition a table was included which listed the means, sums of squares, mean squares, standard deviations and number of observations for both the control and experimental group.

**Symmetric correlation.** -- One of the objectives of the study was to determine the relationship between the dependent variable of landscape plan development and the following independent variables:

1. Age  
2. Education  
3. Spatial aptitude  
4. Supplemental landscape circular

All independent variables were first analyzed by the Pearson product-moment correlation coefficient r. This statistical technique provided an indication of the magnitude and direction of the relationships between the dependent and independent variables.

The data output received from the symmetric correlation included a triangular matrix for all variables followed by tables of means and standard deviations.

**Analysis of Covariance.** -- The technique of analysis of covariance was used to determine the relationships between the ability to draw a landscape plan and the independent variables. The differences between post-test scores were compared with pre-test scores by this technique, holding constant individual differences. Thus adjustments were made for individual differences due to the individuals. Increased
precision was also possible in the test of significance through the reduction of the mean square used as the error term. This is possible since covariance is an extension of regression.

The data output received from analysis of covariance included common partial regression coefficients, means, adjusted means, sources of variations, degrees of freedom, sums of squares and mean squares.

**Multiple regression.** -- The multiple regression technique with parsimony was chosen to determine the influence of the selected independent variables (X) on the dependent variable (Y). In multiple regression an attempt is made to predict any particular variable from any combination of other variables. The regression equation can be defined as the path of the mean of the dependent variable (Y) from all the combinations of (X).

The constant or b associated with each independent value (X) in the multiple regression coefficient is termed the partial regression coefficient. Each constant, b, shows the average increase in Y associated with each unit increase in its corresponding X. In identifying variables the number of the variable in its sequential order in the whole matrix is used. The independent variables are then eliminated by parsimony.  

The data output included identification of the independent variables, their real measure regression coefficients, standard

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deviations for the coefficients, partial correlation coefficients and standard regression coefficients. Also produced was the number of variables previously eliminated, the candidate for the next elimination and the fraction of explained variance.

**Confidence level.** -- The .05 level of confidence was used for the F test to reject or not reject the null hypothesis. F value used for significance at the .05 level of confidence for research computations was based upon the degrees of freedom.

The .05 level of confidence was used as the basis for rejecting the null and/or research hypothesis

The t in this study was used to test the significance of Pearsonian - product-moment correlations and the regression coefficients determined.

**Interpretation of statistical findings**

This section presents research findings and as applicable relates these findings to the appropriate null hypothesis and research hypothesis. First, attention is given to the face data which describes the population sample. Second, results of the four landscape meetings held with and without the use of a landscape circular was compared.

**Location of landscape meetings.** -- Ten counties were randomly selected to participate in this research project. In all cases the

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meetings were held in the town or city where the county agricultural agent's office was located. The communities in which the meetings were held ranged in population size from 9,200 to 80,000. However, respondents who attended the meetings represented a broad cross section of both rural and urban people.

Table 1 indicates that 34.9 percent of the people who attended the landscape meetings either lived on a farm or were rural non-farm people. Thirty-six percent were residents of communities with less than 10,000 population. The remaining 28.3 percent were persons who lived in towns or suburb areas of cities.

TABLE 1

TYPE OF COMMUNITIES IN WHICH RESPONDENTS LIVED

<table>
<thead>
<tr>
<th>Residence</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>On farm</td>
<td>21</td>
<td>10.3</td>
</tr>
<tr>
<td>In the country not on farm</td>
<td>50</td>
<td>24.6</td>
</tr>
<tr>
<td>Town of less than 2,500 people</td>
<td>28</td>
<td>13.7</td>
</tr>
<tr>
<td>Town with 2,500 to 10,000 people</td>
<td>47</td>
<td>23.1</td>
</tr>
<tr>
<td>Town with more than 10,000 people</td>
<td>32</td>
<td>15.6</td>
</tr>
<tr>
<td>City suburb with more than 10,000 people</td>
<td>26</td>
<td>12.7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>204</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>
House age and years of ownership. -- Table 2 shows the house age and years of ownership by families attending the landscape meetings. A total of 79 families or 43.1 percent of the families owned houses which were two years or less old and had lived in their home for one year or less. Homeowners who had lived in their homes three to nine years represented 24.6 percent of the families attending the landscape meetings. Thirty-one families or 16.9 percent had lived in their homes ten years or more.

A total of 92 families or 50.3 percent of the families participating in the landscape meetings lived in homes which were two years old or less. Forty-seven families or 25.5 percent of the total lived in houses which were between three and fourteen years old. The remaining 45 families or 25 percent lived in homes which were 15 years old or older.

Reasons for landscaping. -- The major reason for landscaping expressed by 51.4 percent of the participants was that no landscaping existed at the present time. Thirty-three participants stated reasons other than creating a new or redesigning an old landscape for their interest in landscaping. The majority of respondents in this group stated that their landscape was not complete or they hoped to learn how to improve the landscape which they now had. Table 3 summarizes the reasons expressed for landscaping by the 204 respondents who participated in the ten landscape sessions.
TABLE 2

NUMBER OF FAMILIES ATTENDING LANDSCAPE MEETINGS
BY HOUSE AGE AND YEARS OF OWNERSHIP

<table>
<thead>
<tr>
<th>Years Ownership</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>More than 10</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under construction</td>
<td>6</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>--</td>
<td>--</td>
<td>6</td>
</tr>
<tr>
<td>0 - 2</td>
<td>79</td>
<td>6</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>--</td>
<td>--</td>
<td>85</td>
</tr>
<tr>
<td>3 - 5</td>
<td>4</td>
<td>1</td>
<td>5</td>
<td>9</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>--</td>
<td>--</td>
<td>21</td>
</tr>
<tr>
<td>6 - 8</td>
<td>1</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>5</td>
<td>1</td>
<td>3</td>
<td>-</td>
<td>--</td>
<td>--</td>
<td>11</td>
</tr>
<tr>
<td>9 - 11</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>12 - 14</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>15 - 17</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>18 - 20</td>
<td>2</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>21 - 50</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>7</td>
<td>16</td>
</tr>
<tr>
<td>51 - 100</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>3</td>
<td>13</td>
</tr>
<tr>
<td>100 - 200</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>200 - more</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>--</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>96</td>
<td>12</td>
<td>11</td>
<td>13</td>
<td>3</td>
<td>6</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>6</td>
<td>25</td>
<td>183</td>
</tr>
</tbody>
</table>
TABLE 3
REASONS FOR LANDSCAPING EXPRESSED
BY RESPONDENTS

<table>
<thead>
<tr>
<th>Reason</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>No landscaping at present</td>
<td>115</td>
<td>51.4</td>
</tr>
<tr>
<td>Landscape needs to be done over</td>
<td>56</td>
<td>32.4</td>
</tr>
<tr>
<td>Other</td>
<td>33</td>
<td>16.2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>204</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Age of respondents. -- The overall mean age of respondents, as shown in Table 4, was 42.1 years. The mean age of the 99 men and women in the control group was 43.7 years. The mean age of the 105 men and women in the experimental group was 40.6 years.

TABLE 4
MEAN AGE OF RESPONDENTS IN THE EXPERIMENTAL AND CONTROL GROUPS

<table>
<thead>
<tr>
<th>Group</th>
<th>Number</th>
<th>Mean Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental(^a)</td>
<td>105</td>
<td>40.6</td>
</tr>
<tr>
<td>Control(^b)</td>
<td>99</td>
<td>43.7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>204</td>
<td>42.1</td>
</tr>
</tbody>
</table>

\(^a\) Group which received a supplemental instructional circular.

\(^b\) Group which did not receive a supplemental instructional circular.
Formal level of education. -- Table 5 shows that for both the control and experimental groups the mean formal educational level exceeded 12 years. The experimental group had the highest mean educational level which was 13.55 years. However, the difference between the mean educational level in the experimental and control groups was only .10 years.

Table 5

<table>
<thead>
<tr>
<th>Group</th>
<th>Number</th>
<th>Mean years of formal education</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental</td>
<td>105</td>
<td>13.55</td>
</tr>
<tr>
<td>Control</td>
<td>99</td>
<td>13.45</td>
</tr>
<tr>
<td>Total group</td>
<td>204</td>
<td>13.50</td>
</tr>
</tbody>
</table>

Comparison of pre-test and post-test results. -- Several statistical techniques were used to determine differences within and between the control and experimental groups. Pre-test scores were first analyzed by use of analysis of variance, followed by use of two factor analysis of variance and covariance.

Table 6 shows a comparison of the pre-test mean scores of the control groups. The mean scores of the five control groups ranged from
a low of 11.85 correct responses to a high of 15.31. The mean score for all groups was 14.34. In using the F test to determine significant difference an F value of 9.12 was derived. This value is interpreted as being significant at the .01 level since the critical value needed at this point of confidence was 3.51.

**TABLE 6**

**COMPARISON OF PRE-TEST MEAN SCORES OF THE CONTROL GROUPS**

<table>
<thead>
<tr>
<th>Subgroups</th>
<th>N</th>
<th>Mean Score</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>20</td>
<td>11.85</td>
<td>3.65</td>
</tr>
<tr>
<td>2</td>
<td>16</td>
<td>18.87</td>
<td>4.19</td>
</tr>
<tr>
<td>3</td>
<td>23</td>
<td>12.04</td>
<td>3.47</td>
</tr>
<tr>
<td>4</td>
<td>19</td>
<td>15.31</td>
<td>3.77</td>
</tr>
<tr>
<td>5</td>
<td>21</td>
<td>14.90</td>
<td>5.02</td>
</tr>
<tr>
<td>Total</td>
<td>99</td>
<td>14.34</td>
<td>4.02</td>
</tr>
</tbody>
</table>

\[ F = 9.12 \quad \text{d.f.} = 4,94 \quad P < .01 \]

Comparison of the pre-test mean scores of the experimental groups, as reported in Table 7, indicated an overall mean score of 14.27. The mean scores of the five groups ranged from a low of 11.82 to a high of 16.18. In using the F test to determine significance an F value of 4.86 was derived. This value is interpreted as being significant at the
.01 percent level since the critical value needed at this point of confidence was 3.51.

**TABLE 7**

**COMPARISON OF PRE-TEST MEAN SCORES OF THE EXPERIMENTAL GROUPS**

<table>
<thead>
<tr>
<th>Subgroups</th>
<th>N</th>
<th>Mean Score</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>22</td>
<td>16.18</td>
<td>4.80</td>
</tr>
<tr>
<td>2</td>
<td>26</td>
<td>16.04</td>
<td>4.66</td>
</tr>
<tr>
<td>3</td>
<td>25</td>
<td>11.88</td>
<td>3.45</td>
</tr>
<tr>
<td>4</td>
<td>17</td>
<td>11.82</td>
<td>4.79</td>
</tr>
<tr>
<td>5</td>
<td>15</td>
<td>15.20</td>
<td>5.79</td>
</tr>
<tr>
<td>Total</td>
<td>105</td>
<td>14.27</td>
<td>4.79</td>
</tr>
</tbody>
</table>

F = 4.86 d.f. = 4,100 P < .01

The pre-test scores in both the control and experimental groups reported in Table 8 were used to determine if there was a significant difference between the two groups. The mean score between the two groups varied only .07. The low mean score was 14.27 in the experimental group and the high mean score was 14.34 in the control. It should be noted that the standard deviation for the control group was 4.67 whereas the experimental group deviated about the mean by 4.97 value. This represented a difference of only .30.
TABLE 8

COMPARISON OF THE PRE-TEST MEAN
SCORES OF THE CONTROL AND EXPERIMENTAL GROUPS

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean Score</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>99</td>
<td>14.34</td>
<td>4.67</td>
</tr>
<tr>
<td>Experimental</td>
<td>105</td>
<td>14.27</td>
<td>4.97</td>
</tr>
</tbody>
</table>

The difference between the mean pre-test scores of the control and experimental groups was not significant. To have a significant difference at the .05 level would require an $F$ value of 6.76.

As shown in Table 9, covariance was used to determine the influence of a landscape circular on achievement on a recall test. The mean post-test score was 21.80 for the control group and 26.25 for the experimental group. The results of the analysis indicated that the difference was significant at the .01 level. The experimental group which received the supplemental landscape circular proved superior in recall learning following a series of four meetings on landscape design.

Based upon the experimental results, the null hypothesis which stated there was no significant difference in the level of understanding among adult groups presented landscape design information supplemented with a circular as compared to adult groups presented the same information without a circular as measured by a recall test was, therefore, rejected. At the same time we accept the research hypothesis which
states the adult groups presented landscape design information supplemented with a circular will have a significantly higher mean score as measured by a recall test than adult groups presented the same information as without a circular.

**TABLE 9**

**INFLUENCE OF A LANDSCAPE CIRCULAR ON ACHIEVEMENT ON A RECALL TEST**

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Pre-Test Mean Score</th>
<th>Post-Test Mean Score</th>
<th>Adjusted Mean Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>99</td>
<td>14.34</td>
<td>21.80</td>
<td>21.78</td>
</tr>
<tr>
<td>Experimental</td>
<td>105</td>
<td>14.27</td>
<td>26.25</td>
<td>26.28</td>
</tr>
</tbody>
</table>

\[ F = 76.01 \text{ d.f.} = 1,201 \text{ P} \ll 0.01 \]

**Effect of age, educational level and spatial aptitude on recall.** --

The three independent variables of age, formal education level and spatial aptitude were considered as factors which might have an effect on recall learning. To statistically measure the association of these independent variables, the Pearsonian product-moment coefficient \( r \) was considered to be most useful. For this reason it was applied to determine the relative association of given values of each independent variable with the adult group recall learning as measured by the post-test.
Table 10 lists the mean age for all respondents and the association between age and post-test scores in the control and experimental groups involved in this study. The overall mean age for all respondents was 42.12 years with a standard deviation of 11.56. This denotes that two-thirds of the respondents participating in the landscape meetings were between the ages of 30.56 years to 53.68 years. Respondents in the experimental group were the youngest with a mean age of 40.6 years. The mean age in the control group was 43.72 years. Analysis of variance was computed which indicated there was no significant difference in the mean age of the control or experimental groups. These data are not shown.

**TABLE 10**

**CORRELATION BETWEEN AGE AND POST-TEST SCORES**

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean Age Level</th>
<th>Standard Deviation</th>
<th>Post-Test Scores</th>
<th>r Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>99</td>
<td>43.72</td>
<td>11.11</td>
<td>21.80</td>
<td>-.12a</td>
</tr>
<tr>
<td>Experimental</td>
<td>105</td>
<td>40.60</td>
<td>11.83</td>
<td>26.25</td>
<td>-.03a</td>
</tr>
<tr>
<td>All Groups</td>
<td>204</td>
<td>42.12</td>
<td>11.56</td>
<td>24.09</td>
<td>-.12a</td>
</tr>
</tbody>
</table>

Correlations between age and mean post-test scores are also depicted in Table 10. The Pearsonian r values derived show a negative
correlation between age and post-test scores. This relationship was not significant at the .05 level. This was interpreted to mean that age was not associated with the level of the post-test score.

The respondents' formal level of education was considered in this study as an influencing factor on recall learning. Table 11 lists the mean educational level for respondents in the control and experimental groups. The mean educational level of respondents in both groups was surprisingly high. The mean in the control group was 13.55 years of formal schooling compared to 13.45 years in the experimental group. The mean standard deviation for both groups was 2.28. This indicates that two-thirds of the respondents had between 11 years and 15 years of formal education. Analysis of variance was the statistical technique used to determine if there was a significant difference between the educational levels of the respondents in the control and experimental groups. The F value of .089 was not significant at the .01 level. These data are not shown.

Correlation between formal education level and post-test scores was significant at the .01 level for both the control and experimental groups, as shown in Table 11.

Table 12 indicates the mean spatial aptitude score received on a standardized spatial aptitude test by all respondents in the experimental and control groups. The mean spatial score for both groups varied only 2.05 and the overall mean score for both groups was 63.43. The range of scores was considerable as the standard deviations of both
TABLE 11
CORRELATION BETWEEN EDUCATION LEVEL
AND POST-TEST SCORES

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean Education level</th>
<th>Standard Deviation</th>
<th>Post-Test Scores</th>
<th>( r ) Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>99</td>
<td>14.66</td>
<td>2.35</td>
<td>21.80</td>
<td>.29&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Experimental</td>
<td>105</td>
<td>13.45</td>
<td>2.31</td>
<td>26.25</td>
<td>.53&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>All Groups</td>
<td>204</td>
<td>13.50</td>
<td>2.28</td>
<td>24.09</td>
<td>.37&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a</sup> P < .01

groups indicate. Two-thirds of the respondents in the control and experimental groups had scores ranging from a low of 49.69 to a high of 78.22. A test of significance used to measure the mean spatial score differences between the control and experimental groups was not significant at the .05 level.

Correlations between spatial aptitude scores and mean post-test scores are also indicated in Table 12. The Pearsonian \( r \) values indicate a positive correlation between spatial aptitude and the ability to achieve higher post-test scores. The experimental group had a correlation value of .08 higher than the control group. The relationship of spatial aptitude and post-test scores was significant at the .05 level.
for both the experimental and control groups. This is interpreted to mean that spatial aptitude was associated with the ability to recall.

### TABLE 12
**CORRELATION BETWEEN SPATIAL APTITUDE AND POST-TEST SCORES**

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean Spatial Aptitude</th>
<th>Standard Deviation</th>
<th>Post-Test Score</th>
<th>r Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>99</td>
<td>62.34</td>
<td>14.53</td>
<td>21.80</td>
<td>.21a</td>
</tr>
<tr>
<td>Experimental</td>
<td>105</td>
<td>64.29</td>
<td>15.09</td>
<td>26.25</td>
<td>.29a</td>
</tr>
<tr>
<td>All Groups</td>
<td>204</td>
<td>63.43</td>
<td>14.79</td>
<td>24.09</td>
<td>.25a</td>
</tr>
</tbody>
</table>

In determining the significance of the effect of age, level of formal education and spatial aptitude on post-test scores the t-ratio was computed. The t-ratio is used to estimate the probability that an observed value of $b_{yx}$ might have been obtained by chance in random sampling from a population in which the true regression coefficient was zero. Table 13 indicates the effect of the independent variables on post-test scores.

The probability that level of formal education and spatial aptitude effected post-test mean score results was at the .05 level of significance or less. The t value for education was 4.82. The
positive t value indicates there was a relationship between formal education level and post-test scores.

The t value for spatial aptitude was 3.46. This value indicates there was also a positive relationship between spatial abilities and achievement on the post-test.

### TABLE 13

**EFFECT OF AGE, LEVEL OF FORMAL EDUCATION AND SPATIAL APTITUDE ON POST-TEST SCORES**

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>$b_{yx}$</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>- .135</td>
<td>-1.23</td>
</tr>
<tr>
<td>Education</td>
<td>.918</td>
<td>4.82a</td>
</tr>
<tr>
<td>Spatial aptitude</td>
<td>.873</td>
<td>3.46a</td>
</tr>
</tbody>
</table>

a P < .01

The t value for age was -1.23. The negative t value indicates a slight inverse relationship between age and achievement on the post-test. The t value for age was not significant at the .05 level.

At the significance level of .01, as shown in Table 13, we reject the null hypothesis that there will be no difference among adults with different levels of formal education in the amount of recall following a series of landscape meetings. However, we accept the research hypothesis which states adults with a higher level of formal education
will have a significantly higher mean score on a test of recall measuring understanding of landscape concepts than adults with a less formal education following participation in a series of landscape meetings. We fail to reject the null hypothesis that there will be no significant difference between lower age groupings and higher age groupings in the amount of recall following a series of landscape meetings.

Effect of age, educational level and spatial aptitude on landscape plan score. -- The three independent variables of age, educational level and spatial aptitude were studied to determine their effect on the ability to develop a landscape plan. The Pearsonian product-moment correlation was again used to measure association between the independent variables and the landscape plan scores. Tables 14, 15 and 16 show the correlations between age, formal education level and spatial aptitude and landscape plan scores.

TABLE 14
CORRELATION BETWEEN AGE AND LANDSCAPE PLAN SCORE

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean Plan Score</th>
<th>Standard Deviation</th>
<th>Age</th>
<th>r Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>99</td>
<td>13.27</td>
<td>4.28</td>
<td>43.72</td>
<td>-.01</td>
</tr>
<tr>
<td>Experimental</td>
<td>105</td>
<td>13.72</td>
<td>4.88</td>
<td>40.60</td>
<td>-.10</td>
</tr>
<tr>
<td>All Groups</td>
<td>204</td>
<td>13.50</td>
<td>4.59</td>
<td>42.11</td>
<td>-.06</td>
</tr>
</tbody>
</table>
The Pearsonian $r$ values indicated in Table 14 show a slight negative relationship for both the control and experimental groups. This relationship was not significant at the .05 level. This correlation is interpreted to mean that age had little or no bearing on the respondents' ability to develop a landscape plan.

### Table 15

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean Plan Score</th>
<th>Standard Deviation</th>
<th>Formal Education Level</th>
<th>$r$ Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>99</td>
<td>13.27</td>
<td>4.28</td>
<td>13.55</td>
<td>.71&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Experimental</td>
<td>105</td>
<td>13.72</td>
<td>4.88</td>
<td>13.45</td>
<td>.47&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>All Groups</td>
<td>204</td>
<td>13.50</td>
<td>4.59</td>
<td>13.49</td>
<td>.60&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a</sup> $P < .01$

There was a significant relationship at the .01 level between formal education and the ability to develop a landscape plan, as is indicated in Table 15.

Table 16 indicates the correlation between spatial aptitude and landscape plan scores. The difference in $r$ values between the control and experimental groups was only .14. The mean $r$ value for both groups was .63. This value is significant at the .01 level. This relationship
is interpreted as meaning there is a direct relationship between the respondents' spatial aptitude and their ability to develop a landscape plan.

**TABLE 16**

**CORRELATION BETWEEN SPATIAL APTITUDE AND LANDSCAPE PLAN SCORE**

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean Plan Score</th>
<th>Standard Deviation</th>
<th>Spatial Aptitude Score</th>
<th>r Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>99</td>
<td>13.27</td>
<td>4.28</td>
<td>62.34</td>
<td>.63(^a)</td>
</tr>
<tr>
<td>Experimental</td>
<td>105</td>
<td>13.72</td>
<td>4.88</td>
<td>64.29</td>
<td>.64(^a)</td>
</tr>
<tr>
<td>All Groups</td>
<td>204</td>
<td>13.50</td>
<td>4.59</td>
<td>63.43</td>
<td>.63(^a)</td>
</tr>
</tbody>
</table>

\(^a\) P < .01

The multiple regression coefficient with parsimony was used for the determinations of the percentage of variation in the ability to draw a landscape plan explained by two independent variables. The two independent variables and the percentage of variation explained by each variable for the combined experimental and control groups is indicated in Table 17. The greatest percentage of explained variation which influenced the ability to draw a landscape plan was the spatial aptitude of the respondents. This accounted for 40.2 percent of the explained variation. The two independent variables combined accounted
for only 52.9 percent of the variation. Thus, 47.1 percent of the variation could not be accounted for by use of the multiple regression formula. This indicates there are other variables which were not measured that effected the respondents' ability to develop a landscape plan.

### Table 17

**Percentage of variation in ability to draw a landscape plan explained by two independent variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Percent of variance explained</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spatial</td>
<td>40.2</td>
</tr>
<tr>
<td>Education</td>
<td>12.7</td>
</tr>
</tbody>
</table>

As shown in Table 18, the interaction effect between education, spatial aptitudes and landscape plan scores was significant at the .05 and .01 levels respectively. This indicates there was a direct relationship between the two independent variables and the ability of the respondents in the control and experimental groups to develop a landscape plan. Age, as shown in Table 18, had little effect upon the respondents' ability to develop a landscape plan. The results indicate that respondents who had a higher formal education and spatial aptitude gained significantly more from the instructional sessions than those individuals who had a low formal education and spatial aptitude.
Therefore, the null hypothesis of no significant difference between adults with high spatial aptitude and adults with low spatial aptitude and their ability to draw a landscape plan can be rejected. This leads to the acceptance of the research hypothesis which states adults with higher spatial aptitude will have a significantly higher mean score on landscape development plans than adults with a lower spatial aptitude following participation in a series of landscape meetings.

**TABLE 18**

**EFFECT OF SPATIAL APTITUDE AND EDUCATION ON LANDSCAPE PLAN SCORES**

<table>
<thead>
<tr>
<th>Independent</th>
<th>b&lt;sub&gt;yx&lt;/sub&gt;</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>.016</td>
<td>-.12</td>
</tr>
<tr>
<td>Spatial aptitude</td>
<td>.196</td>
<td>4.43&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Education</td>
<td>.783</td>
<td>5.54&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a</sup> P < .01

**Effect of a supplemental circular on the ability to develop a landscape plan.** -- The relationship between the ability to develop a landscape plan and the use of a supplemental instructional circular was one of the considerations with which this study was concerned. Three factors were considered important in studying the relationship.
They were: (1) correlation between pre-test scores and the landscape plan scores; (2) correlation of the post-test scores and landscape plan scores; and (3) analysis of the landscape plan scores for the control and experimental groups. Table 19 shows the correlation between the pre- and post-test scores and landscape plan scores.

**TABLE 19**

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Pre-test r value</th>
<th>Post-test r value</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>99</td>
<td>.304&lt;sup&gt;a&lt;/sup&gt;</td>
<td>.399&lt;sup&gt;a&lt;/sup&gt;</td>
<td>.10</td>
</tr>
<tr>
<td>Experimental</td>
<td>105</td>
<td>.312&lt;sup&gt;a&lt;/sup&gt;</td>
<td>.472&lt;sup&gt;a&lt;/sup&gt;</td>
<td>.16&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a</sup> P < .01
<sup>b</sup> P < .05

The Pearsonian product-moment correlation indicates a significant relationship at the .01 level between the pre- and post-test scores and landscape plan scores in both the control and experimental groups. The significance in gain in this relationship can be expressed by the difference between the pre- and post-test r values. This difference indicates that the experimental groups had a significant increase in the correlation value expressed at the .05 level while the control
group did not have a significant increase. In order to check whether
or not the significant increase in correlation was due to the effects of
the supplemental circular other statistical analysis techniques were used
to determine the differences between the landscape scores in the control
and experimental groups.

Table 20 indicates that there was no significant difference between
the landscape plan scores received in either the control or experimental
groups. Therefore, the null hypothesis which states there is no
significant difference between adult groups in their ability to develop
a landscape plan when presented landscape information supplemented with
a circular as compared to adult groups presented landscape design
information not supplemented with a circular could not be rejected.

TABLE 20

COMPARISON OF THE LANDSCAPE PLAN SCORES
OF CONTROL AND EXPERIMENTAL GROUPS

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean Plan Score</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>99</td>
<td>13.27</td>
<td>4.28</td>
</tr>
<tr>
<td>Experimental</td>
<td>105</td>
<td>13.72</td>
<td>4.88</td>
</tr>
<tr>
<td>All Groups</td>
<td>204</td>
<td>13.50</td>
<td>4.59</td>
</tr>
</tbody>
</table>

\[ F = .490 \quad d.f. = 1,202 \quad P > .05 \]
The research hypothesis which stated adult groups presented landscape design information supplemented with a circular will have a significantly higher mean score on landscape development plans than adult groups presented landscape design information without a supplemental circular was rejected.

**Summary**

This chapter dealt with the statistical analysis of data obtained in the pursuit of measuring the factors influencing the understanding of landscape design concepts and the relative effectiveness of a landscape circular in creating an understanding of landscape design. Appraisal of the value of a supplemental instructional circular and factors influencing landscape design were accomplished through the utilization of a series of four landscape meetings held in ten different counties.

The adult groups in the ten counties were randomly divided into two groups. The experimental group which represented 105 adults in five counties received a supplemental circular at the beginning of the landscape meetings. The control group which represented 99 adults in the remaining five counties did not receive a supplemental circular for use during the four landscape meetings. All respondents in both the control and experimental groups completed a pre- and post-test. This test was a four response multiple choice test designed to measure immediate recall. Each respondent also completed a standardized spatial aptitude test and a landscape plan for their own property.
The landscape plan was then evaluated by a panel of experts to determine total design continuity.

Analysis of the data was accomplished through the employment of several statistical techniques. The F test was used to determine the influence of a landscape circular on achievement on a recall test. To determine the significance of age, education and spatial aptitude on recall the Pearsonian r and regression techniques was used. The t value was then calculated from the values derived. The relationship between spatial aptitude and a supplemental landscape circular and the ability to develop a landscape plan was compared by the use of the F and t tests using the statistical techniques previously described.

There was a total of 204 respondents who participated in the series of four landscape meetings held in the ten randomly selected counties. The communities in which the meetings were held ranged in population size from 9,200 to 80,000. However, the respondents who attended the meetings represented a broad cross section of both urban and rural people. Thirty-five percent of the respondents lived in the country or on a farm. The remaining 65 percent lived in communities ranging in size from towns with less than 2,500 people to suburban areas of cities.

Data collected to determine the home age and years of ownership of the families participating in the landscape clinics indicated that 43.1 percent of the families lived in homes that were two years
or less old and they had owned their homes for less than a year. Homeowners who had lived in their homes three to nine years represented 24.6 percent of the families attending the landscape meetings. Thirty-one families or 16.9 percent had lived in their homes ten years or more.

The primary reasons expressed by the respondents for landscaping were that either no landscaping existed around their homes at present or the landscape needed to be done over. A total of 51.4 percent of the families expressed the former reason and 32.4 percent the latter. The remaining 16.2 percent expressed reasons other than those stated above.

The mean age of all the respondents was 42.1 years with a mean formal education level of 13.5 years. The mean age of the respondents in the control group was 43.7 years and in the experimental group 40.6 years. The mean formal education level for each group was 13.45 years for the control and 13.55 for the experimental group.

The control group and the experimental group had mean scores of 14.34 and 14.27 respectively on the pre-test. These scores were not significantly different at the .05 level of confidence.

The first major objective of the research project was to determine if adult groups would learn more, as measured by immediate recall, if a series of landscape meetings were presented with the use of visual aids and supplemented with an illustrated circular as compared to the use of visual aids and no supplemental circular. The mean scores of the control group on the post-test was 21.78 as compared
to the experimental group mean score of 26.28. There was a significant difference at the .01 level. It was, therefore, concluded that the supplemental circular did enhance recall learning.

The second objective of the study was to determine if formal education, age or spatial aptitude had an effect on recall learning. Statistical analysis showed that both education and spatial aptitude had a significant effect at the .01 level. This indicated that respondents who had higher educational levels and spatial aptitudes achieved higher post-test scores. The effect of age on post-test achievement was not significant.

The last objective of the study was to determine if higher spatial aptitudes or the landscape circular effected achievement on the landscape plan. Statistical analysis indicated there was a significant relationship at the .01 level between spatial aptitude and the ability to develop a landscape plan. Age and educational levels were also analyzed to determine if a relationship between these independent variables and the ability to develop a landscape plan existed. The relationship between educational level and landscape plan was significant at the .01 level.

The mean pre-test and post-test scores attained by the control and experimental groups were compared with the respondents' ability to achieve a higher mean score on their landscape plan. The increase in the relationship between the mean post-test score and the ability to develop a landscape plan was significant at the .05 level for the
experimental group. However, analysis of the mean landscape plan scores of the control and experimental groups did not bear out this finding since there was no significant difference between the groups and their ability to develop a landscape plan.
CHAPTER IV
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The major purpose of this study was to determine the relative effectiveness of a series of landscape meetings and a supplemental illustrated landscape circular in teaching landscape design concepts to interested adult groups.

Need for the study

The Cooperative Extension Service in Agriculture and Home Economics, with its commitment to help people with agricultural problems, is an agency dedicated to the task of aiding the farmer and the urban dweller. The rapid movement of our society from the farm to suburbia has caused the extension worker to adapt his program to meet some of the subsequent needs of urban people. In the adjustment period, a pressing need becomes apparent for the development of sound techniques which will assist in teaching adult groups.

Landscape design is one of the avocational areas in which many homeowners are interested. Therefore, teaching directed at helping the homeowner solve his landscape problems is an important consideration in extension programming for urban clientele. As a means of fulfilling this need, a series of landscape meetings were prepared which centered on creating an understanding of landscape design concepts. Once the
program was prepared it was essential to evaluate its effectiveness. It was for this reason that the study, "Influence of Selected Factors Upon the Learning of Landscape Design Concepts," was conducted.

Specific objectives

The following specific objectives facilitated the pursuit of this study:

1. To determine the amount of cognitive and affective learning that takes place in an adult group when landscape design information is presented with the use of visual aids and supplemented with an illustrated circular as compared to the use of visual aids and no supplemental circular.

2. To determine the differences in the amount of cognitive and affective learning that takes place by age levels and by different levels of formal schooling.

3. To determine whether or not there is a relationship between the ability to transfer landscape design information to a practical situation and the spatial aptitude of the individual.

Statement of hypotheses

Five hypotheses were formulated in the development of this study. The alternate hypothesis or the operational statement of the research hypothesis was stated first, followed by the statement of the null hypothesis.
The hypotheses were written with the intent to determine the amount of recall learning that takes place following a series of landscape meetings and whether or not the information learned can be transferred to a practical landscape situation. The first hypothesis dealt primarily with whether adult groups learned more, as measured by immediate recall, from landscape design information presented with a supplemental circular or from the same information presented without a circular. Two hypotheses were also formulated to determine if age and formal education levels had a significant effect on recall following the series of landscape meetings.

Two additional hypotheses were formulated to determine if spatial aptitude or the supplemental landscape circular had a significant effect on the ability of adult groups to develop a landscape plan.

**Method of investigation**

The procedures employed in this study were designed to determine whether the use of a supplemental landscape circular during a series of landscape meetings with an adult group increased the amount of knowledge that could be immediately recalled and transferred to a meaningful situation. Also, the study attempted to determine what effect an individual's spatial aptitude had on his ability to comprehend landscape design concepts. In conducting the study a series of four landscape meetings were prepared and held in ten randomly selected Pennsylvania counties. The following factors were important in conducting the investigation: (1) securing adult groups; (2) organizing the landscape meetings; (3) selection of a landscape
circular; (4) development and use of the testing instruments; (5) procedure used in conducting meetings and (6) recording and analyzing data.

Securing adult groups. -- Ten counties, two from each extension supervisory district in Pennsylvania, were randomly selected. A letter was written to each county agent in the counties selected to determine their interest in holding a series of four landscape meetings for homeowners.

All county agents who were initially contacted expressed an interest in holding a series of landscape meetings. Following their initial approval, telephone contact was made with each county agent and dates were set for holding the meeting sessions. Five counties were then randomly selected as experimental counties and the remaining five as control counties. In the five experimental counties a landscape circular was given to each respondent at the beginning of the first meeting. The purpose of the illustrated circular was to provide supplementary information on the subjects being discussed at each meeting. Respondents in the five control counties did not receive the supplementary circular.

The county agents were also requested to secure meeting facilities and to appropriately publicize the meetings. News releases were prepared and sent to each participating agent for this purpose. Individuals who were interested in attending the landscape meetings contacted the county agent's office and were informed of the criteria for participation. If they were still interested in attending the
meetings, a mimeograph detailing the procedures followed in developing a planting plan sketch and graph paper was mailed to them. This information assisted the individual in drawing a flat surface sketch of their house and property to scale on the graph paper supplied. During the meeting series the landscape drawing was brought to each meeting by the respondent so that he could develop a landscape plan for his property.

Organizing the landscape meetings. -- Teaching objectives were formulated which assisted in determining the educational activities needed in planning the four meeting series. Each meeting was planned so that approximately half of the meeting time was allocated for the participants to work on their individual landscape plans.

The teaching objectives also assisted in determining the sequence of presentation at each meeting. The topics discussed at each meeting were as follows: (1) elements of landscape design; (2) design composition in the landscape; (3) trees to fit your landscape needs; and (4) shrubs and ground covers to fit your landscape needs.

Clear and comprehensive visuals were developed to clarify the major landscape concepts discussed at each meeting. Three slide series and a model were prepared for this purpose. An illustrated mimeograph was also prepared to show the form of some common trees and shrubs suitable for landscape use.

Selection of a landscape circular. -- A circular entitled "Landscaping Your Home" was selected by the investigator for use by
the experimental groups. The circular was subjected to the Dale-Chall readability formula to determine the level of the material. The reader selected four random passages from six chapters and applied the test. The readability was determined to be at the ninth and tenth grade level.

Development and use of the testing instruments. -- Three measurement instruments were used in this study. The first instrument was developed by the investigator from the information prepared for use at the four landscape meetings. It was designed to be used as a pre-test and post-test to measure the gain in knowledge following the completion of the four meeting series. The instrument consisted of four pictorial questions from which the respondents were forced to make a discriminating judgment concerning good and bad landscaping. The remaining 36 questions were four response multiple choice questions. The instrument was administered to all respondents in the experimental and control groups.

Following the development of the instrument, the test was administered to 30 volunteer adults who were attending extension landscape meetings held in two Pennsylvania counties. The reliability of the instrument was then tested by use of a split-half reliability analysis. A split-half reliability of +.81 was obtained.

The second instrument used was a standardized spatial relations test. This test was administered to all respondents in the control and experimental groups. The purpose of the test was to measure the

1 Nelson, op. cit.
respondents' ability to perceive a two-dimensional object in three-dimensional form. This test was administered to all respondents in the control and experimental groups.

The third instrument developed was a landscape rating scale. The purpose of the instrument was to measure the quality of the landscape plans completed by respondents at the end of the four meeting series. All landscape plans completed by participants were evaluated by a landscape architect and horticulturist on the staff at The Pennsylvania State University. The evaluating team checked each plan and affixed a score to each rating factor based upon their combined judgments.

Procedures followed in conducting meetings. -- Each of the four meetings held in the ten randomly selected counties followed a set sequence. At the first meeting the pre-test instrument was administered to all respondents in the control and experimental counties. Following completion of the instrument the first slide series entitled "Elements of Landscape Design" was presented. At the end of the meeting the experimental group received the supplemental circular and suggested readings in the circular were indicated. The control group did not receive the supplemental circular.

At the beginning of the second meeting the spatial relations test was administered to all respondents in the control and experimental groups. The second slide series entitled "Design Composition in the Landscape" was then shown. Additional readings in the supplemental circular were suggested to respondents in the experimental group following the slide series. Respondents in the experimental and control groups then worked on their individual landscape plans.
A slide series entitled "Trees to Fit Your Landscape Needs" was 
presented during the third meeting. Respondents in both the control 
and experimental groups again worked on their landscape plans. At 
the close of the meeting additional readings were suggested in the 
supplemental circular for the respondents in the experimental groups.

During the fourth and final meeting, a slide series entitled 
"Shrubs to Fit Your Landscape Needs" was shown to all respondents in 
the control and experimental groups. Following the slide series pres­
etation the respondents completed the development of their landscape 
plans. The post-test was then administered to all respondents in 
both groups. At its completion, the post-test and the landscape plans 
of all respondents were collected for evaluation.

**Recording and analyzing data.** -- Following each set of meetings 
the pre-test, post-test and the spatial relations test were scored. 
The face data collected and the scores were recorded on large graph 
paper sheets. The landscape plans were then evaluated by the experts 
and the total landscape evaluation scores were tabulated by the 
investigator.

Basic data analysis was performed through the use of IBM cards 
and electronic computer processing. After all data were collected 
code cards were punched. The punched cards were processed through 
the IBM 360/67 computer located at Shields Building, The Pennsylvania 
State University.

Analysis of variance and covariance were used to determine the 
significance of difference among the post-test scores and the landscape
plan scores achieved by adults in the experimental and control groups.

The t test in this study was used to test the significance of Pearsonian product-moment correlations and the regression coefficients determined.

Major findings

Major findings derived from the analysis of data collected through this study are listed below. They are grouped according to the major hypotheses which were formulated.

A supplemental circular and its effect on information recall. — Analysis of covariance was used to determine the influence of a landscape circular on achievement on an information recall test. The mean post-test score was 21.80 for the control group and 26.25 for the experimental group. The adjusted mean score for each group varied only .02 and .03 respectively. The results of the analysis which were significant at the .01 level of confidence indicated the experimental group which received the supplemental circular was superior in information recall following a series of four meetings on landscape design.

Based upon the experimental results, the null hypothesis which stated there was no significant difference in the level of understanding among adult groups presented landscape design information supplemented with a circular as compared to adult groups presented the same information without a circular as measured by an information recall test was rejected. At the same time we accept the research hypothesis which is that adult groups presented landscape design information
supplemented with a circular will have a significantly higher mean score as measured by a recall test than adult groups presented the same information without a circular.

**Formal education level and its effect on information recall.** --
The mean educational level for the respondents in both the control and experimental groups was 13.50 years. The mean for the control group was 13.55 years and for the experimental group 13.45 years.

Correlation between formal education level and post-test scores was significant at the .01 level of confidence.

In determining the significance of the effect of formal education levels on post-test scores regression coefficients were also computed. The t radio was significant at the .01 level of confidence. Based upon the statistical analysis, the null hypothesis that there will be no significant difference among adults with different levels of formal education in the amount of information recall following a series of landscape meetings was rejected. However, we accept the research hypothesis which states adults with a higher level of formal education will have a significantly higher mean score on a test of recall measuring understanding of landscape concepts than adults with less formal education following participation in a series of landscape meetings.

**Age and its effect on information recall.** -- The mean age for all respondents in the control and experimental groups was 42.12 years. Respondents in the experimental group were the youngest with a mean age of 40.6 years. The mean age in the control group was 43.72 years.
The Pearsonian r values derived showed a negative correlation between age and post-test scores. However, this relationship was not significant at the .05 confidence level. This is interpreted to mean that age had little relationship with the ability to achieve a higher post-test score.

Regression coefficients were also computed to determine the significance of the effect of age on post-test score achievement. The t value derived was not significant. However, the negative t value indicated that there was a slight negative relationship between age and achievement on the post-test.

The statistical results were such that a null hypothesis that there will be no significant difference between age groupings and higher age groupings in the amount of information recall following a series of landscape meetings could not be rejected.

Spatial aptitude and its effect on landscape plan scores. -- The mean landscape plan score of the control and experimental groups was 13.27 and 13.72 respectively. The spatial aptitude test results indicated a spatial score of 62.34 for the control group and 64.29 for the experimental group.

The Pearsonian product-moment correlation was used to measure the relationship between spatial aptitude and the ability to achieve on a landscape plan. The mean r value for both groups was .63. This value is significant at the .01 level of confidence. This relationship is interpreted as meaning there is a direct relationship between the respondents spatial aptitude and their ability to develop a landscape plan.
The multiple regression coefficient with parsimony was used for the determination of the percentage of variation in the ability to draw a landscape plan explained by spatial aptitude. Spatial aptitude accounted for 40.2 percent of the explained variation.

The t statistic was used to measure the significance of the regression coefficient. It was found to be significant at the .01 confidence level. This indicates there is a direct relationship between the ability to develop a landscape plan and spatial aptitude.

Therefore, the null hypothesis of no significant difference between adults with high spatial aptitudes and adults with low spatial aptitude and their ability to draw a landscape plan was rejected. This leads to the acceptance of the research hypothesis which states adults with high spatial aptitude will have a significantly higher mean score on landscape development plans than adults with a lower spatial aptitude following participation in a series of landscape meetings.

A landscape circular and its effect on landscape plan scores. --

The Pearsonian product-moment correlation indicated a significant relationship at the .01 level between the pre- and post-test scores and landscape plan scores in both the control and experimental groups. The significance in gain in this relationship was expressed by the difference between the pre- and post-test r values. This difference indicates the experimental groups had a significant increase the correlation value expressed at the .05 confidence level.

Analysis techniques were used to check if there was a significant difference between the landscape plan scores of the control and
experimental groups. The F value of .490 derived was not significant. Therefore, the null hypothesis which stated there is no significant difference between adult groups in their ability to develop a landscape plan when presented landscape information supplemented with a circular as compared to adult groups presented landscape design information not supplemented with a circular was accepted. The research hypothesis which stated adult groups presented landscape design information with a circular will have a significantly higher mean score on landscape development plans was rejected.

Other research findings not directly applicable to the stated hypotheses

1. There was a significant relationship between spatial aptitude and post-test mean scores at the .01 level of confidence. The mean spatial aptitude score for the control group was 62.34 and for the experimental group 64.29.

2. There was no significant relationship between age and the ability to develop a landscape plan.

3. There was a significant relationship between formal education level and the ability to develop a landscape plan. This relationship was significant at the .01 level of confidence.

Conclusions

The following conclusions were drawn by the investigator, based on his interpretation of the data and information presented in this study:

1. Adult groups presented landscape design information
supplemented with a circular learned significantly more, as measured by information recall, than did adult groups presented the same information without a supplemental circular.

2. Adults with a higher level of formal education had a significantly higher mean score on a test of information recall measuring understanding of landscape concepts than adults with less formal education following participation in a series of landscape meetings.

3. There was no significant difference between lower age groupings and higher age groupings in the amount of information recall following a series of landscape meetings.

4. Adults with high spatial aptitude had a significantly higher mean score on landscape development plans than adults with a lower spatial aptitude following participation in a series of landscape meetings.

5. There was no significant difference between adult groups in their ability to develop a landscape plan when presented landscape design information with a supplemental circular as compared to adult groups presented landscape design information not supplemented with a circular.

6. Adults with a high spatial aptitude learned significantly more, as measured by information recall, than did adults with low spatial aptitudes.
7. There was no significant difference between lower age groupings and higher age groupings in the ability to develop landscape plans.

8. Adults with a higher level of formal education had a significantly higher mean score on landscape development plans than adults with a lower formal education level.

Recommendations

As a result of the findings of this study and experiences of the writer, the following recommendations were made:

1. Inservice training workshops should be offered to county personnel to acquaint them with the necessary information and procedures to conduct a series of homeowner landscape meetings.

2. Extension circulars which clearly illustrate landscape design concepts should be developed.

3. Greater emphasis should be placed on the use of a series of meetings for extension clientele rather than a one meeting approach.

4. Extension educators should be aware of individual differences in their groups and plan programs accordingly.

Recommendations for further study

In the pursuit of this study the writer became aware of the need for continued research. The following studies are suggested:

1. This study be repeated using a larger sample selected at
random throughout the Commonwealth of Pennsylvania.

2. A study to determine the relative effectiveness of visual aids in presenting landscape design concepts.

3. This study be repeated using county personnel as the instructors.

4. A study to determine the relative effectiveness of various types of landscape publications and their effect on learning.

5. A study to determine all of the factors which determine an adults' ability to comprehend and relate landscape design information to practical situations.
APPENDIX A

LOCATION OF COUNTIES
LOCATION OF COUNTIES PARTICIPATING IN THE STUDY
APPENDIX B

CORRESPONDENCE
October 31, 1967

Mr. County Agent
County Agri. Ext. Association
Pennsylvania

Dear Mr. County Agent:

As you well know, even though Extension has eliminated the landscape planning service there are still many homeowners who would like to have some assistance in preparing a landscape plan. A feasible approach to assist these people may be to offer a series of landscape meetings. The intent of such a meeting series would not be to draw a landscape plan for an individual, but rather to expose them to a series of four meetings in which site planning, plant materials selection, design principles and the broad area of plant maintenance would be discussed. As the meetings progress each homeowner would be developing his own plan and, hopefully, when the landscape clinic is finished an individual will have a workable landscape drawing developed for at least the public area of his property.

My purpose in writing to you is to determine if you would be interested in holding a series of landscape meetings in your county sometime this spring? To effectively conduct these meetings some careful advanced planning on our part will be essential. Previous experience with similar landscape meetings has indicated that we should establish some rigid criteria regarding the operation of the program.

I would suggest the following criteria as being essential if we wish to have a successful meeting series:

1. A series of four meetings should be held either in the afternoon or evening. Preferably, it is advisable to hold two meetings a week. Thus, the program will be completed in two weeks.

2. People who are interested in participating in the program will be required to sign up in advance. This will mean that the individuals who participate will be only those individuals who are seriously interested in a landscape training program.
3. Enrollment in the program will be limited to 15 to 20 individuals. A group larger than 20 becomes extremely difficult to work with; however, this criteria is somewhat flexible.

4. People who chose to participate in the program will need to bring with them to the first meeting a flat surface drawing of their property on which they can develop their own landscape plan.

As you can see, the criteria established will effectively limit the group to only those individuals who are interested. This will permit developing a program which is worthwhile and practical to the individuals who attend.

I shall appreciate hearing from you at your earliest convenience regarding your possible interest in such a program this spring. The pressure of spring meeting commitments makes it essential that we make some advance planning for scheduling these meetings. It is my desire to hold these meetings sometime between January and April.

Sincerely,

Craig S. Oliver
Assistant Professor
Ornamental Horticulture Extension
December 19, 1967

Mr. County Agent
County Agri. Ext. Association
Pennsylvania

Dear Mr. County Agent:

Under separate cover I have enclosed some information pertinent to the landscape meetings to be held in your county on April 30 and May 2, 7 and 9. The packet of information includes three news releases, 20 mimeographs on how to prepare a planting plan sketch and a general information sheet. I have also enclosed under separate cover a sufficient amount of graph paper for distribution along with the mimeograph to those individuals who sign-up to participate in the clinic.

Several counties have expressed an interest in charging an enrollment fee for the meetings. If this is your desire, I would suggest charging a fee of $3.00 to $5.00. This would permit the purchase of a landscape circular and a certificate of accomplishment which could be given to each participant.

There is an excellent landscape publication available from the University of Illinois. I intend to bring along 20 copies of this publication to the meetings so that individuals attending can use them. It would, however, be better if each individual had their own personal copy for use after the program is over. The title of this publication is "Landscaping Your Home Grounds", Circular 858. It can be purchased from the Cooperative Extension Service, University of Illinois, Urbana, Illinois at a cost of $2.00.

I would suggest purchasing the landscape circular and the certificates of accomplishments in advance of the first meeting, if it is your desire to charge a registration fee. I understand that certificates of accomplishment can be purchased from the Agricultural Mailing Room.
I hope the information which you will be receiving will be of some assistance. Please contact me if you have any further questions.

Sincerely,

Craig S. Oliver
Assistant Professor
Ornamental Horticulture Extension
APPENDIX C

PRELIMINARY MEETING INFORMATION
EXTENSION LANDSCAPE MEETING

The series of landscape meetings are designed to help homeowners develop a landscape plan, primarily for the public area of their property. The four meetings which are planned will be divided into the following instructional units:

1. Elements of Landscape Design. Design problems which effect landscape development will be discussed and illustrated with slides. The homeowner will gain an awareness of what his landscape problems are, and begin to relate possible solutions to his own property.

During the first meeting participants will evaluate their problems and needs with a site analysis checklist. Areas around the home where visual blocks, shade, and defined entry approach are needed will be indicated on their landscape plan.

2. Design Composition in the Landscape. Design composition for the public area will be discussed in detail. Slides will be shown to illustrate how plants can be arranged at the entryway and corners of the property.

Participants in the clinic will locate plant groupings, with the use of a landscape template, on their landscape plan.

3. Selecting Plants to Fit Your Landscape Needs. The form, texture, and seasonal characteristics of trees, shrubs and ground covers will be illustrated and discussed.

Participants in the clinic will select plants to fit the design which they have developed.

4. Evaluating the Landscape Plan. During the fourth session participants will continue to develop their landscape plan. Each plan will be evaluated by the instructor.

Recommendations and comments regarding plant hardiness, purchasing plants and sizes to purchase will be given.

Instructional Materials Needed by Participants

1. Landscape template (Provided by Oliver)

2. Complete plot plan of the participants' property. Graph paper and instructions for developing plan provided by county office.

3. Mimeographs (Provided by Oliver)
Facilities

A meeting room with tables for all the meetings would be desirable. A projector and screen will also be needed at each meeting.

Criteria for Participants

1. Participants should desire to attend all sessions.

2. Participants should bring with them to the first meeting a flat surface drawing of their property drawn to scale.

3. Participants should be interested in developing their own landscape plan primarily for the public area (front yard) of their property.

4. Individuals interested in attending the meeting should call the county office and register in advance.

Enrollment

Meeting sessions should be limited to a maximum of 15 to 20 persons developing plans.
APPENDIX D

PREPARING A PLANTING PLAN SKETCH
PREPARING THE PLANTING PLAN SKETCH

Begin With A Plan

Landscape planning refers not only to the use of plants around the home, but to the complete planning of your property in order to achieve maximum privacy, utility, beauty and a feeling of spaciousness. This requires a complete organization of outdoor space into a functional plan that will meet the needs of the entire family.

Most homes differ considerably in the physical features of the lot, structural features of the home and orientation of the home to sun and wind. Since these differences do exist, there are no common arrangements or planting plans that fit all homes. Likewise, there are many different solutions to landscaping any particular home.

Merely planting trees and shrubs is not landscaping. Instead, good landscaping is an art of shaping spaces and a blending of family needs, physical features and existing exposures into a functional design. All who are able to do so should employ a professionally trained landscape architect or landscape nurseryman to plan and develop their home grounds. Some may prefer to have the planting done by an experienced designer, but do the actual work themselves. Others may wish to do their own planning and landscaping. Regardless of the procedure chosen, good planning is essential in landscape development.

The first step in developing a landscape plan for your home is to make a graphic record of all the details presently existing on your property. This involves making a simple line drawing of the property boundaries, house, walks, drive, trees, and other landscape features present. The details of your property, if accurately put on paper to scale, will aid you in landscape planning much as a blueprint aids a builder when he constructs a home.

The landscape sketch should always be drawn in such a way that, in studying the plan, you are facing the front of the house. Compass direction should also be shown on the drawing.

Steps in Making a Plot Plan

1. Measure your property boundaries. The exact location of the house on the lot can be measured from any two adjacent boundary lines. Include porches, garage and other buildings on the property. Be sure to include the location of all doors and windows on the outline of the house. Roughly sketch the needed dimensions on a piece of paper when measuring outdoors.

2. Locate other features on the plan such as existing trees, walks, drives, septic tank and unusual terrain features.
3. Use a scale which is convenient to work with and keep all features indicated on the plot plan to the same scale. A scale of 1/8" or 1/4" equalling a foot will usually be satisfactory. Graph paper may be substituted for plain drawing paper and then one or two squares on the graph paper may be used to represent one square foot.

4. Transfer all rough measurements to a workable scale drawing. You will probably need a large sheet of graph or drawing paper (24" x 30"), sharp pencil, eraser and ruler to make the scale drawing.

5. Locate the compass direction plan. (North, South, East & West).

Prepared by: Craig S. Oliver, Assistant Professor, Ornamental Horticulture Extension.
RESIDENCE OF

Mr. & Mrs. J. Q. Public
APPENDIX E

PHOTOGRAPHS OF THE LANDSCAPE MODEL
A. Where is your home located? (Check only one)
   a. On a farm _____
   b. In the country but not on a farm _____
   c. In a town or village with less than 2,500 people _____
   d. In a town or village with 2,500 to 10,000 people _____
   e. In a town or city with more than 10,000 people _____
   f. In a suburban area (not in city limits) of a city with
      10,000 or more people _____
B. What is the age of your home? ___________
C. When did you buy your home? ___________
D. Why do you desire to landscape your home? (Check only one)
   a. There is no landscaping at present _____
   b. The landscape needs to be done over _____
   c. Other reason (be specific) ____________________________
E. What is the highest grade in school you completed? __________
What is wrong with this landscape scene? (Check only one of the answers below)

____ A. Trees are located too far away from the house.

____ B. Trees located on either side of the house should not be the same size and shape.

____ C. Pyramidal or conical shaped trees would be more attractive.

X  D. The trees are not in scale with the house.
Circle the letter or letters where you feel the tallest plant or plants should be located at the entrance to this house.
How would you rate the landscape which is illustrated? (Check one)

_____ A. Well designed.

_____ B. Poorly designed.

How do you rate the landscape which is illustrated? (Check one)

_____ X A. Well designed.

_____ B. Poorly designed.
MULTIPLE CHOICE QUESTIONS

INSTRUCTIONS

Each question below includes a statement followed by several possible answers labeled a, b, c, d. Select the answer which best completes the statement and then place a check (X) to the left of the answer in the blank space provided. Answer all questions. Check only one answer per question. Read each question and each possible answer carefully before selecting your choice.

EXAMPLE

Question: Norway maple trees are not suitable for home grounds landscaping because:

_____ A. they have a poor shape.
_____ B. they require considerable pruning.
X  C. the foliage canopy is so dense that grass will not grow under the tree canopy.
_____ D. they grow very slowly.
1. Check the statement below which you feel best describes landscaping.

_____ A. The planting of trees and shrubs.

X   B. The effective development of open space around the home.

_____ C. The placement of a few trees and shrubs in front of the home.

_____ D. The careful selection and use of plants which will be attractive on the home property.

2. Landscaping has many useful purposes. Check the statement below which you feel is the most important reason for landscaping.

_____ A. Landscaping makes the house more attractive.

_____ B. Landscaping directs traffic movement on the property.

_____ C. Landscaping blocks unsightly parts of the house from public view.

X   D. Landscaping is attractive and controls the environment around the home.

3. Planning the landscape on paper before beginning to plant will assist you in avoiding problems in the future. When do you feel would be the ideal time to begin planning your landscape?

X   A. Before the house is built.

_____ B. A year or two after you have moved into a home.

_____ C. Immediately after the home is built.

_____ D. Wait until you have visited several garden stores and nurserymen to see what is available.

4. Most of us would prefer to live in a neighborhood which is attractively landscaped. How can an attractively landscaped neighborhood best be achieved?

_____ A. Each homeowner should plant similar shrubs and trees on their property.

_____ B. A row of trees planted on either side of the street is all that is needed.

_____ C. Neighbors should get together and plan their landscapes so that each property will blend with the others.

X   D. Careful analysis of each property in the neighborhood is essential before developing the landscape.
5. Many estimates have been made concerning how much money the average homeowner should spend for landscaping. What do you feel is a fair estimated cost for landscaping a new home if you were to consider grading, lawn establishment, and the planting of shrubs and trees?

A. $500  
B. $750  
C. 10% of the home cost  
D. 5% of the home cost

6. Many of the newer homes constructed today are low and sprawling compared with homes constructed 30 years ago. When landscaping new homes which of the following principles is important to keep in mind?

A. Plant only low growing shrubs and trees.  
B. Plan the landscape according to your needs.  
C. The size to which shrubs and trees will grow is not important when planning the landscape.  
D. A combination of tall and low growing trees and shrubs are essential to create an attractive landscape.

7. Landscaping the home grounds has many purposes. Which of the following is NOT an important landscape consideration?

A. An attractive view of a mountain or woodland area which appears off in the distance.  
B. The neighbors' doghouse which borders your property.  
C. The directing of traffic movement on your property.  
D. All of the above are important.

8. Which of the following will provide you the greatest source of satisfaction when your landscape is completed?

A. Beauty for your own appreciation.  
B. Usefulness of the landscape in daily living.  
C. The satisfaction that you have done the job yourself.  
D. Beauty for the appreciation of others.

9. The term "foundation planting" has often been used to define the landscape around the house. What does this term mean to you?

A. Plantings arranged in a straight line in front of the house.  
B. The placement of one or more shrubs at the corners of the house and beside the front door entrance only.  
C. Plantings grouped near the foundation of the house but not necessarily in a straight line.  
D. The beginning of the landscape design from which further design and development can be planned.
10. A properly landscaped home creates dimensional perspective. What does this term mean?

___ A. Plants and construction features are arranged so that the landscape creates a depth dimension.
___ B. Plants are selected that will not grow too tall for the house.
___ C. A combination of both tall and low growing shrubs are used to create interest in the landscape.
___ D. Plants and construction features are arranged so that they are complementary to each other.

11. Space arrangement is an important consideration in landscape design. Which of the following is the major reason for the concern of spacial arrangement in landscape design?

___ A. Most new homes are symmetrically designed and require a balanced planting to complement the house.
___ B. Space arrangement creates an orderly transition as one moves through a garden and views it from several different angles.
___ C. Most new homes are asymmetrically designed and require the use of carefully selected plant groupings to balance the house on the lot.
___ D. Space arrangement creates a unified design which is most pleasing in the public area.

12. The area located in front of a house is called the public area. Why is the public area of primary concern when landscaping?

___ A. The public area is viewed by people who pass by.
___ B. The public area provides the primary access area to the house.
___ C. The public area requires the most landscaping.
___ D. Landscaping the public area improves the neighborhood in which you live.

13. The driveway approach is an important part of landscape planning since today the driveway is often the primary entrance for visitors entering the home. What should be the width of a driveway to permit adequate parking space and movement of foot traffic to and from the house?

___ A. 6 - 8 feet wide
___ B. 8 - 10 feet wide
___ C. 10 - 14 feet wide
___ D. 14 - 18 feet wide
14. A pleasant access way to the front door of the home is an important consideration in landscape design. Where should the entrance walk usually be located if there is a driveway entering into the public area?

______ A. The main entrance walk to the front door should be parallel to the house and lead to the driveway.

______ B. The main entrance walk should be located so that it is inconspicuous and does not become the predominate landscape feature in the public area.

______ C. The main entrance walk should lead from the street or sidewalk to the front door.

______ D. The main entrance walk should be located so there is a minimum of distance from the sidewalk or street to the house.

15. Plants located at the corners of the house should be taller than those near the main entrance. What general rule can be followed regarding the height to which plants should grow when located at the corners?

______ A. Plants should grow no more than 6 feet tall.

______ B. Plants should be at least 10 feet tall.

______ X C. Plants should grow to a height of one-half to two-thirds the distance from the ground line to the eave.

______ D. Plants should grow as tall as the house.

16. The height to which plants should grow when they are located in front of a house will depend upon the house design. A general rule to follow is:

______ X A. Plants should gradually increase in height from the front door to the corners of the house.

______ B. Plants should gradually increase in height from the corners of the house to the front door.

______ C. Plants should be the same height along the front of the house.

______ D. Tall plants should be used along the front in any location where windows are not located.

17. The width of the walk leading to the main entrance of the home is an important factor in landscape design. What is the minimum width for a properly designed entrance walk?

______ A. 2 feet

______ B. 3 feet

______ X C. 4 feet

______ D. 5 feet
18. A two story house often looks too tall on the site. What is the best practice to make the house look lower and wider?

   ______ A. Plant large shade trees in the public area.
   X    B. Place plant groupings at the corner of the house.
   ______ C. Plant one conical or pyramidal shaped shrub at each corner of the house.
   ______ D. Plant a combination of deciduous and evergreen shrubs in the public area.

19. Design unity is an important landscape concept. Unity can best be achieved by:

   ______ A. Locating a mixture of various sized trees and shrubs throughout the public area.
   ______ B. Grouping plants together.
   X    C. Grouping plants together in plant beds.
   ______ D. Using flowering shrubs which complement the house and surroundings.

20. When you select plants it is important to consider their mature spread. In general, what will be the spread of a plant which grows 6 feet tall?

   ______ A. 2 - 4 feet
   X    B. 4 - 6 feet
   ______ C. 6 - 8 feet
   ______ D. 8 - 10 feet

21. Trees are an essential part of the landscape. What is the primary purpose for trees placed in the public area?

   ______ A. Shade
   X    B. Enframement
   ______ C. Increase property value
   ______ D. To create symmetry

22. Lots which are narrow often present problems in landscaping. The most effective way to landscape the corner of a house when space is limited is to:

   ______ A. Place on pyramidal evergreen shrub near the corner of the house.
   X    B. Plant a grouping of shrubs which extend toward the front of the lot.
   ______ C. Place one deciduous shrub near the corner of the house.
   ______ D. None of the above.
23. To locate trees for framing the house it is essential to first determine the point from which most people will see the house. Where should the tallest trees be located?

_____ A. The tallest trees should be located close to the point where people see the house.
X   B. The tallest trees should be located at the greatest distance from where the house is viewed.
_____ C. All the trees used for framing the house should be the same height.
_____ D. None of the above.

24. The shape which a plant attains is an important factor when selecting shrubs for the landscape. Plants which have a conical or pyramidal shape are usually not used in the public area because:

_____ A. They grow too tall for the house.
_____ B. They de-emphasize the vertical lines of the home.
X   C. They emphasize the vertical lines of the home.
_____ D. They grow too wide.

25. The proper spacing of plants in the landscape is essential. What is a general rule that can be followed in spacing plants in the landscape?

X   A. The distance from the center of one plant to the center of the next plant should be equal to 1/2 the mature spread of each plant.
_____ B. Space shrubs a minimum of 3 feet apart and trees a minimum of 30 feet apart.
_____ C. There is no general rule that can be followed when spacing trees and shrubs in the landscape.
_____ D. The distance from the center of one plant to the center of the next plant should be equal to the mature spread of each plant.

26. One of the primary uses of shade trees is to provide enframement. Enframement can be defined as:

_____ A. The placement of trees in a row across the front of the property.
_____ B. The placement of trees in an irregular pattern on the property.
X   C. The placement of trees to provide a focal emphasis on the house or distant view.
_____ D. The placement of trees along the driveway.
27. Trees can be used to provide enclosure and vertical accent. To provide enclosure and vertical accent in the public area a tree should be placed near the:

- [X] A. Entry area.
- ______ B. Corners of the house.
- ______ C. In the open front lawn area.
- ______ D. In any location where there is an open space or blank wall.

28. Low growing plants placed in front of taller growing plants are called:

- ______ A. Border plants
- [X] B. Facer plants
- ______ C. Corner plants
- ______ D. None of the above

29. The texture of a plant or plant grouping has the ability to make an area look large or small. To make a landscape area appear larger in size what types of plants should be selected for the landscape?

- ______ A. Coarse textured plants
- ______ B. Medium textured plants
- [X] C. Fine textured plants
- ______ D. A combination of coarse and fine textured plants

30. A well landscaped home utilizes plant materials which have gradual texture changes. What is the general rule that should be followed in selecting plants that are to be grouped together in the landscape?

- [X] A. Each plant should have about half the leaf size of the plant which precedes it.
- ______ B. Plants which are placed in a grouping should be of the same species.
- ______ C. No more than three different species of plants should be used in a plant grouping.
- ______ D. Plants which are placed in a grouping should grow approximately the same height and width.

31. Many plants may be hardy in the area where you live, but may grow better in a particular location because of unusual climatic factors on your property. Which of the following factors is NOT an important hardiness factor?

- ______ A. Wind
- ______ B. Sunlight
- ______ C. Temperature
- ______ D. Plant species
- ______ E. Soil conditions
- [F] All of the above are important.
32. Lower growing plants used in combination with taller shrub species provides a pleasant facade effect when placed at the corners of a home. Which of the following low growing shrubs would provide an effective planting combination with rhododendrons?

A. Drooping Leucothoe  
B. Pyramidal arborvitae  
C. White Birch  
D. Spreading Juniper

33. One of the purposes of landscaping is to soften the harsh vertical lines at the corners of a house. An excellent shrub for this purpose is:

A. Upright Japanese Yew  
B. Pfitzer Juniper  
C. Pyramidal arborvitae  
D. Dwarf winged euonymus

34. Pruning shrubs is an important landscape maintenance practice. A general rule which should be followed when pruning shrubs is:

A. Prune shrubs at least twice during the growing season.  
B. Prune shrubs to fit the location where they are planted.  
C. Prune shrubs to their natural form.  
D. Prune shrubs before May 30.

35. Ground cover plants provide a living carpet which provides contrast and serves to reduce maintenance in the planting bed. An excellent ground cover for most landscape situations is:

A. Cotoneaster  
B. Bayberry  
C. Myrtle  
D. Honeysuckle

36. Trees can improve the landscape by providing shade, enframement, and background. An excellent tree which has a fine foliage texture and provides a filtered shade, that does not interfere with grass growth beneath is:

A. Norway Maple  
B. European Beech  
C. Catalpa  
D. Honeylocust

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APPENDIX G

LANDSCAPE EVALUATION RATING SCALE
LANDSCAPE PLAN

EVALUATION

The rating scale provides a measure to determine the relative quality of the landscape plans completed by participants in the landscape meetings.

The rating scale ranges from 1 to 4 - number one indicates the portion of the plan evaluated was poor while a four rating indicates excellence.

The purpose of the rating scale is to provide a measure of the individual's knowledge gained through participation in the landscape meetings. The major considerations listed do not reflect all of the factors which could be considered in evaluating a landscape plan; however, they do reflect the major points which were discussed when presenting the four landscape meetings.

Landscape design is, of course, an arbitrary point which may be viewed as good or bad depending upon an individual's training and background. The term "design" as it is considered in this evaluation technique refers to the physical arrangement of plants and their appropriate location around or near the home. Particular consideration should be given to design unity. This may be created by repetition, sequence, contrast and balance of design elements. For example, grouping plants of the same species, in the corner facade or the use of ground cover beds may be all that is essential. Each plan will require careful evaluation in relationship to the pictures of the home which are attached to the plan in order to determine its appropriateness.
Selection of plants to fit the landscape setting is a problem which relates to many factors. Consideration of the plant form, texture, color and appropriate spacing should be the major points considered. How the landscape will look five to ten years after it has been established is an excellent criteria to keep in mind when evaluating plant materials selection.

RATING SCALE

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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<tbody>
<tr>
<td></td>
<td>Poor</td>
<td>Fair</td>
<td>Good</td>
<td>Excellent</td>
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1. Entry Area
   Design
   Plant Selection

2. Corner Planting
   Design
   Plant Selection

3. Enframement
   Design
   Plant Selection

Total Score _____
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