

DEVELOPMENT AND EVALUATION OF DOMAIN REFERENCED ITEMS  
FOR PROFESSIONALS IN HORTICULTURAL THERAPY

by

PATRICE MARIE MURPHY

B.S., KANSAS STATE UNIVERSITY, 1978

---

A MASTER'S THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

Department of Horticulture

Kansas State University

Manhattan, Kansas

1982

Approved by:

Richard H. Mattson

Major Professor

Spec.  
Coll.  
LD  
2668  
.T4  
1982  
M87  
C.2

A11202 316173

# TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENTS.....	iii
INTRODUCTION.....	1
Purpose of the Study.....	1
LITERATURE REVIEW.....	3
METHODS	
Test Development.....	9
Administration and Subjects.....	12
RESULTS AND DISCUSSION	
Demographics.....	14
Domain Scores.....	14
Academic Background.....	14
Registered vs. Non-registered.....	15
Experience vs. Scores.....	15
Educational Objectives.....	16
TABLES	
1 Descriptive Data for Domain Referenced Tests.....	18
2 Comparison of Degree and Mean Score.....	19
3 Mean Scores of Registered and Non-Registered H.T.'s vs. Test Domains.....	20
4 Mean Scores of Years Experience vs. Test Domains.....	21
5 Mean Item Difficulty Index of Ed. Obj. vs. Test Domains.....	22
FIGURE	
1 Comparison of Domain Score Frequencies.....	23
LITERATURE CITED.....	24
APPENDIXES.....	25
A. Topics and Educational Objectives.....	25
B. Horticulture Consultants - Letter, Topics and Blueprint.....	28
C. Therapy Skills Consultants - Letter, Topics and Blueprint....	31
D. Horticultural Therapy Consultants - Letter, Topics, and Blueprint.....	34
E. Sample Blueprint Values for Horticulture.....	37
F. Mean Values for Table of Specifications.....	38
G. Letter of Instructions for Item Review.....	41
H. Domain Referenced Exams.....	44
I. Statement to Conference Participants.....	52
J. Confidentiality and Questionnaire.....	53
K. Item Analysis.....	54

### Acknowledgements

The author gives thanks and appreciation to Dr. Richard H. Mattson, Professor in Horticulture, for his advice and assistance in conducting the study.

Acknowledgements also go to committee members Dr. Carl Clayberg, Professor of Horticulture, and Dr. Robert Newhouse, Professor of Administration and Foundations for their guidance and assistance.

A special note of thanks is expressed to the author's parents for their encouragement throughout this endeavor.

## Introduction

Advancement in the field of horticultural therapy and recognition as an effective treatment modality requires definition of professional skills. Fundamental to horticultural therapy professionalism is a thorough understanding of horticultural practices and the ability to present this information in a clear and concise manner.

A professional horticultural therapist must have a basic knowledge of the scientific principles underlying the plant sciences. This includes an understanding of the environmental and cultural requirements of horticultural plants, knowledge of propagation, and experience in solving problems related to garden, greenhouse, and nursery management.

Secondly, the acquisition of therapeutic skills involves focus upon improving, maintaining, or accepting a client's functioning ability. The horticultural therapist must have a thorough understanding of special population groups, the ability to communicate effectively with clients, and the skills to provide an environment that will facilitate the treatment process.

Thirdly, horticultural therapists are developing a unique field of knowledge where specialized adaptive tools, creative gardening methods, training systems, and cultural modifications are being utilized to meet the needs of each person.

## Purpose of Study

This study (1) identified essential educational domains in the horticultural therapy profession, (2) developed objective questions encompassing



these domains, and (3) analyzed the questions by testing horticultural therapy professionals.

The identification of the educational domains details knowledge in three areas: horticulture, horticultural therapy, and therapy skills. The topic areas developed in each domain represent essential skills required by the profession. Objective knowledge questions were designed and evaluated for each domain using guidelines set forth by educational measurement techniques.

The results of this study were prepared for publication in HortTherapy, a periodical of the National Council of Therapy and Rehabilitation through Horticulture.

## Literature Review

The certification and registration of horticultural therapists will require that the identification of skills and abilities required by the profession be explicit. Fretz and Mills (5) emphasize that licensing and certification of a profession must be based upon a core body of knowledge.

Bormuth (3) states that the procedures for constructing achievement tests are well established and widely agreed upon by test specialists. He indicates that Bloom (2), Tinkleman (12), and Tyler (13) offer identical descriptions of the traditional procedure. Gronlund (8) points out that the development of an achievement test is a systematic planning technique. The procedure he describes is that of the above mentioned authors. These procedures stated by Bormuth (3) and identified by test specialists are as follows: (1) construction of the content outline, (2) selection of educational objectives, (3) construction of the table of specifications, (4) development of the test items, and (5) review of the entire process by content specialists. Gronlund (8) emphasizes that this is the best technique to assure content validity of the tests. Tinkelman (12) states that the content outline should consist of the areas to be covered in the test. The test is a work sample from the universe of tasks constituting achievement in the area to be tested. Shimberg (11) emphasizes the test must reflect the skills, knowledge and abilities that are required of the profession. In order to identify these skill areas Wesman (14) and Shimberg (11) recommend that a job analysis be used. Wesman (14) contends that the job analysis will give insight into what individuals proficient in this area are expected to know. Shimberg (11) states that the content outline must be representative of a specified content domain. This content domain can be identified by a

job analysis where the knowledge, skills and abilities required for effective work performance are known.

In addition to the selection of topic areas, educational objectives must also be selected. Bloom (2) contends that the purpose of stating educational objectives is to determine the outcome or the ability of the examinee at the various cognitive levels, and is a basis for the methodology of developing test items. While Martuza (10) states that without the clarification of educational objectives there is a tendency by the item writer to produce items that measure only knowledge of isolated facts and neglect the more complex learning outcomes. Tinkelman (12) advises the test constructor to utilize some type of educational classification so that the skill levels can be identified and measured in a test. Denova (4) also emphasizes the importance of stating educational objectives to assist in further guiding the item writing process.

The next procedure utilized in test development is the table of specifications or the test blueprint. Blood and Budd (1) offer the following description.

"The table of specifications is essentially a two-way classification of the items that will constitute the proposed test. One classification is the content to be covered by the test, the other classification is the objectives to be measured. In the cells of the table formed by the two-way classification scheme, we place either numbers or percentages. The percentages is that proportion of the total number of items in the test to be allotted to the cell."

Tinkelman (12) contends that the purpose of the test blueprint is to define the scope and emphasis of the test. Gronlund (7) states that the table of specifications provides an assurance that the test will measure a representative sample of the learning outcome and topic area. Martuza (10) states that the table specifies the desired characteristics in the finished product. This also provides assurance of a balanced measurement of instructional

objectives and content. Blood and Budd (1) emphasize that the decision as to the percentage assigned in each cell is dependent upon the relative importance of this objective on this element of content and on the emphasis given to it in the profession. In regards to developing the blueprint, Tinkelman (12) emphasizes the importance of soliciting the advice and assistance of authorities with respect to the topics contained in each domain. The panel for each domain should constitute adequate representation of professional thought. Martuza (10) contends that one approach to the empirical validation of domain referenced tests which are intended to measure achievement is to involve the use of consultant specialists to complete the table of specifications and to review the items developed from the table. Content validity can only be determined by having individuals who are knowledgeable about the particular universe of tasks to make judgements concerning the adequacy of the domain and the representativeness of the sample test items. Tinkelman (12) recommends that the consultants be given the table of specifications and requested to criticize or revise the topics and to assign weights to the topics. A request to assign weights to the topics is then most likely to stimulate active and thoughtful considerations of the problem. The mean values are then calculated from the scores arrived at by the consultants. Test questions are developed from tabular values.

Tinkelman (12) suggests that all competencies and topic areas contained in the table of specifications be represented in the test in the same degree of emphasis as their tabular value. The table is the single most important guide to and control over the compilation of items, and the item writer should not change from the values assigned for reasons of expediency.

In determining the item type to be contained in the test Denova (4)

states that the multiple choice item is considered the best type of objective testing method for measuring a variety of objectives. Wesman (14) contends that the multiple choice item is adaptable to a variety of topics and can be used with great skill and effectiveness to measure complex skills and fundamental understandings. Green (6) states that multiple choice items are preferred because of the speed and objectivity with which they can be scored. The multiple choice item according to Gronlund (8) is the most useful format for measuring complex achievement. Green (6) states that 4 or 5 options per question are preferred to reduce the effect of guessing. Wesman (14) states that more distractors increase the reliability of the item, but additional distractors may also merely act as filler. It is not so much the number of distractors but their effectiveness that determines their utility.

Once test items are written they should be reviewed by consultants in each respective field. Tinkelman (12) states items should be reviewed by consultants from three points of view: (1) item form, (2) subject matter accuracy, and (3) editorial consistency. Green (6) also emphasizes these points and recommends that more items than are needed for the test must be written, for some questions will not pass the review process and the item writer must expect a mortality rate for the items developed. Once the items are screened and edited the test constructor then assembles the test according to the table of specifications.

Henrysson (9) states that at least 25 items should be included on the test to provide a reasonably stable criterion score. In regards to a time limit being set on examinees Henrysson (9) points out that adequate time to complete all the items should be allowed, since the main interest is on the items in the test, not how quickly the items can be answered. Tinkelman (12) emphasizes that assessment of speed of response on achievement tests is not

an important measurement objective, and examinees should be allowed sufficient time to demonstrate their maximum performance level.

When test administration has been completed, scores are derived and an item analysis is performed. Wesman (14) points out that the item analysis identifies questions which are too difficult, too easy, or otherwise non-discriminating. Item analysis examines the difficulty level and the discrimination index for each question. Blood and Budd (1) emphasize that in testing ability the goal is to spread the score along the continuum of achievement as widely and reliably as possible. By producing maximum variability the accuracy of the measurement increases. According to Blood and Budd (1) and Martuza (10) a maximum number of discriminations among examinees and the greatest variability in test scores is achieved by items having a difficulty level between 0.30 - 0.70. The item discrimination index refers to an item's ability to differentiate between examinees performing well and the examinees performing poorly on the test as a whole. The difficulty level of the item will directly influence the discrimination index. Gronlund (7) points out that items having a 0.50 difficulty level make maximum discriminating power possible, since it is at this level that examinees in the upper half of the group get the item right, while those in the lower half get it wrong. Martuza (10) states that an item is a good discriminator if performance on the item is positively correlated with performance on the entire test. This is the single most important characteristic of a norm-referenced test. Blood and Budd (1) contend that the aim is to have all items positively discriminating. Those items that have a discrimination index of +0.40 and above are discriminating highly; those of +0.20 - +0.39 are moderate; below this level those items between +0.00 - +0.19 are low discriminators. Gronlund (7) cautions that a low index of discrimination does not necessarily indicate a defective

item by stating:

"Achievement tests are designed to measure several different types of learning outcomes, knowledge, comprehension and application. When this is the case test items that represent an area receiving relatively little emphasis will tend to have poor discriminating power. This is because those items have less representation in the total test score and there is typically a low correlation between measures of knowledge and measures of comprehension. Low indices of discrimination here merely indicate that these items are measuring something different from what the major part of the test is measuring."

Gronlund (7) advises that it may be necessary to retain such items in order to measure a representative sample of the learning outcomes and topic areas. A well constructed achievement test will of necessity contain items that have a low discriminating power and discarding them would result in a test that is less valid, rather than more valid. Martuza (10) also mentions this and stresses that low indices of discrimination are a rule rather than an exception.

These procedures were reviewed and utilized in the development of domain referenced tests to measure knowledge and skills of professional horticultural therapists. This study will begin to identify the knowledge base needed by horticultural therapists in terms of objectives questions, contained in domain referenced tests.



## Methods

### Test Development

In order for the test to contain a representative work sample of the universe of task constituting achievement in horticultural therapy, three domains were identified: horticulture, horticultural therapy, and therapy skills. Each domain contained 25 multiple choice items, with 4 options. Each domain would take approximately 15 minutes to complete.

Topic areas for each domain were developed from an unpublished 1981 job analysis, where horticultural therapists identified knowledge, skills, and abilities required for successful job performance. These skills were then compared with the core curriculum of academic training for horticultural therapists at Kansas State University. Based upon these two sources a tentative topic outline was developed for each domain. Each topic was subdivided into educational objectives of knowledge, comprehension, and application (2). Appendix A contains a copy of the topics and educational objectives.

The topics for each domain were then listed in a test blueprint or table of specifications. The blueprint consisted of a two-axis chart of specifications. Placed on the left side of the chart were the topic areas to be contained in the test. Across the top of the chart were the educational objectives; knowledge, comprehension, and application. Percentages were placed in the cells of the table formed by the two-way classification scheme to denote the proportion of the items to be placed in the test.

A panel of professionals assisted in the review and assignment of values to the topics contained in the test blueprint. Five consultants for each domain were selected. Two criteria were established for the selection



of the 15 consultants. They must possess professional expertise in one of the three domains and have a knowledge of the skills required in the horticultural therapy profession. The consultants were requested to criticize or revise the topics, suggest new topics, and assign values to the topics agreed upon in the test blueprint. Appendix B contains the letter sent to the 5 horticultural consultants, along with definitions of topics and objectives, the test blueprint and instructions for completing the blueprint. Appendix C contains the letter and accompanying information sent to the therapy skills consultants. Appendix D contains the letter and information requested of the consultants in the horticultural therapy domain.

All consultants for each domain agreed upon the topics listed in the test blueprint. None indicated that any important aspect had been omitted from the list of topics. Appendix E is a sample of the values submitted in the test blueprint by a consultant in the horticultural domain. Mean percentages were calculated from the values assigned in the test blueprint by the consultants. (See Appendix F.) These percentages in the test blueprint cells represent the proportion of the items to be developed for each topic area.

Once the specifications for the domains were established the next procedure was development of the multiple choice questions. Three of the consultants submitted course outlines and old exams to assist in item development. Each question was written to measure achievement in the topic areas as it related to the educational objective. For example, in the development of questions in the horticultural domain under the topic of fundamental plant processes, questions were written that would measure fundamental knowledge or recall of facts, comprehension or an understanding of the principles, and application of those principles. This procedure was utilized

for each topic and objective in the domains.

Each question was recorded on an index card and filed according to domain, topic, and educational objective. Based on an expected mortality rate surplus items were written, so that after the review process a sufficient number of acceptable item types demanded by the test specifications remained. The number of questions written for review ranged from 49 to 36 for each domain. Each of the consultants who assisted in the development of the test blueprint reviewed the questions written for that domain. (See Appendix G.)

The correct response was not indicated in the questions submitted to the consultants for item review. This was done to facilitate careful scrutiny of each question and the four options. Below each question the consultants indicated by circling yes or no if the question should be considered in the domain test. Adjacent to this response they indicated which of the three educational objectives each question intended to measure. The responses were tabulated and only those questions judged as acceptable by the five consultants in each of the three domains were considered for the final domain tests. These items were categorized according to topic area and the agreed upon educational objective the question measured.

The next procedure was to select and assemble the final test questions that passed the item review. The questions selected were determined by the specifications in the test blueprint. For example, the test blueprint for the horticulture domain specified that 15% or 4 of the 25 items contained in the test must pertain to the topic area of fundamental plant processes. Of the 4 questions, 2 must measure fundamental knowledge, 1 comprehension, and 1 application. This procedure was completed for each cell contained in the three domain blueprints. When the selection of the 25 items for each domain

was completed a sample test form was prepared.

The sample tests were reviewed for continuity of items, random placement of the correct response within the four options, and any errors that might have occurred in the typing process. Preparation for printing the final domain-referenced testforms was planned upon completion of the review process. The horticultural domain was printed on green paper, therapy skills on blue, and horticultural therapy on white paper to simplify identification and minimize confusion in administering the exams. The domain title was printed in capital letters on the top of each test form. Below the title was a paragraph of instructions for the examinee. Questions were numbered 1 through 25. The four options were numbered 1 through 4. All responses were recorded on computer score cards by the examinees. (See Appendix H.)

#### Administration and Subjects

The domain-referenced tests were administered on September 9th and 10th, 1981 at the Annual Conference of the National Council of Therapy and Rehabilitation through Horticulture in New York City. A baseline of 50 replications for each domain was sought. A statement describing the study and requesting participation was given to each individual attending the conference at the registration desk. (See Appendix I.) Announcements were also made during the conference requesting participation in the study. All participants were currently working in the field of horticultural therapy. A private conference room was provided for the subjects to complete the domain-referenced tests undisturbed. Those wishing to participate in the study were requested to read the introduction statement. Upon their agreement to participate, the subjects were given a statement of assurance of confidentiality that their names would not be associated with their scores in any public or

private report. Accompanying the confidentiality clause was a questionnaire requesting demographic information. (See Appendix J.)

The domain tests were administered on a rotating basis to assure even distribution of each domain. Participants were encouraged to answer all three domains. Each domain required approximately 15 minutes to answer. The participants were given a copy of the domain test, and a computer score card. They were required to post only the domain title on their score card, showing no reference to their identity. When the subjects completed the 25 items, the test and response card were returned. If the participant had time to complete a second domain, another test was administered at this time. In case of inadequate time to begin and finish a second domain, the participants were requested to return later to complete remaining tests.

#### Evaluation

The Grader Computer Program with optical mark reader was utilized for the analysis of the domain-referenced tests. A score analysis was also derived for each domain. To determine reliability Kuder-Richardson 20 was computed for each domain.

## Results and Discussion

### Demographics

A sample of 50 participants for each domain was achieved. A total of 80 horticultural therapists participated in the study; 25 took only one domain, 55 took more than one domain. There were 23 males and 57 females. The mean age of the participants was 34. The mean number of years employed as a horticultural therapist was 4 years, 8 months. Of the 80 participants 6 held no professional degree, 5 had associates degrees, 40 bachelor of science, 11 bachelor of arts, 13 master of science, and 5 held a doctorate.

### Domain Scores

As shown in Table 1, the therapy skills domain mean was slightly higher than horticulture or horticultural therapy means. Based on the size of the standard deviation and the standard error, these means were considered statistically similar. Kuder-Richardson 20 values were high for each domain, indicating that the three tests have a high degree of reliability. The difficulty encountered in developing questions for the horticultural therapy domain is reflected in the reliability measure of .86 and the item analysis. The areas of horticulture and therapy skills are clearly defined, while horticultural therapy, a relatively new field, has no reference point.

As shown in Figure 1, the score frequencies for the horticulture items ranged from 28 through 100 (mode = 68). Score frequencies for horticultural therapy ranged from 36 through 92 (mode = 68); the therapy skills scores ranged from 28 through 96 (mode = 76).

### Academic Background

As shown in Table 2, the importance of a degree in horticultural therapy

is reflected in the mean scores. Participants with a horticultural therapy degree achieved higher mean scores for the horticulture and therapy skills domain-referenced exams than participants with horticulture or other degrees, respectively. Participants with degrees in horticulture and horticultural therapy scored similarly on the horticultural therapy domain test. This indicates a need for professional training of individuals working in horticultural therapy.

Product moment correlation coefficients were derived for the domain scores in the test. The horticulture and horticultural therapy  $r^2$  was 0.12; horticulture and therapy skills  $r^2 = 0.06$ ; therapy skills and horticultural therapy  $r^2 = 0.16$ . These values indicate no significant relationship exists between the scores achieved on the domain referenced exams.

An item analysis of each question on the exams are presented in Appendix K. The difficulty index and the discrimination index are presented.

#### Registered vs. Non-Registered

As shown in Table 3, participants who were registered through the National Council of Therapy and Rehabilitation through Horticulture achieved higher mean scores on each test than participants who were not registered. The registration process is based upon experience and academic training. A degree in horticultural therapy is not required, although the mean scores for those registered were higher, caution should be taken interpreting this as evidence of the registration process functioning as a method of insuring professional expertise.

#### Experience vs. Scores

Presented in Table 4 are the comparisons of mean scores for number of years experience. Participants employed in the field between 4 and 6 years

achieved higher mean scores than those with less and more experience. This indicates as years of experience increase, knowledge in all three domains increases. The decline in mean scores in the category of 7 or more years experience may indicate a loss of interest in the profession.

#### Educational Objectives

As shown in Table 5, the mean item difficulty index for horticultural therapy questions was 7 to 10 percentage points lower for knowledge than for horticulture or therapy skills questions. Difficulty index means for comprehension questions was similar for horticulture and horticultural therapy domains but higher for therapy skills. Horticultural therapy application difficulty index means were 6 and 13 points higher than horticulture and therapy skills, respectively.

This data indicates that questions developed in the knowledge educational objective categories were more difficult than those measuring comprehension or application. Also professionals in horticultural therapy have a better understanding of the application of skills than of fundamental knowledge.

The random sample of 80 examinees with 50 participants for each domain are representative of horticultural therapists throughout the United States. The high reliability coefficients of the three domains indicate that measurements achieved are consistent.

The discrimination index of the items offers crucial information into the further refinement of the domains. Recommendations are made that those items having a discrimination index below +0.20 be reviewed for apparent weakness in the stem or options. Precautions must be taken for those items that measure something different from the whole test (1,7).

The scores achieved by the examinees in relation to their degree indicate that those trained in horticultural therapy perform consistently better on the three exams than those not trained for the profession. The advancement of horticultural therapy is dependent upon the competency of those representing the profession. The use of a certification exam prior to registration would provide assurance that those working in the field have attained a specified level of competency.

This study identifies three distinct domains of core knowledge in the horticultural therapy profession. This research provides a baseline for the future development of certification examination within the horticultural therapy profession.



**THIS BOOK  
CONTAINS  
NUMEROUS PAGES  
WITH DIAGRAMS  
THAT ARE CROOKED  
COMPARED TO THE  
REST OF THE  
INFORMATION ON  
THE PAGE.**

**THIS IS AS  
RECEIVED FROM  
CUSTOMER.**

Table 1  
Descriptive Data for Domain Referenced Tests

Domain Statistic	Horticulture	Horticultural Therapy	Therapy Skills
Mean	70.40	69.33	73.52
Standard Deviation	15.10	10.78	14.25
Kuder- Richardson 20	.93	.86	.92
Standard Error	3.85	3.98	3.95

Table 2  
Comparison of Degree and Mean Score (%)

Degree	Domain	Horticulture	Horticultural Therapy	Therapy Skills
Horticulture		71.80	70.82	70.00
Horticultural Therapy		75.20	70.33	77.67
Other Degree/ No Degree		66.00	67.62	74.10

Table 3  
Mean Score of Registered and Non-Registered Horticultural  
Therapists vs. Test Domains (%)

Domain Registration	Horticulture	Horticultural Therapy	Therapy Skills
Registered	73.09	70.82	79.66
Non- Registered	68.84	68.58	71.13

Table 4  
Mean Scores of Years Experience vs. Test Domains (%)

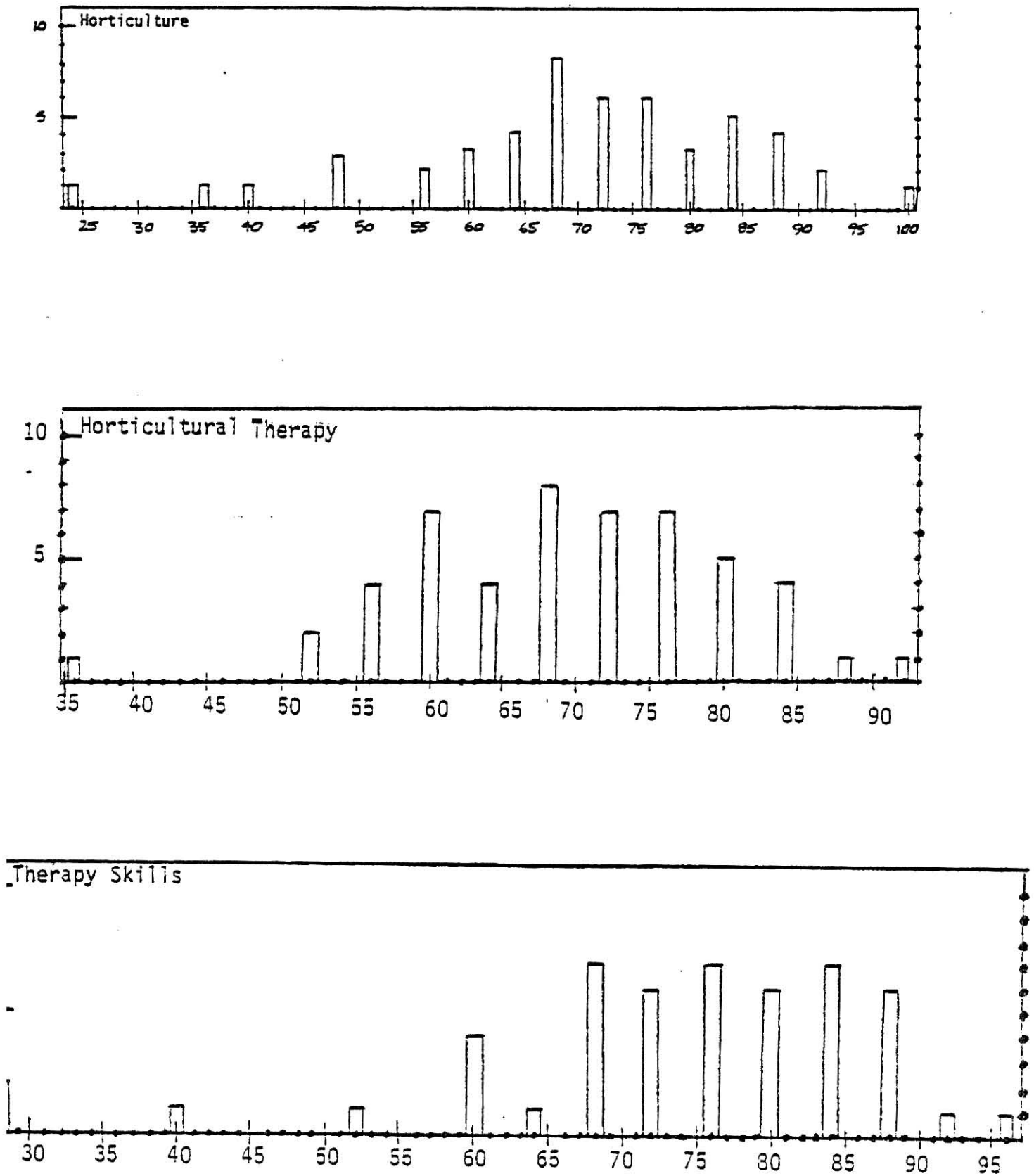
Years \ Domain	Horticulture	Horticultural Therapy	Therapy Skills
3 or less	65.44	68.50	69.84
4 - 6	76.70	73.25	80.00
7 or more	68.00	64.00	75.00

Table 5

Mean Item Difficulty Index of Ed. Obj. vs. Test Domains (%)

Domain Ed. Obj.	Horticulture	Horticultural Therapy	Therapy Skills
Knowledge	66.6	60.0	69.7
Comprehension	70.0	69.6	75.2
Application	77.3	83.7	70.8

Figure 1 Comparison of Horticulture, Horticultural Therapy, and Therapy Skills Score Frequency



## Literature Cited

1. Blood, D.F., and W.C. Budd. 1972. Educational measurement and evaluation. Harper and Row, New York, N.Y.
2. Bloom, B.S., ed. 1964. Taxonomy of educational objectives. Handbook I. Cognitive domain. David McKay, New York, N.Y.
3. Bormuth, J.R. 1970. On the theory of achievement test items. University of Chicago Press, Chicago, IL.
4. Denova, C.C. 1979. Test construction for training and evaluation. Van Nostrand Reinhold Co., New York, N.Y.
5. Fretz, B.R., and D.H. Mills. 1980. Licensing and certification of psychologists and counselors. Jossey-Boss Inc., San Francisco, CA.
6. Green, B.F. 1981. Primer of testing. American Psychologist. 36 (10): 1001 - 1011.
7. Gronlund, N.E. 1981. Measurement and evaluation in teaching, ( 4th ed.). Macmillan Publishing Co., Inc. New York, N.Y.
8. Gronlund, N.E. 1977. Constructing achievement tests, ( 2nd ed.). Prentice Hall, Inc., Englewood Cliffs, N.J.
9. Hennesson, S. 1971. Gathering, analyzing, and using data on test items. Pages 130 - 159 in: R.L. Thorndike, (ed.). Educational measurement, ( 2nd ed.). American Council on Education, Washington, D.C.
10. Martuza, V.R. 1977. Applying norm - referenced and criterion - referenced measurement in education. Allyn and Bacon, Inc., Boston, MA.
11. Shimberg, B. 1981. Testing for licensure and certification. American Psychologist. 36 (10): 1138 - 1146.
12. Tinkelman, S.N. 1971. Planning the objective test. Pages 46 - 80 in: R.L. Thorndike, ( ed.). Educational measurement, ( 2nd ed.). American Council on Education, Washington, D.C.
13. Tyler, L.E. 1971. Tests and measurement, (2nd ed.). Prentice Hall, Inc., Englewood Cliffs, N.J.
14. Wesman, A.G. 1971. Writing the test item. Pages 81 - 129 in R.L. Thorndike, (ed.). Educational measurement, (2nd ed.). American Council on Education, Washington, D.C.



## APPENDIX A

### Topics and Educational Objectives

**THIS BOOK IS OF  
POOR LEGIBILITY  
DUE TO LIGHT  
PRINTING  
THROUGH OUT IT'S  
ENTIRETY.**

**THIS IS AS  
RECEIVED FROM  
THE CUSTOMER.**

## HORTICULTURE

1. Fundamental Plant Processes: The processes of photosynthesis, respiration, water absorption and transpiration. The application of these processes to the growth and development of plants and to the solution of plant production problems.
2. Plant Tissues and Structures: The morphology and function of tissues and structures of the plant.
3. Environmental Control: The effects of water, temperature, and light on plant response.
4. Soils and Plant Nutrition: The primary functions of soils. Plant nutrition and the essential elements. The use of fertilizer for various crops, application rate, and method.
5. Propagation: Asexual plant propagation; cuttings, division, budding, and grafting. Sexual plant propagation; seeds, sowing of seeds, germination, transplanting care.
6. Plant Identification: Taxonomic knowledge of ornamental and food crops including cultivars and appropriate use in landscape and vegetable/fruit gardens.
7. Plant Problems and Controls: Plant diseases and disease control. Pesticides and safety. Insect identification and appropriate control.
8. Production of Horticultural Crops: Growth habits and cultural requirements for indoor plants, ornamental plants, vegetable/fruit crops, and grasses.

## THERAPY SKILLS

1. Treatment models: An understanding of the theory and practice employed in the medical, educational, and community based models, i.e. behavior modification, clinical psychology, reality therapy, reality orientation.
2. Group Dynamics and Process: The function, formation, and maintenance of small groups in the appropriate treatment model.
3. Documentation/Assessment: Theory and process of client assessment, observations, writing progress notes, and other charting procedures utilized in the treatment process.
4. Communication: Send and interpret oral and non-verbal messages to clients/staff in a manner appropriate to the setting.
5. Client Population: Knowledge of the characteristics and needs of the special populations within horticultural therapy. Developmentally disabled, geriatric, psychiatric, corrections, physically disabled.

## HORTICULTURAL THERAPY

1. Activity Planning: Assessment of the specific client groups in the Horticultural Therapy setting. Development of goals and objectives, understanding and utilization of systematic planning techniques,(task analysis). Evaluation and choice of appropriate horticultural activities for various client groups.
2. Program Adaptations: Environmental and material adaptations required for client groups in the horticultural therapy setting.
3. Professionalism: Awareness of the field of horticultural therapy, national organization and professional advancement.
4. Business Skills: Financing, budgeting and maintaining a Horticultural Therapy program. For example, securing grants, public relations, scheduling production.

1. Knowledge is defined as the remembering of previously learned material. This may involve the recall of a wide range of material, such as terminology, specific facts, principles and methodologies. All that is required is the bringing to mind the appropriate information.
2. Comprehension is defined as the ability to grasp the meaning of material. This may be shown by translating material from one form to another, by interpreting material, and by estimating future trends. These learning outcomes go one step beyond the simple remembering of material, and represent the lowest level of understanding.
3. Application refers to the ability to use learned material in new and concrete situations. This may include the application of rules, methods, concepts, principles and theories.

## APPENDIX B

Horticulture consultants - letter, topics and blueprint



## Department of Horticulture

28

Waters Hall  
Manhattan, Kansas 66506  
913-532-6170

July 8, 1981

I am in the process of identifying essential horticultural skills required by horticultural therapists, the results of which will be incorporated into a domain referenced examination. Content items extracted from horticultural courses will be set into test question format to measure fundamental knowledge, comprehension and application of information.

To achieve content validity for the horticultural items, I am requesting your assistance to:

1. Review topics to be covered in the test, and assign an appropriate weight to these topics.
2. Provide sample test questions for the topics listed.
3. Review the selected items for clarity, content, and relevance in the prepared examination.

Your advice in this project will help determine the scope and emphasis the horticulture portion of the test should take. Thank you for your time and consideration. Please call me if you have any questions.

Sincerely,

Patrice Murphy, Assistant Instructor  
Horticultural Therapy Research Project

Listed below are the horticultural topics and the educational objectives. Please read the descriptions and then estimate what percentage of the total test should be devoted to each topic. Using the table provided, write your estimates in the total weight column. Your percentage estimates should add up to 100 percent. In the columns marked fundamental knowledge, comprehension and application estimate the appropriate weight that each topic should have relative to these three areas. The sum for each topic should equal the weight you have assigned in the right hand column. If you feel you feel elements of horticulture other than the eight listed are important, please list and briefly describe in the table space provided.

#### TOPICS

1. Fundamental Plant Processes: The processes of photosynthesis, respiration, water absorption and transpiration. The application of these processes to the growth and development of plants and to the solution of plant production problems.
2. Plant Tissues and Structures: The morphology and function of tissues and structures of the plant.
3. Environmental Control: The effects of water, temperature and light on plant response.
4. Soils and Plant Nutrition: The primary functions of soils. Plant nutrition and the essential elements. The use of fertilizer for various crops, application rate and method.
5. Propagation: Asexual plant propagation; cuttings, division, budding and grafting. Sexual plant propagation; seeds, sowing of seeds, germination and transplanting care.
6. Plant Identification: Taxonomic knowledge of ornamental and food crops including cultivars and appropriate use in the landscape and vegetable/fruit gardens.
7. Plant Problems and Control: Plant diseases and disease control. Pesticides and safety. Insect identification and appropriate control.
8. Production of Horticultural Crops: Growth habits and cultural requirements of indoor plants, ornamental plants, vegetable/fruit crops, and grasses.

#### EDUCATIONAL OBJECTIVES

1. Knowledge is defined as the remembering of previously learned material. This may involve the recall of a wide range of material, such as terminology, specific facts, principles and methodologies. All that is required is the recall of the appropriate information.



2. Comprehension is defined as the ability to grasp the meaning of material. This may be shown by translating material from one form to another, by interpreting material, and by estimating future trends. These learning outcomes go one step beyond the simple remembering of material, and represent the lowest level of understanding.
3. Application refers to the ability to use learned material in new and concrete situations. This may include the application of rules, method, concepts, principles and theories.

TOPIC	Fundamental	Comprehensive	Application	TOTAL
Fund. Plt. Proc.				
Plt. Tissue				
Env. Control				
Soils				
Propagation				
Plt. ID				
Plt. Problems				
Hort. Crops				
TOTAL				100

## APPENDIX C

Therapy Skills consultants- letter, topics and blueprint



## Department of Horticulture

Waters Hall  
Manhattan, Kansas 66506  
913-532-6170

31

July 27, 1981

I am in the process of identifying essential therapeutic skills required by horticultural therapists, the results of which will be incorporated into a national certification examination. Content items extracted from courses will be set into test question format to measure fundamental knowledge, comprehension, and application of information.

To achieve content validity for the therapeutic items, I am requesting your assistance to:

1. Review topics to be covered in the test, and assign an appropriate weight to these topics.
2. Provide sample test questions for the topics listed in #1.
3. Review the selected items for clarity, content, and relevance in the prepared examination.

Your advice and assistance in this project will help determine the scope and emphasis the therapy portion of the test should take.

Thank you for your time and consideration. Please call me if you have any questions.

Sincerely,

A handwritten signature in cursive script that reads 'Patrice Murphy'.

Patrice Murphy, Instructor  
Horticultural Therapy Research Project

PM:na

Listed below are the therapy skills topics and the educational objectives. Please read the descriptions and then estimate what percentage of the total test should be devoted to each topic. Using the table provided, write your estimates in the total weight column. Your percentage estimates should add up to 100 percent. In the columns marked fundamental knowledge, comprehension and application estimate the appropriate weight that each topic should have relative to these three areas. The sum for each topic should equal the weight you have assigned in the right hand column. If you feel elements of therapy skills other than those listed are important, please list and briefly describe in the table space provided.

### TOPICS

1. Treatment Models: An understanding of the theory and practice employed in the medical, educational and community based models, i.e. behavior modification, clinical psychology, reality therapy and reality orientation.
2. Group Dynamics and Process: The function, formation and maintenance of small groups in the appropriate treatment model.
3. Documentation/Assessment: Theory and process of client assessment, observations, writing progress notes and other charting procedures utilized in the treatment process.
4. Communication: Send and interpret oral and non-verbal messages to clients/staff in a manner appropriate to the setting.
5. Client Population: Knowledge of the characteristics and needs of the special populations within horticultural therapy. Developmentally disabled, geriatric, psychiatric, corrections, physically disabled.

### EDUCATIONAL OBJECTIVES

1. Knowledge is defined as the remembering of previously learned material. This may involve the recall of a wide range of material, such as terminology, specific facts, principles and methodologies. All that is required is the bringing to mind the appropriate information.
2. Comprehension is defined as the ability to grasp the meaning of material. This may be shown by translating material from one form to another, by interpreting material and estimating future trends. These learning outcomes go one step beyond the simple remembering of material, and represent the lowest level of understanding.
3. Application refers to the ability to use learned material in new and concrete situations. This may include the application of rules, methods, concepts, principles and theories.

TOPIC	KNOWLEDGE	COMPREHENSION	APPLICATION	TOTAL
Treatment Models				
Group Dynamics				
Documentation /Assessment				
Communication				
Client Population				
Total				100

## APPENDIX D

Horticultural Therapy consultants- letter, topics and blueprint



## Department of Horticulture

34

Waters Hall  
Manhattan, Kansas 66506  
913-532-6170

July 10, 1981

I am in the process of identifying essential skills required by horticultural therapists, the results of which will be incorporated into a domain referenced examination. Content items extracted from horticultural therapy courses will be set into test question format to measure fundamental knowledge, comprehension and application of information.

To achieve content validity for the horticultural therapy items I am requesting your assistance to:

1. Review topics to be covered in the test, and assign appropriate weight to these topics.
2. Provide sample test questions for the topics.
3. Review the selected items for clarity, content, and relevance in the prepared examination.

Your advice and assistance in this project will help determine the scope and emphasis the horticultural therapy portion of the test should take.

Thank you for your time and consideration. Please call me if you have any questions.

Sincerely,

Patrice Murphy, Assistant Instructor  
Horticultural Therapy Research Project

Listed below are the horticultural therapy topics and the educational objectives. Please read the descriptions and then estimate what percentage of the total test should be devoted to each topic. Using the table provided, write your estimates in the total weight column. Your percentage estimates should add up to 100 percent. In the columns marked fundamental knowledge, comprehension and application estimate the appropriate weight that each topic should have relative to these three areas. The sum for each topic should equal the weight you have assigned in the right hand column. If you feel elements of horticultural therapy other than those listed are important, please list and briefly describe in the table space provided.

#### TOPICS

1. Activity Planning: Assessment of the specific client group in the horticultural therapy setting. Development of goals and objectives. An understanding and utilization of systematic planning techniques, (task analysis). Evaluation and choice of appropriate horticultural activities for various client groups.
2. Program Adaptations: Environmental and material adaptations required for client groups in the horticultural therapy setting.
3. Professionalism: Awareness of the field of horticultural therapy, national organization and professional advancement.
4. Business Skills: Financing, budgeting and maintaining a horticultural therapy program. For example securing grants, public relations, scheduling production.

#### EDUCATIONAL OBJECTIVES

1. Knowledge is defined as the remembering of previously learned material. This may involve the recall of a wide range of material, such as terminology, specific facts, principles and methodologies. All that is required is the bringing to mind the appropriate information.
2. Comprehension is defined as the ability to grasp the meaning of material. This may be shown by translating material from one form to another, by interpreting material and estimating future trends. These learning outcomes go one step beyond the simple remembering of material, and represent the lowest level of understanding.
3. Application refers to the ability to use learned material in new and concrete situations. This may include the application of rules, methods, concepts, principles and theories.



TOPIC	KNOWLEDGE	COMPREHENSION	APPLICATON	TOTAL
Ativity Planning				
Program Adaptations				
Professionalism				
Business Skills				

## APPENDIX E

Sample of values submitted by horticulture consultant in blueprint

Listed below are descriptions of horticultural topics. Please read the descriptions and then estimate what percentage of the total test should be devoted to each topic. Using the table provided, write your estimates in the total weight column. Your percentage estimates should add up to 100 percent. In the columns marked fundamental knowledge, comprehension, and application estimate the appropriate weight that each topic should have relative to these three areas. The sum for each topic should equal the weight you have assigned in the righthand column. If you feel elements of horticulture other than the eight listed are important, please list and briefly describe in the table space provided.

TOPIC	Fundamental	Comprehensive	Application	TOTAL
Fund. Plt. Proc.	13	3	4	20
Plt. Tissue	6	2	2	10
Env. Control	3	9	3	15
Soils	3	3	4	10
Propagation	6	3	4	13
Plt. ID	6	2	2	10
Plt. Problems	2	6	2	10
Hort. Crops	3	6	3	12
TOTAL	42	34	24	100

## APPENDIX F

Mean values assigned in table of specifications

HORTICULTURE DOMAIN TABLE OF SPECIFICATIONS

Ed. Obj. Topic	Knowledge		Comprehension		Application	
	%	N	%	N	%	N
Plant Processes	7.8	2	4.0	1	3.2	1
Plant Tissue	6.2	2	.8	0	1.0	0
Environmental Control	3.5	1	8.5	2	4.0	1
Soils	3.8	1	4.0	1	.7	0
Propagation	3.9	1	.7	0	3.4	1
Plant Identification	3.4	1	7.0	2	1.6	0
Plant Problems	3.7	1	7.9	2	4.4	1
Horticulture Crops	4.0	1	4.1	1	8.4	2

## THERAPY SKILLS DOMAIN TABLE OF SPECIFICATIONS

Ed. Obj. Topic	Knowledge		Comprehension		Application	
	%	N	%	N	%	N
Treatment Models	3.5	1	12.0	3	.5	0
Group Dynamics	7.6	2	.4	0	4.0	1
Documentation Assessment	7.8	2	3.6	1	8.2	2
Communication	1.1	0	4.0	1	2.9	1
Client Population	28.0	7	12.0	3	4.0	1

HORTICULTURAL THERAPY DOMAIN TABLE OF SPECIFICATIONS

Ed. Obj. Topic	Knowledge		Comprehension		Application	
	%	N	%	N	%	N
Activity Planning	8.0	2	16.0	4	12.0	3
Program Adaptations	20.0	5	8.0	2	4.0	1
Professionalism	15.4	4	.6	0	4.0	1
Business Skills	3.6	1	.4	0	8.0	2

## APPENDIX G

Letter of instructions for item review





## Department of Horticulture

41

Waters Hall  
Manhattan, Kansas 66506  
913-532-6170

August 10, 1981

Enclosed please find questions to be used in the horticulture domain referenced test. Review each question and designate by marking yes or no, if you think the question should be used in the domain test.

Using the definitions given for the objectives, knowledge, comprehension and application, mark the category you feel the question falls within.

When you have completed reviewing the items, please return them to Dr. Mattson's mailbox. Thank you.

Sincerely,

Patrice Murphy, Assistant Instructor  
Horticultural Therapy Research Project

Enclosures



## Department of Horticulture

42

Waters Hall  
Manhattan, Kansas 66506  
913-532-6170

August 15, 1981

Enclosed please find questions to be used in the therapy skills domain referenced test. Review each question and designate by marking yes or no, regarding whether or not the question should be used in the test.

Using the definitions given for the objectives, knowledge, comprehension and application, mark the category you feel the question falls within.

When you have completed reviewing the items return them in the envelope provided. Thank you for your time and assistance.

Sincerely,

Patrice Murphy, Assistant Instructor  
Horticultural Therapy Research Project

Enclosures



## Department of Horticulture

43

Waters Hall  
Manhattan, Kansas 66506  
913-532-6170

August 17, 1981

Enclosed please find questions to be used in the horticultural therapy domain referenced test. Review each question and designate by marking yes or no, regarding whether or not the question should be used in the test.

Using the definitions given for the objectives, knowledge, comprehension and application, mark the category you feel the question falls within.

When you have completed reviewing the items return them in the envelope provided. Thank you for your time and assistance.

Sincerely,

Patrice Murphy, Assistant Instructor  
Horticultural Therapy Research Project

Enclosures

## APPENDIX H

Domain referenced exams

# **ILLEGIBLE DOCUMENT**

**THE FOLLOWING  
DOCUMENT(S) IS OF  
POOR LEGIBILITY IN  
THE ORIGINAL**

**THIS IS THE BEST  
COPY AVAILABLE**

### HORTICULTURE

Print name and record answers on the computer card provided. Marks in answer spaces should fully obscure the inscribed number. To change answers, erase completely. Only one answer is correct for each question. Please ask at desk if you have any question. Turn in test and computer card when you finish.

- \_\_\_ 1. Loss of water by plants through leaves is called (1) translocation, (2) transpiration, (3) respiration, (4) evaporation.
- \_\_\_ 2. The opening in the epidermis of the leaf through which the gases, oxygen, carbon dioxide, and water vapor enter and exit the plant is called (1) cuticle, (2) xylem, (3) guard cell, (4) stoma.
- \_\_\_ 3. Photosynthesis, the process by which all plants make food for their growing processes, produces (1) carbon dioxide, (2) water, (3) oxygen and carbohydrates, (4) oxygen and water.
- \_\_\_ 4. What is the function of xylem tissue? (1) Transport manufactured foods downward from leaves to stem, (2) Transport oxygen from stomata to roots and stem, (3) Transport water and essential raw minerals upward from roots to stem and leaves, (4) Transport only manufactured food upward.
- \_\_\_ 5. What is the term used when a plant must undergo a specific period of cold temperature to initiate flower primordia? (1) vernalization, (2) stratification, (3) hardening, (4) dormancy.
- \_\_\_ 6. A tomato seedling grown under a 12 hour photoperiod indoors, under a 100 watt incandescent bulb will (1) grow short and compact, (2) become tall and thin in growth, (3) produce flowers quickly, (4) have large leaves to compensate for low light intensity.
- \_\_\_ 7. Most of the essential mineral elements are most readily available for uptake by plants at a soil pH of (1) 4.0-4.9, (2) 5.0-5.9, (3) 6.0-6.9, (4) 7.0-8.0.
- \_\_\_ 8. If a citrus plant develops a yellowing or chlorotic appearance between the dark green veins of the leaves, the plant is probably lacking (1) nitrogen, (2) iron, (3) phosphorus, (4) potassium.
- \_\_\_ 9. To correct a nitrogen deficiency, you should apply (1) iron sulfate, (2) 20-0-0 (3) ground limestone, (4) 0-0-60.
- \_\_\_ 10. Fruit or seed bearing vegetables respond most favorably to (1) nitrogen, (2) phosphorus, (3) potassium, (4) zinc.
- \_\_\_ 11. The quickest way to propagate an African violet is by (1) leaf petiole cutting, (2) division, (3) stem cutting, (4) seed.
- \_\_\_ 12. Insects which build up large masses of white cottony colonies on the underside of leaves and along the stem and leaf nodes are (1) white fly, (2) mites, (3) mealy bugs, (4) aphids.
- \_\_\_ 13. Irregular shaped yellow areas on the leaves of an African violet plant are usually caused by (1) fertilizer salts, (2) cold water on the leaves, (3) freezing temperatures, (4) low light intensity.

- \_\_\_ 14. The best time of year to establish a lawn with a cool season grass from seed is (1) early summer, (2) from late August to mid-October, (3) late spring, (4) from late spring to early fall.
- \_\_\_ 15. Which of the following is considered to be one of the least tolerant evergreens to hot, dry conditions, and the pollution in large cities (1) pines, (2) firs, (3) spruce, (4) juniper.
- \_\_\_ 16. Which one of the following plants would be classified as a ground cover? (1) Acer rubrum, (2) Pachysandra terminalis, (3) Cercis canadensis, (4) Picea abies.
- \_\_\_ 17. A stolon is an (1) underground root, (2) above ground root, (3) above ground stem, (4) underground stem.
- \_\_\_ 18. Which one of the following is the least desirable time to transplant a tree? (1) early spring, (2) late spring, (3) mid summer, (4) early fall.
- \_\_\_ 19. When the relative humidity decreases the plants (1) transpiration rate increases, (2) transpiration rate decreases, (3) transpiration rate is not affected, (4) evaporate rather than transpire water.
- \_\_\_ 20. When the respiration rate in a plant is higher than the rate of photosynthesis, the plant is (1) using up stored food reserves, (2) at the compensation point, (3) building up food reserves, (4) at the terminal oxidation point.
- \_\_\_ 21. Chlorophyll absorbs light primarily in (1) red and blue wave lengths, (2) orange and red wave lengths, (3) yellow and orange wave lengths, (4) green and blue wave lengths.
- \_\_\_ 22. The NPK analysis of a fertilizer is expressed as, the percent of total nitrogen available,  $P_2O_5$ , and (1) elemental potassium (K), (2)  $K_2O$ , (3)  $K_2O_5$ , (4)  $K_2(OH)_2$ .
- \_\_\_ 23. Most of the cultivars belonging to the species Juniperus horizontalis are used in the landscape as (1) shrub borders, (2) foundation plantings, (3) specimen plants, (4) ground covers.
- \_\_\_ 24. The response of a sunflower where by the flower 'turns' toward the sun is an example of (1) photoperiodism, (2) geotropism, (3) phototropism, (4) a nastic movement.
- \_\_\_ 25. If web-like coverings are found on your schefflera plant, the leaves appear stippled, and they begin to fall, you may have a problem with (1) aphids, (2) spider mites, (3) white flies, (4) powdery mildew.

This information was prepared  
pursuant to a grant from the  
National Institute of Mental  
Health Grant # MH16068  
K.S.U. Project # KS0606  
Project Director:  
Dr. Richard H. Mattson

## THERAPY SKILLS

46

- \_\_\_ 1. Behavior modification is most closely related to (1) clustering, (2) mediation, (3) stimulus-response, (4) organization.
- \_\_\_ 2. The defense mechanism by which an individual attributes a trait to someone else that he has himself is termed (1) projection, (2) rationalization, (3) compensation, (4) reaction-formation.
- \_\_\_ 3. The form of psychotherapy most related to conditioning principles is: (1) psychoanalysis, (2) behavior therapy, (3) client-centered therapy, (4) chemotherapy.
- \_\_\_ 4. According to psychoanalytic theory, mental illness may be primarily attributed to (1) poor conditioning at an early age, (2) lack of parental guidance, (3) a repressed idea, (4) genetic factors.
- \_\_\_ 5. Reinforcement of behavior that resembles the desired response is termed (1) generalization, (2) discrimination, (3) shaping, (4) operating.
- \_\_\_ 6. Which of the following individual characteristics of delinquency has the most substantial evidence? (1) genetic abnormalities, (2) physical types (3) learning disabilities, (4) low self esteem.
- \_\_\_ 7. Which most accurately describes epilepsy? (1) attacks may or may not be accompanied by convulsions or unconsciousness, (2) a person seldom loses consciousness during an attack, (3) it is a form of mental illness, (4) a person falls down and loses bladder control because all of the muscles totally relax.
- \_\_\_ 8. A major characteristic of any group is (1) heterogeneity, (2) member loyalty, (3) it has a longer life than does any individual member, (4) shared acceptance of group rules.
- \_\_\_ 9. Eighty-nine percent of the mentally retarded are considered (1) mildly retarded or educable, (2) severely retarded, (3) dependent mentally retarded, (4) profoundly retarded.
- \_\_\_ 10. The child is of at least average intelligence, whose academic performance is impaired by a developmental lag in the ability to sustain selective attention. Such a child requires special instruction in order to permit the use of their intellectual potential. This statement describes a child who is (1) environmentally disadvantaged, (2) learning disabled, (3) mildly retarded, (4) trainable mentally retarded.
- \_\_\_ 11. The most common communication disorder secondary to brain damage is: (1) dysarthria, (2) non aphasic language disorder, (3) stuttering, (4) aphasia.
- \_\_\_ 12. The single most important factor in the first encounter with a patient is: (1) taking an accurate history, (2) exhibiting patience and understanding, (3) making plans for a future vocation, (4) sharing the patients deep feelings concerning his condition.



- \_\_\_ 13. By definition aphasia is a language disorder associated with (1) visual or hearing deficits, (2) generalized mental deterioration, (3) both aural and/or oral communication, (4) psychiatric aberrations.
- \_\_\_ 14. Accurate record keeping directly after an activity gives the horticultural therapist a chance to (1) diagnose client level, (2) prescribe treatment for the client, (3) record client response to the activity, (4) determine client's feelings.
- \_\_\_ 15. The drug which is most effective in treating manic-depressives is (1) 1-Dopa, (2) Dilantin, (3) Thorazine, (4) Lithium carbonate.
- \_\_\_ 16. The major type of psychiatric disorder in the United States is (1) organic brain damage, (2) depression, (3) paranoia, (4) schizophrenia.
- \_\_\_ 17. Sensory perception disorders include all of the following except:  
(1) confusion in time and memory recall, (2) figure ground dysfunction,  
(3) fine motor coordination dysfunction, (4) position in space disorders.
- \_\_\_ 18. Which one of the following observations would be the least likely example of good recording: (1) client appearance, (2) client behavior, (3) client response to the activity, (4) another client's complaints about this client.
- \_\_\_ 19. Which one of the following is an example of a behavioral reaction? (1) client is distrusting and withdraws, (2) client's idea of time is disoriented, (3) client's mood is affectionate, (4) client understands easily.
- \_\_\_ 20. The most crippling type of arthritis is (1) rheumatoid, (2) osteoarthritis, (3) gout, (4) bursitis.
- \_\_\_ 21. Johnny has aphasia and is trying to tell you about his vacation. He is experiencing difficulty in telling you, as a therapist you should:  
(1) have him keep trying until he is able to express himself, (2) pretend you know what he is saying, (3) have someone who knows him well speak for him, (4) tell him you don't understand and to do something else for awhile and maybe the words will come to him.
- \_\_\_ 22. Interpretation is an error made in observation records. Which of the following statements should be considered interpretation?  
(1) Tim arrived to the activity on time. (2) Ann was seeking attention by throwing her pencil at the teacher. (3) John said, "I don't feel like working today." (4) The girl ran across the room to the door.
- \_\_\_ 23. Head nods, eye contact and leaning toward a client are examples of:  
(1) proximity, (2) active listening, (3) responsibility acceptance,  
(4) posture.

- \_\_\_\_ 24. The aim of this group leader is to involve members to such an extent that each participant contributes to the welfare of other individuals in the group. This describes what type of leader?  
(1) authoritarian, (2) laissez-faire, (3) democratic, (4) planless.
- \_\_\_\_ 25. John is a member of your group and recently has been expressing very negative feelings toward the group. As group facilitator what would be the most appropriate thing to say?  
(1) "We are all tired of your comments. Would you like to leave the group?"  
(2) "John, I am really trying to help you, but I feel that you push me away, and I am confused by that."  
(3) Wait until another group member mentions John's behavior.  
(4) "John, please refrain from comment unless you have something positive to say."

This information was prepared  
pursuant to a grant from the  
National Institute of Mental  
Health Grant # MH16068  
K.S.U. Project # KS0606  
Project Director:  
Dr. Richard H. Mattson

## HORTICULTURAL THERAPY

1. Select the answer that describes the order in which the systematic planning process takes place. (1) Define goals, set objectives, assess needs, evaluate planning process. (2) Assess needs, define objectives, set goals, evaluate planning process. (3) Assess needs, define goals, set objectives, evaluate planning process. (4) Evaluate planning process, define goals, set objectives, assess needs.
2. The process of defining long-term goals involves which one of the following steps? (1) gathering information concerning your groups current status, (2) determining what is the best possible effect that you can have on the group, (3) reviewing your progress notes on the group, (4) determining what activities will be best suited to your group.
3. Which of the following provides the best description for 'Systematic Planning'. (1) it is a business management procedure, (2) it can only be applied when the situation involves numerical data, (3) it is a means of determining effective action in relation to client, client group, or program management, (4) it is an evaluation technique.
4. How often should a formal evaluation of the planning process take place if you are working with a plan for a client? (1) once every 6 months, (2) only when client's situation/status seems to change, (3) depends on the facility, but once every two months is optimum, (4) depends on the facility and the client. Review period should be set as frequently as past experience of the client indicates.
5. Your client has not met the objectives agreed upon by the end of the review period. You should: (1) extend the review period, (2) change the objectives, (3) have a talk with the treatment team who devised the plan, (4) review the activities, objectives and goals, and your original assessment of needs to discover where the problem lies.
6. Which of the following would be the primary limitation to a non-ambulatory client in a greenhouse? (1) tool accessibility, (2) bench height, (3) rough walkway, (4) width of door and walkway.
7. Which of the following activities would not provide for release of frustration or aggression? (1) kneading clay, (2) mixing soil, (3) making a seed collage, (4) hoeing the garden.
8. When working with a individual who has multiple sclerosis, it is important to be careful to avoid all of the following except: (1) fatigue, (2) physical exercise, (3) frustration, (4) extremes in temperatures.
9. A raised bed garden would make gardening more accessible for which one of the following groups? (1) stroke patients, (2) psychiatric clients, (3) moderately mentally retarded, (4) children.
10. A goal that might be set for an elderly group of residents in a nursing home would be: (1) plan an activity that will cause reminiscing, (2) to plant a dish garden, (3) to ask certain members of the group to assist others during the activity, (4) to increase the social interaction of the group.

11. All parts of this plant are toxic and considered extremely dangerous if ingested. Symptoms of poisoning include: nausea, vomiting, diarrhea, abdominal pain, sweating and cardiovascular collapse. Identify the plant.  
(1) chokecherry (*Prunus virginiana*), (2) rhubarb, (3) mistletoe, (4) iris.
12. If a client has swallowed a corrosive poison which was stored in your pesticide cabinet, what would a doctor most likely advise as immediate action?  
(1) induce vomiting, (2) administer activated charcoal, (3) give them a glass of soapy water, (4) give them a glass of water.
13. A greenhouse for physically disabled people should have doorways and paths that are a minimum width of: (1) 40 inches, (2) 30 inches, (3) 50 inches, (4) 60 inches.
14. Raised bed gardens approachable on both sides need to be a maximum width of:  
(1) 2 feet, (2) 3 feet, (3) 4 feet, (4) 6 feet.
15. Which one of the following activities would be best for a patient who has a short attention span? (1) copy, (2) flower arrangement, (3) seed collage, (4) pine cone Christmas wreath.
16. In England, horticultural therapy has evolved from the medical model with the field of (1) physical therapy, (2) activity therapy, (3) occupational therapy, (4) reality therapy.
17. Points toward professional registration in horticultural therapy are awarded for all of the following except: (1) academic degrees, (2) work experience, (3) publications and presentations, (4) attendance at conferences and chapter meetings.
18. The H.T.R. level of registration in the NCTRH requires (1) 2 points, (2) 4 points, (3) 6 points, (4) 8 points.
19. Systematic poisoning from plants in the Aroid Family rarely occurs due to the fact that severe local irritation usually precludes actual ingestion. The best method of treatment if a plant in this group has been chewed, but not swallowed is to : (1) lie the patient down and keep them calm, (2) induce vomiting, (3) rinse the mouth with cold liquids, (4) administer activated charcoal.
20. Horticultural Therapy was first practiced in the United States at:  
(1) Menninger Clinic, (2) Friends Hospital, (3) Melwood Farm, (4) Brooklyn Botanical Garden.
21. The most appropriate step in organizing a gardening program for the general public in a community garden would be: (1) the acquisition of land, (2) donation of plants, seeds, and tools, (3) obtaining water, (4) locating potential users, and determining their preferred location.
22. In your capacity as horticultural therapist at the local nature preserve, you see a six year old child with his school class once a month. You feel the child is showing extreme emotional stress. The teacher does not appear to be aware of it. What would be the most appropriate action? (1) counsel the child, (2) talk with the teacher, (3) call the parents, (4) call the school nurse.

- 23. When planning horticulture activities for elderly people at the local community center, to insure high interest in the program you should:  
(1) tell the group how good it will be for them to participate,  
(2) ask the group what type of activities they would enjoy, (3) give them dates and times for each activity, (4) give them all a free plant for coming.
- 24. A fund raising proposal should: (1) be lengthy, (2) explain in detail what way competitors fall short, (3) include a concise statement of goals and objectives, (4) should always be written for more money than is needed.
- 25. The best approach to a private local source of funding is (1) a generally worded proposal, (2) a phone call to the president of the board, (3) a letter of inquiry followed by a phone call or a visit, (4) send multiple proposals.

This information was prepared  
pursuant to a grant from the  
National Institute of Mental  
Health Grant # MH16068  
K.S.U. Project # KS0606  
Project Director:  
Dr. Richard H. Mattson

## APPENDIX I

Statement given to conference participants



## Department of Horticulture

52

Waters Hall  
Manhattan, Kansas 66506  
913-532-6170

DEAR CONFERENCE PARTICIPANT:

I am developing test questions which delineate objective knowledge in Horticultural Therapy. Three sets of 25 questions each address knowledge of horticulture, therapeutic skills, and horticultural therapy.

You can help me validate these questions. Each set requires 10 minutes to complete. I encourage you to answer all three sets, but you may elect to take only one or two. (If your time is limited, you may return later to answer another set.)

Participation in this project is voluntary. Your name will be taken for identification purposes only, and will at no time be used in any public or private, written or oral, discussion of this study.

If you wish to participate, look for me at the table with the "H.T. K.S.U." t-shirt.

Sincerely,

A handwritten signature in cursive script that reads 'Patrice Murphy'.

Patrice Murphy, Assistant Instructor  
Horticultural Therapy Research  
Kansas State University

PM:na

## APPENDIX J

Statement of confidentiality and demographic questionnaire



## CONFIDENTIALITY

This study is being conducted under guidelines established by Kansas State University. By cooperating, you will help provide answers to important questions; however, your participation is strictly voluntary. You should omit any questions which you feel unduly invade your privacy or which are otherwise offensive to you. Confidentiality is guaranteed; your name will not be associated with your answers in any public or private report of the results.

How long have you been working in Horticultural Therapy?

Highest degree earned:

Date:

Major Field:

Which of the following describes you client group? Please check all that apply.

- ☐ Geriatric
- ☐ Physically disabled
- ☐ Psychiatric
- ☐ Mentally retarded
- ☐ Corrections
- ☐ General Community
- ☐ Other ( please specify )
- ☐
- ☐
- ☐
- ☐

Are you registered as a horticultural therapist ? ☐ YES ☐ NO

If so, at what level are you registered? ☐ HTT ☐ HTR ☐ HTM

State of residence: \_\_\_\_\_

Age: \_\_\_\_\_

Sex: \_\_\_\_\_

## APPENDIX K

### Item analysis

HORTICULTURE DOMAIN TEST  
ITEM ANALYSIS

Item Number	Difficulty Index	Discrimination Index	K	C	A
1	90.0	+ 0.38	x		
2	94.0	+ 0.23	x		
3	72.0	+ 0.54		x	
4	82.0	+ 0.31	x		
5	40.0	+ 0.62	x		
6	74.0	+ 0.69			x
7	74.0	+ 0.23	x		
8	68.0	+ 0.38		x	
9	88.0	+ 0.15			x
10	64.0	+ 0.38	x		
11	50.0	+ 0.46			x
12	94.0	+ 0.31	x		
13	78.0	+ 0.46		x	
14	82.0	+ 0.62			x
15	32.0	+ 0.15	x		
16	92.0	+ 0.38		x	
17	34.0	+ 0.62	x		
18	86.0	+ 0.31			x
19	64.0	+ 0.85		x	
20	80.0	+ 0.54		x	
21	62.0	+ 0.62	x		
22	28.0	+ 0.31		x	
23	60.0	+ 0.23		x	
24	84.0	+ 0.38			x
25	88.0	+ 0.46		x	

K = Knowledge  
C = Comprehension  
A = Application

HORTICULTURAL THERAPY DOMAIN TEST  
ITEM ANALYSIS

Item Number	Difficulty Index	Discrimination Index	K	C	A
1	61.0	+ 0.29	x		
2	51.0	+ 0.57		x	
3	94.0	+ 0.00	x		
4	69.0	+ 0.71		x	
5	94.0	+ 0.07			x
6	86.0	+ 0.21		x	
7	94.0	+ 0.14		x	
8	67.0	+ 0.21		x	
9	96.0	+ 0.07	x		
10	82.0	+ 0.21			x
11	73.0	+ 0.57	x		
12	20.0	+ 0.43	x		
13	47.0	+ 0.36	x		
14	59.0	+ 0.21	x		
15	51.0	+ 0.50		x	
16	51.0	+ 0.57	x		
17	78.0	+ 0.29	x		
18	35.0	+ 0.21	x		
19	82.0	+ 0.21			x
20	31.0	+ 0.07	x		
21	78.0	+ 0.21			x
22	82.0	+ 0.00			x
23	88.0	+ 0.21			x
24	84.0	+ 0.00	x		
25	78.0	+ 0. 07			x

K = Knowledge  
C = Comprehension  
A = Application

THERAPY SKILLS DOMAIN TEST  
ITEM ANALYSIS

Item Number	Difficulty Index	Discrimination Index	K	C	A
1	88.0	+ 0.31		x	
2	90.0	+ 0.38	x		
3	90.0	+ 0.38		x	
4	46.0	+ 0.69		x	
5	90.0	+ 0.15	x		
6	54.0	+ 0.54		x	
7	88.0	+ 0.31		x	
8	64.0	+ 0.38	x		
9	82.0	+ 0.15	x		
10	82.0	+ 0.38	x		
11	52.0	+ 0.46	x		
12	80.0	+ 0.31		x	
13	80.0	+ 0.15	x		
14	84.0	+ 0.54	x		
15	66.0	+ 0.69	x		
16	56.0	+ 0.62	x		
17	64.0	+ 0.38		x	
18	90.0	+ 0.23			x
19	64.0	+ 0.46			x
20	70.0	+ 0.31	x		
21	54.0	+ 0.62			x
22	92.0	+ 0.15		x	
23	78.0	+ 0.38			x
24	66.0	+ 0.38	x		
25	68.0	+ 0.15			x

K = Knowledge  
C = Comprehension  
A = Application

DEVELOPMENT AND EVALUATION OF DOMAIN REFERENCED ITEMS  
FOR PROFESSIONALS IN HORTICULTURAL THERAPY

by

PATRICE MARIE MURPHY

B. S., KANSAS STATE UNIVERSITY, 1978

---

AN ABSTRACT OF A MASTER'S THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

Department of Horticulture

KANSAS STATE UNIVERSITY

Manhattan, Kansas

1982

Three objective knowledge domains required by the horticultural therapy profession were identified; these being horticulture, horticultural therapy, and therapy skills. Twenty five multiple choice questions encompassing each of these three domains were written using test development procedures. Questions were administered to horticultural therapy professionals attending the 1981 Annual Conference of the National Council of Therapy and Rehabilitation through Horticulture.

A sample of 50 participants for each domain was achieved. A total of 80 professionals participated in the study with a mean number of years employed in the field of 4 years, 8 months. Six of the participants held no professional degree, 5 associate degrees, 51 held a bachelor's degree, 13 master of science and 5 doctorate degrees.

The mean scores of the test were 69.3 for horticultural therapy, 70.4 for horticulture and 73.5 for therapy skills. The reliability coefficients for each domain ranged from .86 to .93. Participants with a degree in horticultural therapy scored higher on the horticulture and therapy skills domains than participants having degrees in horticulture or other fields, respectively. Participants who were registered horticultural therapists scored higher in all three domains when compared with those who were not registered. Examinees employed in the field for 4 to 6 years achieved higher mean scores on all three domains when compared with those of more or less experience. The discrimination indexes for 80% of the items was above +0.20.