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Assessing the intended and actual levels of cognition in Ohio Cooperative Extension Service county agricultural agents'/state agricultural specialists' instructional programs

Ismail, Ali Kasim, Ph.D.
The Ohio State University, 1992
ASSESSING THE INTENDED AND ACTUAL LEVELS OF COGNITION IN OHIO COOPERATIVE EXTENSION SERVICE COUNTY AGRICULTURAL AGENTS'/STATE AGRICULTURAL SPECIALISTS' INSTRUCTIONAL PROGRAMS

DISSERTATION

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

by

Ali Kasim Ismail, B.S., M.A.

* * * * *

The Ohio State University

1992

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Approved by

Adviser

Department of Agricultural Education
DEDICATION

TO MY FAMILY
ACKNOWLEDGEMENT

"In The Name of Allah, Most Gracious, Most Merciful"

I thank Allah (GOD) for everything. Without the power endowed to me from Allah, I would have never achieved a thing in my life. I thank Allah for blessing me with guidance on his straight path. I thank Allah for all the knowledge I have and I asked him to help me utilize my knowledge in serving his world. I thank Allah for giving me a faithful, truthful, honest, dedicated and true Moslem wife. I thank Allah for blessing me with three beautiful, intelligent, hardworking, and loving children. I thank prophet Mohammad, peace be upon him, for carrying the message of Islam and I acknowledge and testify that he conveyed the message and submitted the trust.

I would like to acknowledge all the following individuals for their cooperation and assistance in making this study possible.

Dr. Larry E. Miller, chairman of the dissertation committee and major academic adviser, for his excellent guidance, dedication, support, and sincere interest in my graduate program and this study. Dr. Larry E. Miller was a driving force behind the successful completion of my

iii
doctoral program and dissertation.

Dr. Keith Smith and Dr. Emmalou Norland, members of my academic and dissertation committees, for their generous assistance, faithful guidance and support during my graduate program and their substantial contributions to the development of this dissertation.

Dr. Joseph Donnermeyer for serving on my written committee examination.

Dr. Jo Jones and Dr. Nikki Conklin, Cooperative Extension Service, for their participation as members on the validity panel, their cooperation, support and willingness to let me borrow useful materials and books and for facilitating my mission during the developing stages of this study.

Dr. Charles Miller and Dr. Lisa Kitinoja for their participation in the inter-rater reliability panel, tutoring me on the use of the instruments, their listening, offering well-thought advice and reading a rough draft of my work.

Dr. Jamie Cano and Dr. Lowell Hedges, for their participation in the inter-rater reliability panel and their support and encouragement.

Dr. David McCraken, for his help in multiple regression statistical analysis.

Don Peasley, for his help in data analysis.

J. P. Owusu-Ansah, for his friendship during my
graduate program.

County agricultural agents, for their participation in this study and their effort to audio tape their presentations.

State agricultural specialists for their participation in this study, their effort to audio tape their presentation and letting me accompany them to different locations in Ohio to audio tape and observe their teaching.

Dr. Harold Matteson, Director of international programs in New Mexico State University (Yemen Project), Dr. Warren Noland, Dr. Evert Edington and Mary Reynolds for granting me the opportunity to study at the Ohio State University, their support, and encouragement.

Ministry of Education in Yemen, specifically, Abdu-Rabu Gradah, Abdul-Milik AL-Mualimi and Dr. Mohammad AL-Harazi, for their support of my graduate program and their friendship.

Finally, to my wife Rawdah and our children Rehab, Osamah and Nusibah, for their understanding and patience during my long absence, I am forever indebted.
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# TABLE OF CONTENTS

DEDICATION ................................................................. ii

ACKNOWLEDGEMENTS ........................................................ iii

VITA .............................................................................. vi

LIST OF TABLES ................................................................ xvi

LIST OF FIGURES .............................................................. xvii

CHAPTER PAGE

I. INTRODUCTION ............................................................. 1

Taxonomy of Educational Objectives .................................. 10
Problem Statement ......................................................... 13
Purpose of the Study ....................................................... 13
Objectives of the Study ................................................... 14
Variables Studied ............................................................ 15
Research Hypotheses ....................................................... 16
Definitions ................................................................. 19
Limitation of the Study .................................................... 21
Significance of the Study .................................................. 22

II. REVIEW OF LITERATURE ................................................ 25

Educational Philosophy of the Cooperative Extension Service . 25
Legislative Acts Influencing CES ....................................... 27
The National CES Mission Statement ............................. 29
The Ohio CES Mission Statement ................................... 30
Cognitive Thinking ......................................................... 31
Bloom's Taxonomy of Educational Objectives ................. 34
Investigations Related to the Taxonomy ......................... 36
Validity of Bloom's Taxonomy as a Hierarchy .................. 37
Utilization of Bloom's Taxonomy .................................... 41
Levels of Cognition ....................................................... 46
Intended Level of Cognition ........................................... 46

viii
Actual Level of Cognition .......................... 47
Factors Affecting Delivery of Instructional
Programs ................................................. 47
   Years of Experience .................................. 48
   Educational Degree Earned and Fields ................. 49
   Preparation in Pedagogy and Andragogy .................. 50
   Program Area Emphasized .............................. 51
   Distribution of Job Responsibilities ................... 52
Summary .................................................. 53

III. METHODOLOGY ........................................... 56
   Location of the Study .................................. 56
   Research Design ....................................... 57
   Population ............................................ 60
   Sample Selection ..................................... 61
   Instrumentation ....................................... 62
      Measuring the Intended Levels of
      Cognition of Instruction ............................ 62
      Measuring the Actual Levels of
      Cognition of Instruction ............................ 64
      Collecting Personal and Professional
      Demographic Information ............................ 66
   Data Collection ....................................... 66
      Measuring County Agricultural Agents’
      and State Agricultural Specialists’
      Actual Levels of Cognition of
      Instruction ........................................... 66
      Measuring County Agricultural Agents’
      and State Agricultural Specialists’
      Intended Levels of Cognition of
      Instruction ........................................... 68
      Measuring the Personal and Professional
      Demographic Factors Influencing the
      Delivery of Instruction of the OCES
      Programs ............................................. 69
   Data Analysis ......................................... 69

IV. FINDINGS AND CONCLUSIONS ............................. 73
   Personal and Professional Demographic
   Characteristics of the County Agricultural
   Agents and State Agricultural Specialists .............. 76
      Personal Characteristics of the County
      Agricultural Agents and State
      Agricultural specialists ............................. 77
      Years of Experience .................................. 77
| Number of Hours Enrolled in Andragogy | 77 |
| Number of Pedagogical Courses Completed | 78 |
| Highest Educational Degree Earned | 78 |

Professional Characteristics of the County Agricultural Agents and State Agricultural Specialists | 79 |
| Program Area Emphasized in 1991/92 | 79 |
| Field of Study of the Educational Degree Earned | 79 |
| Job Responsibilities (Percent of Time) | 80 |

Cognitive Level of Instruction | 82 |
| Highest Level of Cognition | 82 |
| Number of Type of Agricultural Agents Found at the Intended and Actual Levels of Cognition | 83 |
| Shifting of County Agricultural Agents' and State Agricultural Specialists' Levels of Cognition from Intended to Actual | 85 |

Differences Among Variables of Interest | 87 |
| Difference Between Highest Intended and Actual Levels of Cognition of County Agricultural Agents/State Agricultural Specialists | 87 |
| Differences Between Type of Agricultural Agent and Levels of Cognition | 90 |
| Actual Level of Cognition by Major Program Area Emphasized in 1991/92 | 91 |
| Intended Level of Cognition by Major Program Area Emphasized in 1991/92 | 92 |
| Differences by Years of Experience and Highest Levels of Cognition | 94 |
| Percent of Time Spent in Agriculture Programming by County Agricultural Agents or in Extension by State Agricultural Specialists and Intended and Actual Levels of Cognition | 95 |
| Field of Study in Bachelor, Masters, or Doctorate/DVM Degree and Level of Cognition | 98 |

Relationships Among Highest Levels of Cognition, Type of Agricultural Agents, and Selected Demographic Characteristics | 99 |
Relationship Between Highest
Intended Level of Cognition and
Selected Demographic
Characteristics of the County
Agricultural Agents and State
Agricultural Specialists .... 101
Relationship Between Highest
Actual Level of Cognition and
Selected Demographic
Characteristics of the County
Agricultural Agents and State
Agricultural Specialists .... 105
Relationship Between Type of
Agricultural Agents and Selected
Characteristics of the Agents .. 107
Variance Explained .......... 108

V. SUMMARY, CONCLUSIONS, RECOMMENDATIONS, AND
IMPLICATIONS ..................... 110

Purpose and Objectives of the Study .. 111
Hypotheses ....................... 112
Methodology ...................... 114
  Measuring the Intended Levels of
  Cognition of Instruction .... 115
  Measuring the Actual Levels of
  Cognition of Instruction .... 116
Collecting Personal and
Professional Demographic Data .. 118
Measuring County Agricultural
Agents' and State Agricultural
Specialists' Actual Levels of
Cognition of Instruction .... 118
Measuring County Agricultural
Agents' and State Agricultural
Specialists' Intended Levels of
Cognition of Instruction .... 120
Measuring Personal and
Professional Demographic Factors 120
Data Analysis .................... 121
Summary of Findings ............ 121
Personal and Professional
Demographic Characteristics of
the County Agricultural Agents
and State Agricultural
Specialists ................. 121
Professional Demographic
Characteristics of the County
Agricultural Agents and State
Agricultural Specialists .... 122
VI. APPENDICES

A. Counties Included in the Study ........ 151
B. Bloom’s Taxonomy .................. 153
C. Letter to OCES County Agricultural Agents and State Agricultural Specialists .......... 159
D. Panel of Experts to Establish Interview Schedule Validity .......... 161
E. Panel of Experts to Establish Inter-Rater Reliability for the Interview Schedule .......... 163
F. Interview Schedule to Assess the Highest Intended Level of Cognition .. 165
G. Panel of Experts to Establish Inter-Rater Reliability for the Modified FTCB Instrument .......... 168
H. Modified FTCB Instrument .......... 170
I. Panel of Experts to Establish Validity for the Demographic Instrument .......... 172
J. Demographic Instrument .......... 174
K. Regression Tables .......... 177

VII. REFERENCES ........ 179
# LIST OF TABLES

<table>
<thead>
<tr>
<th>TABLES</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Inter-Rater Reliability</td>
<td>64</td>
</tr>
<tr>
<td>2. Personal Characteristics of the County Agricultural Agents and State Agricultural Specialists</td>
<td>80</td>
</tr>
<tr>
<td>3. Professional Characteristics of the County Agricultural Agents and State Agricultural Specialists</td>
<td>81</td>
</tr>
<tr>
<td>4. Highest Level of Cognition</td>
<td>84</td>
</tr>
<tr>
<td>5. Number of Type of Agricultural Agents Found at the Intended and Actual Levels of Cognition</td>
<td>85</td>
</tr>
<tr>
<td>6. Shifting of County Agricultural Agents' and State Agricultural Specialists' Levels of Cognition from Intended to Actual</td>
<td>86</td>
</tr>
<tr>
<td>7. t-test of Significant Difference Between Intended and Actual Highest Levels of Cognition of County Agricultural Agents and State Agricultural Specialists</td>
<td>89</td>
</tr>
<tr>
<td>8. t-test of Significant Difference Between Type of Agricultural Agent and Highest Levels of Cognition</td>
<td>91</td>
</tr>
<tr>
<td>10. Analysis of Variance of Highest Intended Level of Cognition by Major Program Area Emphasized in 1991/92</td>
<td>93</td>
</tr>
</tbody>
</table>
11. Difference by Years of Experience and Levels of Cognition ................. 95
12. Difference by Percent of Time Spent in Agriculture Programming by County Agricultural Agents or in Extension by State Agricultural Specialists and Highest Intended and Actual Levels of Cognition ... 97
13. Differences Between Fields of Study in Bachelor, Masters, and Doctorate/DVM Degrees and Highest Level of Cognition ... 99
14. Relationship Among Highest Levels of Cognition of Instruction, Type of Agricultural Agents, and Selected Demographic Characteristics ......... 102
15. Correlation Between Distribution of County Agricultural Agents’ and State Agricultural Specialists’ Job Responsibilities and Highest Intended and Actual Levels of Cognition ......................... 104
16. Comparison of Intended Level of Cognition Across Studies ..................... 143
17. Comparison of Actual Level of Cognition Across Studies ...................... 147
## LIST OF FIGURES

<table>
<thead>
<tr>
<th>FIGURE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Ex post facto Model</td>
<td>59</td>
</tr>
<tr>
<td>2. Comparing Bloom's Six Steps Taxonomy and Piaget's Steps of Concept Formation</td>
<td>36</td>
</tr>
</tbody>
</table>
CHAPTER 1

INTRODUCTION

The Extension Committee on Organization and Policy (ECOP, 1987, p. 30), stated that "the future is important for it is where we will spend the rest of our lives. While the Cooperative Extension Service (CES) has had a glorious past, its future is suddenly being questioned."

Extension specialists and other people concerned with the future of extension in the United States predict that the changes the organization has experienced in the past are nothing compared with what it is likely to face in the future. For the CES to gain continued public and political support, the CES must have the ability to initiate meaningful program changes in the organization. The CES must also commit itself to the development of responsible leadership within the organization (Boyle, 1991). Several questions spring into mind. Is the CES a dynamic, fluid institution? Can it focus on current national educational goals? Can the CES, a unique system of non-formal education and information dissemination, continue to meet the educational needs of the people of the United States? What is the future mission of the CES?
A Long Range Planning Task Force was appointed in 1985 by the Director of the Ohio Cooperative Extension Service (OCES) to make recommendations on the future mission of OCES, its programs and priorities, personnel, technology transfer, and funding. Among the problems addressed were those related to the socioeconomic changes in contemporary United States society, the strengths and weaknesses of extension today, and the future of American extension. All public institutions; whether they deal with educational, medical, economic, or social programs; are required to demonstrate their worth if they are to qualify for state and federal support. The CES is no exception.

A concern, therefore, has been raised as to whether or not a 76-year old organization; faced with issues related to the dynamics of technological, environmental, social and occupational concerns and new knowledge demand; can meet the needs of the people of the United States in the 21st century.

The roots of extension can be traced to the ideas of early United States leaders such as George Washington, Thomas Jefferson, Daniel Webster, and Benjamin Franklin (Prawl, et al., 1984). However, the legal base for the CES in the United States was not established until the passage of the Smith Lever Act in 1914. Brevity and simplicity characterized the Smith Lever Act which established that the CES was to aid in diffusing among the people of the United
States useful and practical information on issues relating to agriculture and home economics, and to encourage personal application of this information (Warner and Christenson, 1984). The Act was a milestone in the shaping of United States agriculture and extension. Passed in the early stages of intensive agricultural development and industrial technology in the country, the Smith Lever Act made it possible for the people of the United States to develop a standard of living that remains unexcelled throughout the world.

Since the birth of the United States Cooperative Extension Service nearly a century ago, extension has been working in concert with land-grant universities (established by the Morrill Acts of 1862 and 1890) and Agricultural Experiment Stations (established by the Hatch Act of 1887). Together, these institutions have served the needs of the people of the United States. Also, they have helped raise the living standards of people in other parts of the world.

The launching of the CES created a third link between the federal government represented by the Extension Service -- United States Department of Agriculture (USDA) and the Land-grant University System. The other two key elements in the Land-grant universities are research and teaching. The Land-grant system of higher education has been hailed as one of the greatest United States achievements in higher education with its teaching,
research, and extension functions. Furthermore, the CES function has not been limited only to the service function as it might be understood, but it also carries the non-formal educational function of the Land-grant Universities. Therefore, teaching is a major component for the CES. The educational function can be realized from the tremendous number of educational programs conducted every year throughout the United States and its territories by CES.

The Land-grant system has extended research based educational programs to rural areas through its non-formal teaching arm popularly known as the CES. The educational programs of extension have generally been organized at the state level. As a result, the CES now serves most segments of the general public on problems and issues encompassing agriculture, home economics, 4-H youth programs, and community development.

The CES has become a unique educational achievement in United States as an agency for change and a catalyst for individual and group action. The CES has always emphasized county level, locally designed programming in its educational efforts. Warner and Christenson (1984) observed that two-thirds of the CES personnel are employed as county staff in over 3000 counties across the nation. County agents have been located in almost every county of the nation and are responsible for delivering extension education programs at the local level. The state and district specialists
employed by the CES have been charged with providing technical support to the county staff. In addition, thousands of paraprofessionals have also been employed for specialized programs, and thousands of volunteers have been utilized.

With this vast grassroots establishment, the mission of extension has been to extend practical knowledge generated at the universities to the ultimate users of the knowledge and to promote the application of the knowledge by the users. Astroth and Robbins (1987) stated that "Extension was born out of a need to provide innovative, non-formal adult education programs." The goal of extension is to assist people to achieve what they desire through information and education (Astroth & Robbins, 1987).

Extension programs are educational in nature and therefore would appropriately be classified as part of the educational system. In carrying out its educational mission, the CES has developed its own educational principles and philosophy which are based on teaching-learning principles. In its educational role, CES interprets information developed from research, then this information is disseminated to the people of the United States. Dissemination of this information encourages the practical use of knowledge. The goals of the CES also can be described as serving as an agency for change; a catalyst for individual and group action (Warner and Christenson, 1984).
CES conducts educational programs for action and stresses organizational and educational leadership.

Extension has assisted with problems that are interdisciplinary in nature; problems involving groups of people functioning in the complex interrelationships of modern society. The basic tenets of the CES which spell out that its purpose is to provide practical useful information and encourage its application have consistently been highlighted in the mission statement and philosophy of extension. Ratchford (1984) traced the changes in extension from 1948 through 1983 based on the four Long Range reports (Joint-USDA-NASULGC Committee, 1948, 1958, 1968, and 1983) and concluded that the basic philosophy of extension is to provide useful information and encourage its application. These principles have been retained by the CES despite the constant broadening of scope in its programs.

The effectiveness of the CES in achieving its mission will be determined to a large extent by how well the staff integrates the entire process of continuing education into an overall strategy of education. Though the basic unit of extension programming is at the county level, local staff frequently seek support from state and area specialists. With increased specialization has come the need for more detailed technical expertise, sometimes beyond what the county staff can provide. The Ohio Cooperative Extension Service (OCES) had 208 county extension agents (faculty) on
July 1, 1991, with 34 percent designated agriculture, 34 percent home economics, 30 percent 4-H, and 2 percent CNRD. In addition, eighty-two percent of the agents with CNRD responsibilities were agricultural agents. There were 91 state specialists (The Ohio Cooperative Extension Service Headquarters Faculty and Staff Directory, 1991).

The success of any educational program depends on the quality of the teaching and the relevance of the subject matter (Newcomb et al., 1986). As CES continues to evolve in the coming decade, continual upgrading of the professional qualifications and teaching ability of the staff are a high priority. More specialized roles have evolved for the agent encompassing responsibility for building a favorable climate for education and in developing problem solving capability in clientele.

Kelsey and Hearne (1963) stated that the CES has been largely the result of two great forces: United States agriculture and United States education. In the early phase of extension, both forces played important roles in shaping the CES. However, with the passage of time, United States agriculture, education, and society as a whole have changed. As a result, educational influences have now become major forces in shaping the future of the CES.

Warner and Christenson (1984, p. 7) stated that "the 1940s and 1950s began a period of rapid technological advancement in American agriculture. Farmers improved their
competitive position primarily through the adoption of improved management practices." Technological advancement led to production surpluses and heavy reliance by the United State government upon agricultural production to reduce deficits in international trade and the products to be used for Third World development assistance (Warner & Christenson, 1984).

With an abundance of a reasonably priced food supply, the concerns of extension in the 1960s shifted to the problems of urban residents, low income persons, and minority groups (Warner & Christenson, 1984). At the same time, a substantial reduction occurred in the number of farms and in the total rural population. From 1910 to 1940, 25 to 35 percent of the total United States population were farmers. Since that time, the farm population has generally declined to less than three percent of the population (Warner & Christenson, 1984 p. 10). Thus, the CES has become increasingly responsive to local needs and priorities other than strictly agriculture.

DeMarco (1980), in Warner and Christenson (1984, p. 10), stated that "Probably, the major strength that extension has going for it is the perception, at least among its own clients, that while government is something out there somewhere, extension is local and responsive." Also, there have been some attempts to treat extension as an administrative organization for implementing government
policy, but because of its unique cooperative administrative arrangement, the CES could preserve the educational component of the program (Warner & Christenson, 1984).

Two viewpoints dominate generalizations about extension. One view has grown out of the philosophy of the organization, while the other evolved from a long history of how extension conducted its educational programs (Warner & Christenson, 1984). But the question remains as to whether there is any congruence between the reality and the perception of reality (Warner & Christenson, 1984). In this context, extension programs must be action oriented and easily accessed to provide practical, adaptable techniques. As Naisbitt (1984) observed, people are loaded with information but starved for knowledge.

Astroth and Robbins (1987, p. 10) stated that "with the rise of electronic information transfer, the world has seen an unparalleled explosion of information that is now available from a plethora of groups." The challenge, then, is to develop the expertise of the extension agents as professional educators to enhance their ability to synthesize information in practical ways. The information explosion has not only brought changes in the information needs of the society, but the delivery strategies as well.

Along with the changes in information needs, the roles of extension educators have changed. Astroth and Robbins (1987) reported that the change agent role is the most
important. Moreover, the county agents have often been accused of relying too much on state specialists. Warner and Christenson (1984) observed that with the change in the professional role of the county staff, local agents may soon occupy a more pivotal position than ever before in regard to extension education and electronic information transfer.

These modifications in goals and the nature of the changes evolving should stimulate the extension service to perform its educational role more efficiently and effectively than it has done in the past. One way to examine efficiency would be from the point of view of redefining the role of extension particularly its educational role. The new role should ensure the application of information to develop insights in the individuals for attaining self-sufficiency and problem solving skills. Therefore, the objective of this study is to ascertain the present cognitive levels of extension education programs of the OhioCES.

**TAXONOMY OF EDUCATIONAL OBJECTIVES**

The taxonomy of educational objectives emerged out of the work done by Bloom, Englehart, Furst, Hill, and Krathwohl (1956), titled *Taxonomy of Educational Objectives, Handbook-1: Cognitive Domain*. The basic objective of this classification system was to facilitate communication among teachers, administrators, curriculum workers, testers, and
educational research workers (Bloom et al., 1956).

A part of this classification has been used to determine the levels at which teaching units are delivered to learners. Furst (1983, p. 3) mentioned that "the educational objectives refer ultimately to mental changes in students thinking; to mental acts which are not directly observable."

In the last decade, this taxonomy has been shown to be useful for teachers who are planning, implementing, and evaluating an educational program. Scott (1972) indicated that the taxonomy of educational objectives has been utilized as a tool to analyze instructional material based on cognitive process. Clegg, Farley, and Curran, 1967 and Willson, 1973 indicated that the taxonomy has been used to train teachers to analyze and improve their cognitive level of teaching. Newcomb and Trefz (1987) stated that at different levels of education--particularly at the secondary and college levels--instructors devote a great deal of attention to actual classroom learning. In agriculture, for example, teachers are more concerned about what students learn, but less concerned about how and at what level of cognition it is being learned (Newcomb & Trefz, 1987, p.1).

In the taxonomy of educational objectives, referred to in this study as "Bloom's Taxonomy", Bloom et al., (1956) classified the cognitive taxonomy into six major levels. The taxonomy was based on a cumulative hierarchical order,
increasing in complexity from the lowest level, knowledge, through comprehension, application, analysis, synthesis, and to the highest level of evaluation. The idea of the classification of cognitive behavior from the simplest to the most complex was based on the assumption that "a particular simple behavior may become integrated with other equally simple behaviors to form a more complex behavior" (Bloom et al., 1956, p.18).

In addition to Bloom's taxonomy (Cognitive Domain), another taxonomy was developed by Brown, Ober, Soar, and Webb in 1968 and called the Florida Taxonomy of Cognitive Behavior (FTCB). This taxonomy consisted of seven categories: knowledge of specifics, translation, interpretation, application, analysis, synthesis, and evaluation (Appendix B).

Recently, a modification of Bloom's taxonomy was developed by Newcomb and Trefz (1987). This modification was used to define at what level of cognition test questions and out-of-class assignments occurred in the College of Agriculture courses at The Ohio State University in Columbus (Newcomb & Trefz, 1987). This modified taxonomy consists of four major categories -- remembering, processing, creating, and evaluating.

For the purposes of this study, Bloom's taxonomy will be utilized to investigate the highest intended and actual
levels of cognition of instruction for delivering OCES programs.

PROBLEM STATEMENT

The CES is facing a new challenge in the wake of the changing United States agricultural scenario. This demands that the CES sets new standards of excellence to meet various information needs. Ironically, while the number of clientele in rural areas has been declining rapidly, the clientele in the urban areas is increasing (Warner & Christenson, 1984). Changes in the demographic composition of contemporary United States society show there is a need for educational programs to address a wide range of issues across subjects to meet the needs of newly emerging clientele groups. The literature shows CES agents are not familiar with the application of the taxonomy of the educational objectives which might encourage the learning of clientele.

PURPOSE OF THE STUDY

The objective of this study was to describe levels of cognition of instruction delivered by OCES county agricultural agents and state agricultural specialists. Furthermore, the study sought to describe the relationship among the levels of cognition, type of agricultural agents and selected personal and professional demographic
characteristics of OCES county agricultural agents and state agricultural specialists.

OBJECTIVES OF THE STUDY

Specifically, the study sought to:

1. Describe the highest intended level of cognition for instruction in selected OCES programs.
2. Describe the highest actual levels of cognition for instruction in selected OCES programs.
3. Ascertain the relationship between the highest intended level of cognition of instruction and selected characteristics of OCES county agricultural agents and state agricultural specialists.
4. Ascertain the relationship between the highest actual level of cognition of instruction and selected characteristics of OCES county agricultural agents and state agricultural specialists.
5. Ascertain the relationship between the highest intended level of cognition of instruction and the highest actual level of cognition of instruction of OCES programs.
6. Ascertain the relationship between the type of agricultural agents and selected characteristics of OCES county agricultural agents and state agricultural specialists.
VARIABLES STUDIED

Dependent Variable

Highest actual level of cognition of instruction

Main Independent Variables

1. Highest intended level of cognition of instruction.

2. Type of agricultural agents:
   a. County agricultural agents.
   b. State agricultural specialists.

Rival Independent Variables

1. Years of experience.

2. Number of pedagogical courses completed.

3. Number of hours enrolled in andragogy instruction.

4. Educational degree completed.
   1. BS
   2. MS
   3. Ph.D.
   4. Other

5. Major field of study in B.S./B.A., M.S/M.A.,
   and Ph.D.
   1. Social sciences
   2. Technical studies

6. Program area emphasized by OCES county agricultural
   agents and state agricultural specialists in 1991/92.

7. Distribution of job responsibilities.
A. For County Agricultural Agents
   a. Agriculture programming
   b. County Chair
   c. CNRD Programming
   d. Other

B. For State Agricultural Specialists
   a. Extension
   b. Resident instruction
   c. Research
   d. Other

RESEARCH HYPOTHESES

The study was designed to be ex post facto type research. Two types of hypotheses -- main and rival hypotheses -- will be established (Kerlinger, 1973) corresponding to the independent variables.

The main hypotheses would ascertain if there was a relationship between the dependent variable -- highest actual levels of cognition -- and the main independent variables -- highest intended level of cognition of instruction and the type of agricultural agents. Rival hypotheses were formulated to explore the relationship between the dependent variable, main dependent variables and the rival independent variables. The rival independent variables are: 1) years of experience, 2) number of pedagogical courses completed, 3) number of hours enrolled
in andragogy instruction, 4) educational degree completed, 5) major field of study in B.S., M.S/M.A, and Ph.D., 6) program area emphasized by OCES county agricultural agents and state agricultural specialists in 1991/1992, 7) distribution of job responsibilities. All hypotheses were tested at alpha level 0.05.

Main Research Hypotheses

HM1: The highest actual level of cognition of the instruction delivered by OCES county agricultural agents and state agricultural specialists will be significantly higher than their highest intended levels of instruction.

HM2: State agricultural specialists deliver instruction at significantly higher actual levels of cognition in their instruction than county agricultural agents do in their programs.

Rival Hypotheses

HR1: County agricultural agents and state agricultural specialists who have had more years of experience deliver significantly higher actual levels of cognition in their instruction than those who have had fewer years of experience.

HR2: County agricultural agents and state agricultural specialists with more pedagogical courses, as part of
the academic program, deliver instruction at significantly higher actual levels of cognition than those who have less pedagogical courses.

**HR3:** County agricultural agents and state agricultural specialists with more hours preparation in andragogy deliver instruction at significantly higher actual levels of cognition than those who have less hours of preparation in andragogy.

**HR4:** County agricultural agents and state agricultural specialists with different educational degree completed differ significantly in actual levels of cognition of instruction in delivering OCES programs.

**HR5:** County agricultural agents and state agricultural specialists with different major educational field of study differ significantly in actual levels of cognition of instruction in delivering OCES programs.

**HR6:** Significant difference in actual levels of cognition of instruction will exist among types of educational programs county agricultural agents and state agricultural specialists emphasize in agriculture.

**HR7:** County agricultural agents and state agricultural specialists with different distribution of job responsibilities differ significantly in actual levels of cognition of instruction.

**HR8:** There is a positive relationship between the highest intended level of cognition of instruction and:
a. Years of experience
b. Number of pedagogical courses completed
c. Number of hours enrolled in andragogy instruction
d. Degree completed
e. Major field of study
f. Program emphasized in 1991/92
g. Distribution of job responsibilities

HR9: There is a positive relationship between type of agricultural agents with county agricultural agents coded 1 and state agricultural specialists coded 2 and:

a. Years of experience
b. Number of pedagogical courses completed
c. Number of hours enrolled in andragogy instruction
d. Degree completed
e. Major field of study
f. Program emphasized in 1991/92

DEFINITIONS

1. **County Agricultural Agents** refer to the professional staff of the OCES at the county level who are responsible for delivering of agricultural related educational programs to the clientele.

2. **State Agricultural Specialists** refer to the professional
staff of the OCES at the state level who are responsible for delivering of agricultural related educational programs to the clientele.

3. **Clientele** refers to any adult seeking information related to agriculture and human development through educational programs delivered by OCES county agricultural agents and state agricultural specialists.

4. **Extension education programs** denote any adult educational programs planned by the OCES and delivered by OCES county agricultural agents and state agricultural specialists in a group setting for the benefit of extension clientele.

5. **Levels of cognition for the classification system of educational objectives** refers to Bloom's taxonomy of cognitive domain (1956). These include knowledge, comprehension, application, analysis, synthesis, and evaluation.

6. **Highest intended level of cognition** refers to any of the highest six categories of cognition of Bloom's taxonomy at which the county agricultural agents and state agricultural specialists plan to teach lessons to the clientele as contained in the written lesson plans. Highest intended level of cognition is operationally defined as the process by which county agricultural agents and state agricultural specialists plan to teach lessons at a certain cognitive level measured by an
existing open ended interview schedule.

7. **Highest actual level of cognition** refers to any of the highest six categories cognition of Bloom's taxonomy at which the county agricultural agents and state agricultural specialists deliver the OCES programs. Highest actual level of cognition is operationally defined as the actual delivery of OCES instructional programs as measured by listening to the audio taped presentations of the county agricultural agents and state agricultural specialists, using an existing instrument designed specifically for the purpose.

8. **Number of hours enrolled in andragogy** operationally measured by clock hours of attending adult workshops, regular adult courses or seminars.

9. **Type of agricultural agents** refer to county agricultural agents and state agricultural specialists who deliver the OCES programs to clientele.

**LIMITATIONS OF THE STUDY**

This study is bounded by some limitations either due to time factor or financial support. These limitations are:

1. Since the classroom programs are often offered only during the months of January, February, March, and April and with study limited to a group setting, travel can become difficult during winter season which may limit the number of classes observed.
2. Due to the lack of time and financial support, the study is restricted to the highest intended and highest actual level of cognition of instruction of delivering the agricultural extension educational programs.

3. Because of these constraints, the generalization of the results will be confined to the purposeful sample used for this study.

4. Audio tape was a limitation in this study because participants might act differently when they are audio taped than if they were not audio taped.

SIGNIFICANCE OF THE STUDY

The development of intellectual skills and abilities, critical thinking, higher level of thinking and problem solving ability have been of great concern in the recent past. The National Commission on Excellence in Education (1983) and Boyer (1987) reported great concern about creating environments wherein higher order thinking could be delivered with appropriate intellectually stimulating information. In 1977, Fincher expressed the concern for the cognitive development of educational participants which has been substantiated by Kuhn (1977).

The ability to engage in careful logical thinking and critical analysis, therefore, has achieved paramount importance in the ever changing society. Knowledge in the agricultural discipline has expanded over the years across a
wide range of subject areas (Newcomb and Trefz, 1987).

Most studies on cognitive levels in agricultural education have addressed formal education (classroom setting). However, the studies examining cognitive levels of teaching resulting from non-formal education have been scant.

What seems important is that the cognitive levels of delivering the non-formal educational programs of the OCES should receive attention by researchers. Bhardwaj (1989) studied the intended level of cognition of OCES programs and reported there was a need to extend this area of investigation to encompass actual level of cognition of delivering the OCES programs. Therefore, this study will investigate the highest intended and actual levels of cognition of imparting OCES educational programs to the clientele.

The findings from this study will contribute to the existing body of knowledge on cognitive levels of instruction by adding a new dimension with an accent on non-formal adult agricultural education. Furthermore, the findings of the investigation will benefit directly the agents, clientele, and administrators of the OCES.

The study will enlighten extension agents in two major ways. First, they will become aware of the importance of cognitive levels of instruction at which they should plan and deliver the informal adult educational programs.
Second, this awareness should encourage extension agents to acquire knowledge of the taxonomy of educational objectives to improve their efficiency and effectiveness as catalytic educators. The clientele will benefit by improving their intellectual abilities to solve their entrepreneurial problems aptly. The OCES administration will benefit by utilizing the findings of the study to establish in-service training programs needed by the agents to improve teaching expertise of adults. Finally, the results will be useful to the USDA, land-grant universities and colleges and to the CES in bringing about appropriate changes in program planning and evaluation.
CHAPTER II

REVIEW OF LITERATURE

This chapter encompasses the literature which has direct and indirect bearing on the main independent variables, dependent variable, and rival independent variables included in the study. The chapter is based on a review of the research and theory related to cognition in order to develop the conceptual framework upon which the study was based. The chapter is organized into nine sections: educational philosophy of the Cooperative Extension Service (CES), legislative acts influencing CES educational philosophy, national CES mission statement, Ohio CES mission statement, cognitive thinking, Bloom's Taxonomy of Educational Objectives, utilization of Bloom's Taxonomy, levels of cognition, factors affecting delivery of instructional programs and summary.

Educational Philosophy of the Cooperative Extension Service

Extension is a field of education aimed at teaching people in real life situations to enable them to identify and assess their own needs and problems and to inspire them to action (Boone, 1989). The American Philosophical
Society, founded in 1743, is believed to be the genesis of the Cooperative Extension Service (CES) in the United States (Vines & Anderson, 1976). Benjamin Franklin was considered to be the leader of the American Philosophical Society which was first organized in Philadelphia in 1785 (Vines & Anderson, 1976).

The philosophy of the CES has been to reach citizens wherever they are in rural and/or urban areas. Extension programs take into consideration the educational background and interests of their clientele. The basic extension philosophy has been to teach people "how to think, not what to think" (Raudabaugh, 1974, p. 3). Extension has taught people to help themselves in their respective enterprise (Boone, 1989; Taylor, 1989; Tompkins, 1989; Decker, Noble, and Call, 1989; Prawl et al., 1984; Warner & Christenson, 1984; Vines & Anderson, 1979; Raudabaugh, 1974; Patton, 1987).

Extension philosophy has articulated the rationale for analysis, decision making, and action of individuals, families, groups, and communities (Boone, 1989; Raudabaugh, 1974). This philosophy has described the nature of knowledge and how extension educators believe that knowledge is acquired and transmitted, which is a vital consideration for the world’s largest non-formal education organization (Boone, 1989). Thus, Extension philosophy has been geared
toward practical solutions to real-world problems (Raudabaugh and Aasheim, 1979).

**Legislative Acts Influencing CES**

Education is a fundamental element of change (Prawl et al., 1984). The CES in the United States has been the educational arm of the U.S. Department of Agriculture (USDA) (Prawl et al., 1984). A movement toward increased education in rural America was promoted for one-half a decade before the Smith Lever Act came into existence (Prawl et al., 1984). The CES has a long checkered history that was preceded by a reconsideration of and commitment to the small family farm as an essential part of the nation's spirit (Boone, 1979).

Various legislative acts helped promote the extension service in the U.S.. The Morrill Act was passed in 1862 and provided public land for the establishment of at least one Land-grant college in each state to promote agricultural education and mechanic arts (Sanders, 1966; Prawl et al., 1984; True, 1928). In 1887, Congress passed the Hatch Act to establish agricultural experiment stations as an integral part of the Land-grant system. With the backing of research information, new courses were developed and the colleges began to develop educational materials and conduct lectures in different places. Educational programs in extension were
based on experimental observations (Sanders et al., 1966; Prawl et al., 1984; True, 1928; Kelsey, 1963).

The second Morrill Act was passed in 1890. The act stated that the university system should extend its educational programs to all clientele regardless of color, race, sex, or nationality (Prawl et al., 1984). The Smith Lever Act was passed in 1914. The Act was a milestone in shaping United States society. The Act came during the early stages of the intensive development of agricultural and industrial technology in the United States (A Report of the National Extension Committee on Policy (ANCOP), 1979, p. 1). With the help of the Smith Lever Act, a nationwide CES was set up (True, 1928; Prawl et al., 1984; Sanders et al., 1966; Joint USDA-NASULGC Report, 1968), thus completing the triad of Land-grant colleges and universities: teaching, experiment stations (research), and the CES.

The purpose of the CES was to disseminate and encourage the application of useful and practical instruction in agriculture, home economics, and related subjects among United States citizens (Prawl et al., 1984; True, 1928; ANCOP Report, 1979; Boone, 1989). The Smith Lever Act has directed its attention toward improving the welfare of socially disadvantaged people (Prawl et al., 1984). The Smith Lever Act served as a directive for national policy. "The Act has recognized that the research and information need to get to potential users faster and with objectivity"
(ANCOP, 1979, 1). The act stated that the nation's educational institutions should educate people of the United States throughout the country just as effectively and efficiently as they educate young people who enter any educational degree program (ANCOP, 1979; Prawl et al., 1984).

The pattern that emerged out of the Smith Lever Act linked the CES inextricably with the educational aspects of the Land-grant institutions and the agricultural research stations (True, 1928; Prawl et al., 1984). This tripartite responsibility has led to a broad organizational structure which is flexible enough to help people set goals and select programs (Boone, 1989).

**The National CES Mission Statement**

Ever since the CES came into existence, its basic mission has been one of education. The educational programs of the CES targeted both youth and adults (Prawl et al., 1984; Kelsey, 1963). A non-formal approach, designed to help the clientele to improve the quality of their lives, was adopted throughout the country (Sanders & Maunder, 1966; Patton, 1987; ANCOP, 1979). The approach used problem solving and empowerment techniques. The main idea of the CES was to extend lifelong learning and continuing education opportunities to the people of the United States (Prawl et
The lasting influence for motivating people to improve their lives has been a combination of sound practical ideas and an understanding that is put to use (ANCOP, 1979). Abraham Lincoln once said, "You can not help people permanently by doing for them what they could and should do for themselves" (ANCOP, 1979, p. 2). Hence, the mission of the CES has been to provide information and encourage people to change. Extension has sought to achieve these goals primarily by disseminating information and encouraging its application.

**The Ohio Cooperative Extension Service Mission Statement**

Each state has a cooperative extension service to help people apply tested research results and to improve their quality of life through relevant educational programs. The Ohio Cooperative Extension Service (OCES) legislation has identified the role of the OCES as providing educational programs (Long-Range Planning Task Force (LRPTF), 1987). The OCES conducts educational activities related to agriculture, community development and natural resources, home economics, family living, and 4-H youth programs for Ohio’s rural and urban citizens through personal instruction, bulletins, practical demonstrations, and mass media (LRPTF, 1987). Programming includes addressing
current needs of clientele as they are based on research and knowledge generated through and provided by various departments within the Colleges of Agriculture, Biological Sciences, and Human Ecology.

The OCES, with support from The Ohio State University and research stations, has been dedicated to improving people's lives by addressing current issues through educational programs and materials. To meet the challenges of the 1990s, the OCES must implement more interdisciplinary issues-oriented educational programs (Annual Report of OCES, 1990). Hence, the OCES has stated clearly its mission statement:

"We help people improve their lives through an educational process using scientific knowledge focused on identified issues and needs" (Administrative Cabinet OCES, Approved July, 1, 1991).

Cognitive Thinking

Nedelsky (1965) emphasized "the process of science is the scientific inquiry as well as critical thinking necessary for the solution to the problems and discovery of new information" (p. 6). Investigations in the field of cognitive development have been widespread and varied. The interest for teaching higher cognitive processes, as compared to lower mental level processes (based on recall of facts) is an old phenomenon. Tyler, in his eight years of investigation in the 1930s, focused on fact retention versus
higher mental processes such as application to new situations. Tyler (1936) observed that teaching at lower levels of cognition cannot bring forth any desirable outcome.

Piaget has often been considered to be the most important individual to have studied cognitive development (Meadows, 1983). As Rotman (1977) observed, Piaget’s, publications were the dominant force in the field of cognitive development for about one-half a century. Piaget sought to explain stages of thought in terms of cognitive structures. Most of these are described in logical mathematical terms (Kirby & Biggs, 1980). Piaget employed a clinical descriptive technique which resulted in the identification of a number of principles of cognitive development. The most notable principle was that "development is a progression from action based, concrete operations or schemes to abstract systemized logical operations" (Kurfiss, 1988). Piaget’s theory of cognition was correct in the sense that it illuminated a principle and essential element of rational thought. The theory dealt with the elements that determine successful encounters with the real world of objects (Rotman, 1977).

Based upon this premise, a number of research scholars in the field of education developed systems for classifying cognitive levels of teaching and learning. In the 1950s and 1960s approximately eleven such classification systems were
made (Ryan, 1973 cited in Cano, 1988). The Taxonomy of Educational Objectives in the cognitive domain as developed by Bloom, Englehart, Furst, Hill, and Krathwohl (1956), popularly known as Bloom’s Taxonomy, was one of these eleven classification systems.

Raths (1967) stated that learners will have "to be able to think for themselves, to be self-directing, considerate, and thoughtful" (p. 1). The idea of "self-directed learning" was also advocated by Knowles (1980) as one of five assumptions of adult learners. Following Piaget’s work, many studies have attempted to illustrate the level of thinking that is characteristic of the typical learner. Applying Piaget’s theory, Callea (1981), Day (1981), and Taylor and Dunbar (1983) all found that learners function at the level of concrete thinking. Among scholars, Bloom’s Taxonomy of Educational Objectives has emerged as the most widely used tool for the classification of cognitive behavior in education.

Many scientific research studies have used Bloom’s Taxonomy since its inception (Furst, 1981). Bloom’s Taxonomy, as a means of describing various levels of cognition, required an understanding of the classification. Researchers concerned about Bloom’s Taxonomy have provided evidence that the taxonomy is a valid and reliable means of classifying cognitive behavior (Kropp & Stoker, 1966). The taxonomy served as a valuable tool for educators in
developing instructional objectives and constructing test items at higher cognitive levels (Willson, 1973; Furst, 1981).

Bloom’s Taxonomy of Educational Objectives

In 1948, a group of college examiners decided to develop a classification system for educational objectives. The purpose was to facilitate communication among educators engaged in testing, curriculum development, and research (Bloom et al., 1956). Popularly known as Bloom’s Taxonomy, this model "has dominated instructional design and evaluation for a quarter of a century" (Stahl & Murphy, 1981, p. 1). Bloom’s Taxonomy has six levels: knowledge, comprehension, application, analysis, synthesis, and evaluation. The taxonomy’s structure was presumed to be hierarchical. The behaviors that define the first broad category were regarded as being integrated with new behaviors in the next higher category, and the pattern is repeated -- the integration of these behaviors and new behaviors in the next higher category -- through each level (Bloom et al., 1956). The "knowledge level is considered to be the lowest taxonomic category since information is processed with a minimum of understanding" (Kunen et al., 1981, p. 202) and the upper level, the cumulative contribution of the five preceding levels, evaluation, incorporates critical judgment (Kunen et al., 1981). "The
remaining four levels, comprehension, application, analysis, and synthesis are arranged in order of cognitive complexity between the knowledge and evaluation levels" (Kunen et al., 1981, p. 202).

Bloom’s Taxonomy has become a standard of measure. "The taxonomy today is a widely accepted model of the range of cognitive abilities used in education and appears in many current educational psychology textbooks" (Kunen et al., 1981, p. 203) including Cronbach (1977); Gage & Berliner, (1979) and Kagan & Lang, (1978). At all levels of educational programs, the taxonomy was used as the main framework upon which to plan, develop, implement, monitor, and evaluate instructional variables (Stahl & Murphy, 1981). They went on to say that the "popularity of Bloom’s Taxonomy as a hierarchical model is evidenced by the entry of nearly 1,000 articles on the taxonomy of educational objectives in the education index between 1966 and 1978" (p. 3).

Bloom et al. (1956) defined educational objectives as follows:

"By educational objectives, we mean explicit formulations of the ways in which students are expected to be changed by the educative process. That is, the ways in which they will change in their thinking, their feelings, and their actions" (p. 26).

This definition was reflected in the Educational Policies Commission Report (1961, p. 12). The report stated that the central purpose of education is to strengthen educational purposes, and to develop the ability of an
individual to think. A variety of expressions have been used to denote various facets of thinking. These were openmindedness, inquiry, discovery, problem solving, fluency, flexibility, insight, and originality (UNESCO, 1977).

Investigations Related to the Taxonomy

The theory, validity and applicability of Bloom’s Taxonomy has been studied frequently. Babatolu (1982, p. 37) cited a study made by Montgomery County Public Schools (1963) comparing the six levels of Bloom’s Taxonomy and Piaget’s steps of concept formation (Figure 2). The comparison was as follow:

<table>
<thead>
<tr>
<th>Level</th>
<th>Piaget</th>
<th>Bloom</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Intuitive thought</td>
<td>Knowledge</td>
</tr>
<tr>
<td>II</td>
<td>Concrete operation</td>
<td>Comprehension</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Application</td>
</tr>
<tr>
<td>III</td>
<td>Propositional or formal operations</td>
<td>Analysis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Synthesis</td>
</tr>
<tr>
<td>IV</td>
<td>Continuation of III</td>
<td>Same</td>
</tr>
<tr>
<td>V</td>
<td>Same</td>
<td></td>
</tr>
</tbody>
</table>

Figure 2 Comparing Bloom’s six steps taxonomy and Piaget’s steps of concept formation
The results showed that Bloom's Taxonomy helps induce individuals' thinking about learning behavior. The taxonomy has also helped educators make educational objectives clear to the learner (Gagne, 1965).

Williams (1970) observed that with the increase in the cognitive structure of the teacher's instruction, cognitive behaviors of the learners also increased. Willson (1973) also reported that the increased level of cognition of instruction has an influence on the level of cognition of learners. However, adult learners, as unique individuals, must be able to relate new knowledge to previous experiences. Knowles (1984) believed that the motivation to learn is mostly internal in adults, but the instructor through his/her higher level instructions should translate latent needs into felt needs leading to an increased interest in learning.

**Validity of Bloom's Taxonomy as a Hierarchy**

The rationale underlying the Taxonomy of Educational Objectives was that the cognitive processes can be placed along a cumulative and hierarchical continuum. The classes of the taxonomy have been so arranged that each successive category requires that the individual performing at the level that has all the information and skills required to perform at the preceding level (Bloom et al., 1956).
The taxonomy was based on four major assumptions as observed by Kropp et al. (1966). First, the processes of the taxonomy stipulated are cognitive in nature. Second, the arrangement of categories, knowledge, comprehension, application, analysis, synthesis, and evaluation are hierarchical in a way formed from a simple to complex process. Third, the hierarchy is cumulative. Fourth, the mental processes designed in the taxonomy are learned behaviors. The research enveloping Bloom's Taxonomy falls into two general categories. First, the basic assumption is that the taxonomy represents a cumulative hierarchy of thought, and second the implication of this assumption is to measure classroom cognitive behavior (Roberts, 1976).


Madaus et al. (1973) used a causal model approach to analyze the data of Kropp et al. (1966) for a subsample of 1,128 students. The validity of the hierarchy of the taxonomy was assessed from a direct and an indirect statistical relationship point of view. The study observed that the taxonomy has a Y-shaped structure, implying that
only the first four levels measure achievement dependent
upon learning and experience, whereas synthesis and
evaluation measure general ability. Madaus and others
concluded that the hierarchy did describe the learning
process for the first four levels (knowledge, comprehension,
application, and analysis). However, they were not able to
establish a strong connection between either analysis-
synthesis or synthesis-evaluation.

When Smith (1968) applied hierarchial system analysis
to the correlation matrices of Kropp et al. (1966), the
resulting order of complexity consistently placed the first
level of the taxonomy in a different position. However, the
study revealed a linear relationship between synthesis and
evaluation as observed by Miller, Snowman, and O’Hara
(1979).

Some researchers have questioned the interpretation of
the cognitive domain (Furst, 1981). Kunen, Cohen, and
Solman (1981), Furst (1981), and Fain and Bader (1983) have
challenged the hierarchical placement of the six levels.
For example, Kunen et al. (1981) contended that evaluation
may be misplaced. However, despite questioning some aspect
of the taxonomy, Kunen et al. (1981) noted that Bloom’s
Taxonomy had a substantial amount of validity when applied
in both American and Australian nationalities.

In general, moderate support has resulted for the
cumulative hierarchical assumption. Stedman (1973)
evaluated the first four levels of Bloom's Taxonomy on the assumption that the first four levels of the taxonomy are arranged in a hierarchy and the levels are cumulative. The finding of the study concluded that the hierarchy of the levels assumed to be cumulative is perhaps an error. Also, the results showed that there was no significant difference found between knowledge and comprehension or application and analysis.

Roberts (1976), in her study on "Further Verification of Bloom's Taxonomy", reported that the results support the basic assumption that the taxonomy is hierarchical in order. The study further claimed that significant achievement occurred at all levels of the taxonomy. The study also pointed out a weak link between the knowledge and comprehension levels of the taxonomy. Allen (1966) observed that the correlation techniques used to test Bloom's taxonomy were inappropriate making it impossible to either support or deny the taxonomy's hierarchical order.

One result of scholars' inquiry has been to put evaluation and synthesis on the same level. Rather than seeing evaluation as superordinate to synthesis, Foley (1971), McGuire (1963), Ormell (1974), and Willson (1973) all considered evaluation as a component of synthesis.

Classification of cognitive operations and objectives has persisted and no doubt distinctions will continue to be made. However, despite this tendency and the minor
disagreements and limitations described above, Bloom's Taxonomy has continued to be a useful conceptual tool for evaluating instruction and learning outcomes (Fain & Bader, 1983). Furthermore, Phillips and Kelly (1983) stated that the hierarchy is fundamental to the make-up of skills, abilities, and conceptual organization of subject matter.

In this perspective, no single scheme would be considered as an all inclusive, all purpose tool. Goodland (1966, p. 173) stated that "The Taxonomy of Educational Objectives is a valuable tool for clarifying and evaluating objectives and for evaluating the results of teaching." Similar observations were made by Brandwein et al. (1958). In conclusion, Bloom et al. (1956) subscribed that making sharp distinctions among the levels might not be as possible as one might like to do.

Utilization of Bloom's Taxonomy

One of the basic problems of any society has been that of preserving, fostering, and sustaining the flow of creative ideas. In view of this, the importance of well defined objectives in an educational program endeavor has been time and again emphasized. The widespread use of Bloom's Taxonomy has lent support to the notion that it has been accepted in a broad sense as an effective tool which has practical utility (Fain & Bader, 1983).
Mager (1975) indicated that there are three important reasons for obtaining good objectives: first, for the selection or designing of instructional content and procedure; second, for evaluating or assessing the success of instructions; and third, for organizing the learners' own efforts and activities for acceptance of the instructional material.

The taxonomy has certain limitations, but it is applied in many educational programs (Fain & Bader, 1983). Evidence has shown substantial application of Bloom's Taxonomy in planning, developing, and evaluating educational programs (Fain & Bader, 1983). Research studies in the area of applying Bloom's Taxonomy to adult learning in non-formal settings have been rare. The application of the taxonomy has been introduced in most undergraduate programs in the United States. The educators have used the taxonomy to develop learners' instructional objectives, lesson plans and to construct original classroom test questions progressing from the knowledge level to the evaluation level of cognition (Fain & Bader, 1983).

Shibata (1968) pointed out that the taxonomic classifications have been used to code teacher classroom behavior. The technique utilized descriptions and examples of the six levels of the taxonomy. Coding was applied to affective behavior, methods of instruction, and verbal and non-verbal expressions (Shibata, 1968). Plowman (1968a)
noted that many elementary school students have used the taxonomy as a means of evaluating their own thinking. Anderson (1969) observed that in science methods instruction courses student learners evaluate the test items according to Bloom's Taxonomy and then design test questions for each cognitive level. Pfeiffer and Davis (1965) indicated that their use of the taxonomy in analyzing classroom examinations leaned toward knowledge of the taxonomy.

Lessinger (1963) and Metos (1966) used the taxonomy as an instrument for constructing test questions. Based on these questions, a textbook was developed as a potential source of test questions. In an analysis of textbook questions, Davis and Hunkins (1966) found that nearly 85 percent of the questions were at the first taxonomic level. In order to insure that learners be challenged and critical in their thinking, McDaniel (1979) applied Bloom's Taxonomy to the design of essay questions.

Kegan (1977), of Institutional Research and Evaluation at Hampshire College cited in Fain and Bader study (1983), put forth his observation that Bloom's Taxonomy has been widely accepted for evaluation and curriculum planning. The taxonomy has been used basically as a guide in assessing educational objectives in addition to addressing the question of accountability. Bloom's Taxonomy appeared to have provided a helpful conceptual framework. In light of the classification system, Stoker and Kropp (1964) viewed
the cognitive domain on one hand from the perspective of a hierarchy and a classification system on the other hand.

Bloom et al. (1956) indicated that the Taxonomy of Educational Objectives Cognitive Domain was based on four guiding principles. First, the taxonomy would be used with prevailing educational units and programs. Second, it should be logically developed and internally consistent. Third, it should be consistent with understanding psychological phenomenon. Finally, it should be a purely descriptive scheme. Sylwester (1971), quoted in Fain and Bader (1983, p. 8), stated that Bloom's Taxonomy has attempted to "put intellectual concerns into proper perspective." Marksberry et al. (1969) analyzed recommendations of some national committees and the cognitive objectives from a group of selected texts. They found that all six of Bloom's levels were present in the national committee's stated goals. However, the six levels were not present in the selected texts and the levels emphasized in the textbooks was not representative.

The impact of Bloom's Taxonomy has been clearly seen in the findings of Willson (1973). He stated that the group of teachers who received training in Bloom's Taxonomy demonstrated a significant change in their level of inquiries compared to teachers in a control group. Arnold et al. (1974) obtained similar results with another group of teachers. While the higher level questions facilitated
learning behavior as compared to lower level questions, the aiding effects demonstrated limited transfer of learning. However, Newcomb and Trefz (1987) and Cano (1988) stated that Bloom's Taxonomy is useful for improving the quality of teaching and evaluating instructional education programs.

Furst (1981) indicated that the taxonomy has been used for developing comprehensive listings of objectives to be applicable for curricula, describing courses, instructional materials with respect to objectives, planning courses of instruction, and conducting research on the structure of learning outcomes. Furst (1981) concluded that researchers and educators who have applied the Taxonomy are generally satisfied with its comprehensiveness. The taxonomy has been useful to evaluate the accomplishment of higher order learning outcomes. Thus, Bloom's Taxonomy has been used increasingly by educational researchers, educational evaluators, curriculum specialists, and educators in general. The domain, therefore, has been central to the practice of education (Fain & Bader, 1983). From this brief account of work completed, the cognitive taxonomy has appeared to have had significant impact on the practice and evaluation of instructional objectives.
Levels of Cognition

In the last five years, graduate students in the Department of Agricultural Education, The Ohio State University, have been studying the intended and/or actual levels of cognition of instruction of selected agricultural college professors, selected vocational agriculture teachers and selected extension agents. All five studies had shared certain common findings.

Intended Level of Cognition: Cano (1988) assessed the intended level of cognition of instruction of 10 production agriculture teachers in the public secondary schools in Ohio. He analyzed instructional objectives indicated in teachers’ courses of study across subject area and grade levels. He found that the majority of instructional objectives were written at remembering and processing levels of cognition.

Bhardwaj (1989) studied the intended levels of cognition of the educational programs offered by Ohio Cooperative Extension Service (OCES) county agricultural agents. He found that county agents planned programs at lower intended levels of cognition (remembering and processing).

Kitinoja and Miller (1989) analyzed the highest intended levels of cognition of vocational agriculture teachers and OCES agents. They found that vocational
agriculture teachers and OCES agents tended to plan to teach the participants at the lower intended levels of cognition.

Whittington (1991) assessed the aspired cognitive level of instruction of 10 agricultural college professors at The Ohio State University using the Newcomb and Trefz model. She obtained similar findings to the previous studies.

**Actual Level of Cognition:** Pickford (1988), Miller (1989) and Whittington (1991) studied the actual level of cognition of instructors' discourse in the College of Agriculture at The Ohio State University using the FTCB instrument. The three researchers obtained similar findings. They found that professors who participated in the three studies conducted discourse at the remembering and processing levels of cognition. Kitinoja and Miller (1989) found slightly different results with vocational agriculture teachers and OCES agents from the findings obtained by Pickford, Miller and Whittington. They found that vocational agriculture teachers and OCES agents most often taught the classes at the synthesis level of cognition.

**Factors Affecting Delivery of Instructional Programs**

In their study on vocational agricultural teachers, Miller et al. (1989) indicated that the combined effect of teachers' behavior and demographic characteristics make agricultural teachers more effective. In essence, he found that "teachers are the important and critical element in
education. The values, skills, and human relations factors that a teacher possesses largely determine the quality of teaching opportunities that occur in education" (Miller et al., 1989, p. 81).

Martin and Bin Sajilan (1989) identified 16 teaching competencies considered to be important for extension agents in Malaysia. The study indicated that extension professionals should possess these sixteen teaching competencies to teach adult learners effectively. However, the study did not make any attempt to explore the association of demographic factors with teaching competencies of extension. Empirical studies on demographic variables of teachers in relation to agricultural extension agents are scant.

Years of Experience: Findlay et al. (1989) conducted an ex post facto study covering the states of Alabama, Florida, and Georgia. The study observed that teachers with a broader knowledge base and experience made more realistic and objective assessments of their levels of competence than their colleagues with less experience and a narrow knowledge base.

Powers (1961) and Musgrove (1968) reported that the length of experience of teachers in teaching is significantly associated with teaching effectiveness. Gaines (1955), McGhee (1967), and Feldman (1971) focused on the importance of work experience in the context that work
experience helped the teachers understand the learners' environment. They also stressed the importance of updating the skills in the occupational area. Burhoe (1981) indicated that the technical expertise and the qualifications of teachers are very important for a successful adult teacher. But according to Brooks (1971), there was no relationship between length of teaching experience and teaching effectiveness. Allen (1974) indicated that teachers who had work experience in the subject being dealt with should deliver the instruction in vocational education.

Educational Degree Earned and Fields: Wilhoyte (1965) pointed out that an instructional staff with training and experience proved to be the most important aspects of a successful program. Cashin (1968) found that instructors favored the inclusion of certain components in professional preparation programs and the number of professional education courses completed. He further observed that instructors with higher academic degrees (Master and Ph.D.) favored the inclusion of certain components in professional preparation of programs compared with teachers having lower academic qualifications.

In an investigation of teacher preparation patterns, Gragun (1969) found that teacher educators preferred that program instructors possess at least a Master's degree in the area of specialization with a Bachelor's degree in
agricultural education. Kowalski and Weaver (1989) pointed out that "outstanding teachers in Indiana were profiled as professional with a master's degree" (p. 98). Bhardwaj (1989), who studied cognitive levels of the educational programs taught by the county agricultural agents, found that agents with a degree in agricultural education had planned for lower cognitive levels in their programs compared to those with degrees in agricultural economics, agronomy, and animal and dairy science.

Preparation in Pedagogy/Andragogy: Smith (1960) found from his empirical study that pedagogical experience is very important for vocational agriculture teachers. Similar findings were reported by the U.S. Department of Health, Education, and Welfare (1963) which indicated that a teacher must be proficient in the pedagogical skills and methods of teaching. Newcomb (1976) indicated that the technical knowledge and skills which a teacher possesses fulfills only one part of the requirements of being a good teacher, while the other part is pedagogical aspects.

Knowles (1980) emphasized that teachers should possess andragogical skills so they can help adults learn properly. Burhoe (1981) indicated that individuals preparing to be adult teachers may need additional expertise and preparation in teaching and technical subject matter. Feiman-Nemser and Buchman (1986, 1987) and Wilson, Shulman, and Richert (1987) claimed that developing pedagogical content knowledge is the
foundation of learning to teach. Feiman-Nemser and Buchman (1986, 1987) further pointed out that new teachers lack pedagogical reasoning as compared to experienced teachers.

Livingston (1989) reported that a cognitive perspective helps teachers understand the importance of experiences such that it facilitates the development of integration of the various forms of knowledge for teaching. The cognitive perspective also enhanced pedagogical ways of teaching about students and subject matter content. Shulman (1987) reported that a good pedagogy instructor requires an in-depth knowledge of the subject matter, organizational techniques, and communicative skills. Rubin (1989) examined the theoretical issues of pedagogical intelligence. He stated that what expert teachers do is not as important as how they do it. Thus, the constructive use of experience becomes a crucial parameter in skillful teaching.

Program Area Emphasized: Bhardwaj (1989) found that type of program emphasized had an impact on the level of cognition at which Ohio county agricultural agents offered their programs. For example, he stated that agents emphasizing crop science and farm management offered programs at higher cognitive levels than those emphasizing animal and dairy science. Furthermore, Kitinoja and Miller (1989) indicated that pesticide training programs had significantly lower intended level of cognition as compared
to other programs emphasized by the Ohio Cooperative Extension agents.

Distribution of Job Responsibilities: One antecedent characteristic investigated in Rennekamp's (1987) study was the percent of time devoted to 4-H youth development education by Ohio Cooperative Extension agents who have 4-H responsibilities. He found that agricultural agents who devoted more time to 4-H youth programming perceived the overall importance of key skills in 4-H youth development to be highly important. However, home economics agents perceived the overall importance of key skills less important. Based on the qualitative data, he further stated that "by increasing the work load of an individual agent by assigning them two or more program areas for which they are responsible may in fact be associated with lowered perceptions of the importance of key skills in either area" (p. 139-140). Intuitively, it may be true. When an individual is asked to accomplish many tasks, he/she may not be able to find enough time to place appropriate emphasis on all responsibilities to achieve excellence. Though county agents with assigned job responsibilities are already over loaded, adding additional assignments may lower their performance.
Summary

The literature shows cognitive level of instruction can be examined from nine perspectives among them: 1) educational philosophy of the cooperative extension service, 2) legislative acts influencing CES educational philosophy, 3) national CES mission statement, 4) OCES mission statement, 5) cognitive thinking, 6) Bloom’s Taxonomy of Educational Objectives, 7) utilization of Bloom’s Taxonomy, 8) levels of cognition, and 9) factors affecting delivery of instructional programs.

The most important factors for effective delivering of instructional programs in extension are: 1) years of experience, 2) educational degree earned, 3) field of study, 4) preparation in pedagogy/andragogy, 5) program area emphasized, and 6) distribution of job responsibilities.

But teaching effectiveness tends to be low when extension educators are overloaded. Similarly, when county agents or state specialists are overloaded, both extension officials and the clientele suffer in that it becomes difficult to achieve CES objectives. Extension philosophy is rendered ineffective in the sense that the rationale for extension programs -- practical solutions to real world problems through intuition and education -- become unrealistic.

Education is a fundamental element of change. Through various legislative acts, the CES was established to meet
the educational needs of the American people. Backed by research and teaching, new courses have been developed through Land-grant universities to insure educational excellence. The basic mission of CES is education. The CES educational programs target both youth and adults. Extension education is largely non-formal approach designed to raise the living standards of the Americans.

To meet educational needs of the people, OCES conducts educational activities related to agriculture, community development and natural resources, home economics, family living, and 4-H youth programs for Ohio’s rural and urban citizens through personal instruction, bulletins, practical demonstration, and mass media. Educational programs address the most pertinent needs of the clientele. Programs are based on research and knowledge generated through and provided by various departments within the colleges of Agriculture, Biological Sciences, and Human Ecology. The OCES with support from The Ohio State University and its research stations, is dedicated to improving people's lives by addressing current issues through educational programs and services. Educational programs are based on cognitive thinking. Need for intellectual abilities and skills has been a widespread theme in educational literature for many years.

Studies in the field of cognitive development showed that teaching higher cognitive processes, as compared to
lower mental level processes, is not novel. Many studies showed that teaching at lower levels of cognition cannot bring forth any desirable outcome. Using Bloom's Taxonomy as a tool for describing the various levels of cognition, researchers demonstrated that the taxonomy serves as a valuable instrument for educators in developing instructional objectives and constructing test items at higher cognitive levels.

Studies showed that Bloom's Taxonomy helps induce individuals' thinking about learning behavior. Although Bloom's taxonomy has been criticized by some researchers, but its utility remains valid and reliable. The taxonomy serves as an educational tool that helps educators to write clear objectives in the learning process so the learner can achieve higher order thinking. Bloom's Taxonomy is indispensable in the educational programs of the OCES.
CHAPTER III

METHODOLOGY

The purpose of this study was to describe the highest levels of cognition at which OCES agricultural agents intended to teach and at which level of cognition the programs were actually taught, and to determine whether local agricultural agents and state agricultural specialists vary in their levels. This chapter shall discuss the location of the study, research design, population, sample selection, instrumentation, data collection, and the data analysis procedures of the study.

Location of the Study

The eighty-eight counties in the state of Ohio are geographically grouped by the OCES into five administrative districts: Northeast, East, South, Southwest and Northwest (Appendix A). Each district delivers extension programs through county units. The local extension offices were chosen to be included in the study because county level programming is central to the delivery of educational programs of the CES (Warner and Christenson, 1984) and
county programs often utilize the expertise of the district and state specialists.

**Research Design**

Since subjects could not be randomly assigned to experimental and control groups, and levels of the treatment could not be randomly assigned, the design of this study was *ex post facto* research. Kerlinger (1964) stated that this is "Research in which the independent variable or variables have already occurred and in which the researcher starts with observation of a dependent variable" (p. 392). He further noted that the researcher studies the independent variables in retrospect for their possible relations to the dependent variable or variables.

Kerlinger (1964) suggested that the main and rival hypotheses -- for the independent variables -- should be stated before the data are collected to control the potential extraneous variables in *ex post facto* research. The main independent variables; thus, called main hypotheses; were those theoretically conceived to be the best predictors of the dependent variable. The potentially extraneous variables were incorporated into the study as rival independent variables and hypotheses were posited for each; thus, called rival hypotheses. Accordingly, the main and rival hypotheses were posited in Chapter I in this study.
The main hypotheses were stated to establish the relationship between the highest actual levels of cognition of instruction and highest intended levels of cognition of instruction and type of agricultural agents. The relationship was hypothesized to be that the highest actual levels of cognition for the instruction would be higher than the highest intended levels at which instruction was planned. Also, state agricultural specialists were expected to teach their programs at higher levels of cognition than county agricultural agents.

In *ex post facto* research, the researcher should be aware of the weaknesses of the design and should be knowledgeable of how to control them in order to conduct valid research. Kerlinger mentioned three major weaknesses which include the inability to manipulate the independent variables, the lack of power to randomize, and the risk of improper interpretation. However, these weaknesses were controlled through establishing and testing the rival hypotheses (1964). Therefore, the rival independent variables were identified by reviewing the literature to determine the relationship of each rival independent variable with each main independent variable and with the dependent variable — highest actual level of cognition of instruction (Figure 1).
Figure 1. Conceptual Model of this Ex Post Facto Study.
Population

The target and accessible population of this study were the county agricultural agents and the state agricultural specialists. In Ohio the county agricultural agents numbered 73; whereas, there were 72 state agricultural specialists; thus, making the total population 145 extension educators \(N=145\). The researcher chose to study only the county agricultural agents and state agriculture specialists population for several reasons. First, the researcher was interested in county agricultural agents and state agricultural specialists because they are the ones who represent the majority of the staff among OCES professional staffs. Second, a lack of time and money to study other professional staffs were constraints. Third, due to the large number of programs conducted by the OCES extension educators in the different program areas, the researcher’s capability to include all program areas in the study was limited. Because of these three reasons, the researcher limited this study to county agricultural agents and state agricultural specialists and excluded home economics, 4-H, and community and natural resource development agents.

The Ohio Cooperative Extension Service Headquarters Faculty and Staff 1990 Directory was used as a base for developing the population frame of state agricultural specialists. The Personnel Directory (county and district,
1990) was used to develop the population frame for county agricultural agents.

Sample Selection

A sample size of 30 county agricultural agents and state agricultural specialists was determined to be a sufficient sample size for conducting this investigation. The sample was comprised of 15 county agricultural agents and 15 state agricultural specialists. The sample size was determined based on the formula $10 \times (K+1)$, where $K$ is the number of main independent variables of interest, which were two in number (McCallum, 1989). This sample was viewed as a slice of time of the target population of all county agricultural agents and state agricultural specialists. A stratified random sampling technique was utilized to select three county agricultural agents from each district, thus making the total 15. Systematic random sampling was also used to select 15 state agricultural specialists from the updated Ohio Cooperative Extension Service Headquarter Directory. A systematic random sample of every fifth person was chosen with a random start from the list contained in the Ohio Cooperative Extension Service Headquarter Faculty and Staff Directory. Thus, the two samples together made the total sample size of 30 county agricultural agents and state agricultural specialists.

Purposeful time sampling was determined to be during
the months of January, February, March and April of the winter programming season of 1991. The time of year selected was purposeful and considered necessary because the OCES educational programs have been typically governed by the season of the year. During the winter period, the OCES group educational programs (workshops, seminars, training sessions, etc.) have typically been conducted because of the availability of the extension clientele.

**Instrumentation**

Three instruments were utilized to obtain the information needed to test the research objectives and hypotheses addressed in this study.

**Measuring the Highest Intended Levels of Instruction**

An interview schedule, developed by Kitinoja and Miller (1989), was utilized to collect data regarding the highest intended levels of cognition of instruction at which the county agricultural agents and state agricultural specialists planned to deliver the OCES programs. The interview schedule had an open-ended format and was examined for validity and intra-rater reliability. An average percent of agreement of 99% was reported as intra-rater reliability.

To verify validity, the researcher established a panel of experts of three members (Appendix D) from the faculty of
the Department of Agricultural Education and the OCES at The Ohio State University to assess the interview schedule for content and face validity. In terms of the inter-rater reliability, the researcher listened to the tapes recorded during the interviews and wrote the complete answers for each question in the interview schedule. Also, another panel of experts of four members (Appendix E) from the Department of Agricultural Education at The Ohio State University and an outside expert who worked in this area of research were used to assess the inter-rater reliability.

Individually, the panel of experts and the researcher assessed the responses of all 30 participants and determined the highest intended level of cognition of the county agricultural agents and state agricultural specialists. Comparisons were made among members of the panel of experts' assessments and those of the researcher of each participant to determine the percent of agreements. The average percent of agreement of the comparisons of 82.7% was obtained and reported as inter-rater reliability.

Furthermore, the means, standard deviations and correlations for each paired comparison were obtained and reported (Table 1). The average correlation (r=.99) was also obtained using Fisher's z-transformation procedures.
Table 1

Inter-Rater Reliability

<table>
<thead>
<tr>
<th>Pair raters</th>
<th>M1</th>
<th>M2</th>
<th>sd1</th>
<th>sd2</th>
<th>r</th>
<th>z</th>
</tr>
</thead>
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<tr>
<td>1</td>
<td>3.97</td>
<td>4.00</td>
<td>1.52</td>
<td>1.53</td>
<td>0.99</td>
<td>2.65</td>
</tr>
<tr>
<td>2</td>
<td>3.97</td>
<td>4.00</td>
<td>1.52</td>
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<tr>
<td>3</td>
<td>3.97</td>
<td>4.27</td>
<td>1.52</td>
<td>1.48</td>
<td>0.99</td>
<td>2.65</td>
</tr>
<tr>
<td>4</td>
<td>3.97</td>
<td>3.40</td>
<td>1.52</td>
<td>1.24</td>
<td>0.99</td>
<td>2.44</td>
</tr>
<tr>
<td>5</td>
<td>4.00</td>
<td>3.97</td>
<td>1.53</td>
<td>1.52</td>
<td>0.99</td>
<td>2.65</td>
</tr>
<tr>
<td>6</td>
<td>4.00</td>
<td>4.27</td>
<td>1.53</td>
<td>1.48</td>
<td>0.99</td>
<td>2.65</td>
</tr>
<tr>
<td>7</td>
<td>4.00</td>
<td>3.40</td>
<td>1.52</td>
<td>1.24</td>
<td>0.99</td>
<td>2.65</td>
</tr>
<tr>
<td>8</td>
<td>3.97</td>
<td>4.27</td>
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<td>1.48</td>
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</tr>
<tr>
<td>9</td>
<td>3.97</td>
<td>3.40</td>
<td>1.52</td>
<td>1.24</td>
<td>0.99</td>
<td>2.65</td>
</tr>
<tr>
<td>10</td>
<td>4.27</td>
<td>3.40</td>
<td>1.48</td>
<td>1.24</td>
<td>0.98</td>
<td>2.30</td>
</tr>
</tbody>
</table>

r = correlation coefficient
Σz = 26.269
z = Fisher’s z-transformation
Mz = 2.627
procedure
r = 0.99
M = mean

Measuring the Actual Levels of Cognition of Instruction

To measure the actual levels of cognition of instruction, the researcher used the Florida Taxonomy of Cognitive Behavior (FTCB) instrument adapted by Kitinoja and Miller (1989). The FTCB instrument of seven categories (knowledge, translation, interpretation, application, analysis, synthesis and evaluation) was modified to be used with Bloom’s taxonomy of six categories (knowledge, comprehension, application, analysis, synthesis, and evaluation). The categories of translation and interpretation, of the FTCB, were combined to be represented by the comprehension category of Bloom’s taxonomy (Appendix H).
The validity of the FTCB instrument was based upon its direct development from Bloom's Taxonomy and the support generally given by the scholarly community for Bloom et. al.'s hierarchy for the classification of cognitive behaviors. Reliability of the modified FTCB instrument was based on the rater's utilization of the instrument. Therefore, inter-rater and intra-rater reliability of the instrument were established.

Inter-rater reliability was assessed by a panel of experts of three members (Appendix G) from the Department of the Agricultural Education and an outside expert who worked in this area of research. Individually, the panel of experts and the researcher assessed one tape and reported their assessment. The percent of agreement resulting from paired comparisons between members of the panel of experts' assessment and those of the researcher and between one and an other member of the panel of experts were computed. The average agreement of 81.3% was obtained and reported as inter-rater reliability.

The intra-rater reliability was assessed by computing the percent of agreement upon rating a given tape twice with an interval of one week between the first and the second rating. The percentage of agreement of 96 percent was obtained and reported as an intra-rater reliability. To assess the highest actual levels of cognition, the researcher listened to the recorded tapes, and underlined
the terms provided by the modified FTCB instrument. Then, the highest actual levels of cognition which occurred in each instructional session were reported by the researcher.

**Collecting Personal and Professional Demographic Information**

The researcher developed an instrument to collect personal and professional demographic characteristics. The personal and professional demographic information of interest to the researcher were those hypothesized to explain the levels of cognition at which the county agricultural agents and state agricultural specialists intended and actually delivered the OCES programs. The content and face validity of the personal and professional demographic information instrument were assessed using a panel of experts from the Department of Agricultural Education and the Ohio Cooperative Extension Service (Appendix I).

**Data Collection**

**Measuring County Agricultural Agents' and State Agricultural Specialists' Actual Levels of Cognition of Instruction**

The highest levels at which county agricultural agents and state agricultural specialists actually delivered the OCES programs were determined through an audio taping of the actual teaching conducted by the county agricultural agents and state agricultural specialists. The researcher
telephoned or met face-to-face with all the county agricultural agents and state agricultural specialists selected to participate in the study. The researcher explained to them the purpose of the study and asked them to participate in the study and to audio tape at least one of their group presentations during the months of January, February, March or April, 1991. The study had prior approval of the OCES Administrative Cabinet.

Letters co-signed by the researcher and Dr. Keith Smith, Associate Director of the OCES, were sent to all county agricultural agents and state agricultural specialists who agreed to participate in the study. Two of the fifteen county agents who were randomly selected and initially agreed to participate in the study decided not to participate. The researcher randomly reselected two county agricultural agents to replace them. All state agricultural specialists who were randomly selected and initially agreed, participated in the study. The researcher sent a ninety-minute blank audio tape to each participant to record the presentation along with a self-addressed return stamped envelope. For the researcher to gain clear insight into actual delivery of instruction, the researcher traveled with ten of the fifteen State Agricultural Specialists who agreed to participate in the study to audio tape and observe their presentations.

Approximately one week after the tapes were mailed, the
researcher selected a random sample from the participants and telephoned them to make sure the letters and blank tapes were received by the participants. During the telephone calls, each participant selected a convenient program and date to audio tape his/her presentation. A week before the selected date, telephone calls were made to remind participants about audio taping the presentations. Furthermore, one week after the arranged date, telephone calls were made to the agents and those who had finished with audio taping their presentations were asked to return the tapes.

**Measuring County Agricultural Agents' and State Agricultural Specialists' Intended Levels of Cognition of Instruction**

The highest levels at which county agricultural agents and state agricultural specialists intended to deliver the OCES programs were determined through face-to-face interviews. The interviews were conducted by the researcher with all 30 county agricultural agents and state agricultural specialists using an interview schedule (Appendix F) developed by Kitinoja and Miller (1989). The interviews were tape-recorded, with the permission of the participants. The interviews were conducted during the months of May and June 1991. Arrangements for time and meeting places were made over the telephone or face-to-face with all 30 extension educators selected to participate in
the study. The researcher made a follow-up telephone call to remind the participants of the interview dates.

Measuring the Personal and Professional Demographic Factors Influencing the Delivery of Instruction of the OCES Programs

Demographic data collected from the county agricultural agents and state agricultural specialists were used to gain more descriptive information about the participants in this investigation. Also, the relationships among the main independent variables (highest intended levels of cognition and type of agricultural agents), dependent variable (highest actual levels of cognition), and rival independent variables were determined. Data related to certain factors influencing the delivery of instruction were collected during the face-to-face interviews scheduled during May and June 1991. All 30 participants were asked to complete the questionnaire developed by the researcher (Appendix J) before the face-to-face interview started.

Data Analysis

The selection of procedures for data analysis was guided by three purposes. The first purpose was to describe all main and rival independent variables and dependent variable from the data collected. Some of the rival independent variables were described in terms of frequencies, percentages, means, median, and standard
deviations while the other rival independent variables were described using frequencies and percentages only. The main independent variables and dependent variable were described in terms of frequencies, percentages, means and standard deviations.

The second purpose consisted of two parts. The first part was to test the difference among the mean level of cognition of the dependent variable (the highest actual level of cognition) with the mean levels of cognition of both main independent variables (the highest intended level of cognition and the type of agricultural agents). The second part was to test the differences among the mean levels of cognition of each of the main independent variables and the dependent variable with the rival independent variables (years of experience, program area emphasized in 1991/92, major field of study, and percent of time spent in agriculture programming or extension). The above mentioned variables were stated on pages (17-19) in the research hypotheses (HM1, HM2, HR6, HR8-a, HR8-f, HR8-g, HR7, HR5, HR1, and HR8-e). A t-test and one-way analysis of variance were utilized to test for differences at the 0.05 level of significance.

The third purpose was to determine the degree of association among the main and rival independent variables and the dependent variable. The two main independent variables, highest intended level of cognition and type of
agricultural agents were coded as interval and nominal variables respectively. The dependent variable, highest actual level of cognition, was coded as an interval variable. The rival independent variables, years of experience, number of pedagogical courses completed, number of hours enrolled in andragogy, and distribution of job responsibilities were coded as interval variables. The rival independent variable, program area emphasized, was coded as a nominal variable. The rival independent variable, degree earned, was coded as an ordinal variable. The rival independent variable field of study in B.S., M.S., Ph.D., and Other was coded as a nominal variable.

Furthermore, county agricultural agents with both B.S and M.S. or only M.S. degrees in technical agriculture were coded as technical field of studies. However, county agricultural agents with both B.S. and M.S. or only M.S. degrees in social science were coded as social science field of studies. State agricultural specialists with B.S., M.S., and Ph.D. or any two of the three degrees in technical agriculture or DVM degree were coded as technical field of studies. However, state agricultural specialists with B.S., M.S., and Ph.D. or any two of the three degrees in social science were coded as social science field of studies.

Thus, based on this coding Pearson product moment, Kendalls Tau C, point biserial and phi correlation coefficients were used to determine the direction and the
magnitude of the relationships among the variables. This analysis was used to answer three research objectives.

Research objective number 3 was to ascertain the relationship between the highest intended level of cognition of instruction and selected characteristics of the OCES county agricultural agents and state agricultural specialists. Research objective number 4 was to ascertain the relationship between the highest actual level of cognition of instruction and selected characteristics of the OCES county agricultural agents and state agricultural specialists. Research objective number 6 was to ascertain the relationship between the type of agricultural agents and selected characteristics of the participants.

The data were analyzed using the Statistical Package for Social Sciences PC version (SPSS-PC+) which was available in the Department of Agricultural Education, The Ohio State University.
CHAPTER IV

FINDINGS AND CONCLUSIONS

This chapter presents the findings and the conclusions of the research. The purpose of this study was to describe the highest intended and actual levels of cognition for agriculture instruction delivered by the Ohio Cooperative Extension Service (OCES). Furthermore, the study sought to describe the relationships among the highest intended level of cognition, the highest actual level of cognition, and type of agricultural agents and selected personal and professional characteristics of the OCES county agricultural agents and state agricultural specialists.

The main and rival independent variables and dependent variable of interest investigated in this study were:

A - Rival independent variables

1 - Years of experience
2 - Number of pedagogical courses completed
3 - Number of hours enrolled in andragogy
4 - Educational degree earned
   a - BS/BA
   b - MS/MA
   c - PhD
   d - Other
5 - Major field of study in BS/BA, MS/MA, PhD, or Other
   a - Social science
   b - Technical studies
6 - Program area emphasized by OCES in 1991/92
7 - Distribution of job responsibilities
   a - County agriculture agents
      (1) - Agriculture programming
      (2) - County chair
      (3) - CNRD programming
      (4) - Other
   b - State agricultural specialists
      (1) - Extension
      (2) - Resident instruction
      (3) - Research
      (4) - Other

B - Main independent variables
   1 - Highest intended level of cognition
   2 - Type of agricultural agents

C - Dependent variable
   1 - Highest actual level of cognition.

The following six objectives were addressed to guide the study:

1 - To describe the highest intended level of cognition for instruction in selected OCES programs.

2 - To describe the highest actual levels of cognition for instruction in selected OCES programs.

3 - To ascertain the relationship between the highest intended level of cognition of instruction and selected characteristics of the OCES county agricultural agents and state agricultural specialists.

4 - To ascertain the relationship between the highest actual level of cognition of instruction and selected characteristics of the OCES county
agricultural agents and state agricultural specialists.

5 - To ascertain the relationship between the highest intended level of cognition of instruction and the highest actual level of cognition of instruction of the OCES programs.

6 - To ascertain the relationship between the type of agricultural agents and selected characteristics of the OCES county agricultural agents and state agricultural specialists.

The population of this study was 145 extension educators; consisting of 73 county agricultural agents and 72 state agricultural specialists. A random sample of 30 county agricultural agents and state agricultural specialists was selected for this study. The sample consisted of 15 county agricultural agents and 15 state agricultural specialists. Generalization beyond these 30 county agricultural agents and state agricultural specialists was not expressed nor intended.

An interview schedule was used to collect data regarding the highest intended levels of cognition at which agricultural county agricultural agents and state agricultural specialists planned to deliver the OCES programs. The Florida Taxonomy of Cognitive Behavior (FTCB) instrument of seven categories was modified by the researcher to be used with Blooms Taxonomy of six categories
to measure the highest actual level of cognition. The demographic information questionnaire was developed and used to collect data concerning personal and professional characteristics of the county agricultural agents.

The data were analyzed using the Statistical Package for the Social Sciences PC version (SPSS-PC+) program. The statistics obtained in the analysis included frequencies, means, median, percentages, standard deviations, correlation coefficients, t-test, one-way analysis of variance and regression. The alpha level for testing the research hypotheses was set a priori at .05.

Included in this chapter is an overview of information on the personal and professional demographic characteristics of the sample, followed by a description of the highest intended and the highest actual levels of cognition. Findings concerning differences among the variables of interest are presented next. Data pertaining to the relationship among the variables are presented last.

**Personal and Professional Demographic Characteristics of the County Agricultural Agents and State Agricultural Specialists**

Seven personal and professional demographic characteristics of the county agricultural agents and state agricultural specialists were studied. For the purpose of the presentation, the personal and professional demographic characteristics were arranged in the following order: years
of experience, number of hours enrolled in andragogy, number of pedagogical courses completed, highest educational degree earned, program area emphasized in 1991/92, field of study of the educational degree earned, and job responsibilities as percent of time spent. The analyses reported were based on information provided by the 30 county agricultural agents and state agricultural specialists on the Demographic Information Questionnaire (Appendix J). These data are presented in Tables 2 and 3.

**Personal Characteristics of the County Agricultural Agents and State Agricultural Specialists**

**Years of Experience**

The majority, eighteen (60.0%), of the 30 extension educators reported between 2 and 20 years of experience. Five of the eighteen county agricultural agents and state agricultural specialists had less than five years of experience. One agent had 38 years of experience. The average years of experience was 17.8 years (Table 2).

**Number of Hours Enrolled in Andragogy**

The majority, twenty-two (73.3%), of the 30 county agricultural agents and state agricultural specialists indicated between 0 and 25 hours in andragogy. Five of those twenty-two county agricultural agents and state agricultural specialists had zero hours in andragogy and nine county agricultural agents and state agricultural
specialists had 1 to 10 hours in andragogy. One state agricultural specialist indicated 928 hours in andragogy. The average number of hours in andragogy was 50.8 hours; median was 18 hours (Table 2).

**Number of Pedagogical Courses Completed**

Thirteen (43.3%) of the 30 county agricultural agents and state agricultural specialists indicated no pedagogical courses had been completed during their college education. Eight (26.7%) of the county agricultural agents and state agricultural specialists reported four or more pedagogical courses had been completed during their college education. The average number of courses completed in pedagogy was 1.6 courses (Table 2).

**Highest Educational Degree Earned**

Fifteen (50.0%) of the 30 county agricultural agents and state agricultural specialists reported the highest educational degree earned was a master of science or arts degree. Fifteen (50.0%) of the county agricultural agents and state agricultural specialists (Table 2) reported the highest educational degree earned was a doctorate/Doctor of Veterinary Medicine degree -- one state agricultural specialists had a Doctor of Veterinary Medicine Degree (DVM).
Professional Characteristics of the County Agricultural Agents and State Agricultural Specialists

Program Area Emphasized in 1991/92

The majority, eighteen (60.0%), of the 30 county agricultural agents and state agricultural specialists indicated the major program area emphasized in 1991/92 was both farm management/community development and plant/animal production. Eight (26.7%) of the county agricultural agents and state agricultural specialists reported the major program area emphasized in 1991/92 was plant/animal production only (Table 3).

Field of Study of the Educational Degree Earned

The data on the field of study of the college degree (Bachelor, Master, and Doctorate/DVM) are presented in Table 3. The majority, twenty (69.0%), of the 29 county agricultural agents and state agricultural specialists reported technical studies had been completed in their bachelor degree. Fifteen (52.0%) of the 29 county agricultural agents and state agricultural specialists indicated technical studies had been completed in their master's degree. Twelve (80.0%) of the 15 county agricultural agents and state agricultural specialists reported technical studies had been completed in their doctorate/DVM degree.
Table 2

**Personal Characteristics of the County Agricultural Agents and State Agricultural Specialists**

<table>
<thead>
<tr>
<th>Years of Experience</th>
<th>0 - 10</th>
<th>11 - 20</th>
<th>21 - 30</th>
<th>31 - 40</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>f</td>
<td>8</td>
<td>10</td>
<td>9</td>
<td>3</td>
<td>30</td>
</tr>
<tr>
<td>%</td>
<td>26.7</td>
<td>33.3</td>
<td>30.0</td>
<td>10.0</td>
<td>100.0</td>
</tr>
<tr>
<td>x</td>
<td>17.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Med</td>
<td>18.75</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SD</td>
<td>8.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of Hours in Andragogy</th>
<th>0 - 25</th>
<th>26 - 50</th>
<th>51 - 100</th>
<th>&gt; 100</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>f</td>
<td>22</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>30</td>
</tr>
<tr>
<td>%</td>
<td>73.3</td>
<td>16.7</td>
<td>6.7</td>
<td>3.3</td>
<td>100.0</td>
</tr>
<tr>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>50.8</td>
</tr>
<tr>
<td>Med</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>18.0</td>
</tr>
<tr>
<td>SD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>167.6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of Pedagogical Courses Completed</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4 or More</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>f</td>
<td>13</td>
<td>3</td>
<td>5</td>
<td>1</td>
<td>8</td>
<td>30</td>
</tr>
<tr>
<td>%</td>
<td>43.3</td>
<td>10.0</td>
<td>16.7</td>
<td>3.3</td>
<td>26.7</td>
<td>100.0</td>
</tr>
<tr>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.6</td>
<td></td>
</tr>
<tr>
<td>Med</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>SD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.7</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Highest Educational Degree Earned</th>
<th>BS/BA</th>
<th>MS/MA</th>
<th>PhD/DVM</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>f</td>
<td>0</td>
<td>15</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>%</td>
<td>0.0</td>
<td>50.0</td>
<td>50.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

**Job Responsibilities (Percent of Time Spent)**

All county agricultural agents had agriculture programming appointments. Fourteen (93.3%) of the fifteen county agricultural agents reported they also had CNRD programming responsibilities in their appointments. Eleven (73.3%) of the county agricultural agents reported they also had county chair appointments.
All state agricultural specialists reported they had extension appointments. Eleven (73.3%) of the fifteen state agricultural specialists reported they also had research appointments and nine (60.0%) reported they had resident instruction appointments (Table 3).

**Table 3**

**Professional Characteristics of the County Agricultural Agents/State Agricultural Specialists**

<table>
<thead>
<tr>
<th>Program Area Emphasized in 1991/92</th>
<th>f</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farm management and community development (Fmgt/CD) only</td>
<td>4</td>
<td>13.3</td>
</tr>
<tr>
<td>Plant and animal production (P/A PROD) only</td>
<td>8</td>
<td>26.7</td>
</tr>
<tr>
<td>Both (Fmgt/CD) and (P/A PROD)</td>
<td>18</td>
<td>60.0</td>
</tr>
<tr>
<td>Total (n)</td>
<td>30</td>
<td>100.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Field of Study of the Educational Degree Earned</th>
<th>BS/BA</th>
<th>MS/MA</th>
<th>PhD/DVM</th>
<th>All Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social science</td>
<td>9</td>
<td>14</td>
<td>3</td>
<td>26</td>
</tr>
<tr>
<td>Technical studies</td>
<td>20</td>
<td>15</td>
<td>12</td>
<td>47</td>
</tr>
<tr>
<td>Total</td>
<td>29</td>
<td>29</td>
<td>15</td>
<td>73</td>
</tr>
</tbody>
</table>

**Job Responsibilities: Percent of Time Spent**

<table>
<thead>
<tr>
<th>Responsibilities % of Time</th>
<th>Agent Type County (n = 15)</th>
<th>Agent Type State (n = 15)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>15 100.0</td>
<td>Extension 15 100.0</td>
</tr>
<tr>
<td>Programming</td>
<td>11 73.3</td>
<td>Resident 9 60.0</td>
</tr>
<tr>
<td>County Chair</td>
<td>14 93.3</td>
<td>Instruction 11 73.3</td>
</tr>
<tr>
<td>CNRD Programming</td>
<td>4 26.7</td>
<td>Research 1 6.7</td>
</tr>
<tr>
<td>Other</td>
<td>1 6.7</td>
<td>Other</td>
</tr>
</tbody>
</table>
Cognitive Level of Instruction

Data were collected related to the highest intended and the highest actual level of cognition of instruction. These data are presented in Tables 4 through 6.

Highest Level of Cognition

In Table 4, fifteen (50.0%) of the county agricultural agents and state agricultural specialists intended to deliver the OCES programs at two of the cognitive levels (comprehension and application). Nine (30.0%) of the county agricultural agents and state agricultural specialists intended to deliver the OCES programs at the highest level of cognition (evaluation). These data resulted from interviews with the county agricultural agents and state agricultural specialists and two-thirds reported that they had no written lesson plans or objectives written for the lesson. When no lesson plans or objectives existed, county agricultural agents and state agricultural specialists were questioned to determine their intent related to the instruction. Twenty-eight (93.3%) of the county agricultural agents and state agricultural specialists were actually delivering the OCES programs at the three highest levels of cognition (analysis, synthesis, and evaluation). The average highest intended and actual levels of cognition were 3.97 and 4.57, respectively, with scaling of 1 = knowledge, 2 = comprehension, 3 = application, 4 = analysis,
5 = synthesis, and 6 = evaluation. From these results, therefore, county agricultural agents and state agricultural specialists were actually delivering the OCES programs at higher cognitive levels than they originally intended.

Number of Type of Agricultural Agents Found at the Intended and Actual Levels of Cognition

As can be seen in Table 5, eleven of the county agricultural agents intended to deliver the OCES programs at the comprehension and application levels of cognition. Nine of the county agricultural agents actually delivered the OCES programs at the analysis level of cognition. Four county agricultural agents delivered the OCES programs at the two highest levels of cognition (synthesis and evaluation).

Eleven of the state agricultural specialists intended to deliver the OCES programs at the analysis and evaluation levels of cognition. All state agricultural specialists actually delivered the OCES programs at the three highest levels of cognition: analysis, synthesis, and evaluation (Table 5).

From these findings, it appears that county agricultural agents intended to deliver the OCES programs at lower two cognitive levels (comprehension and application) whereas the majority of the county agricultural agents actually delivered the OCES programs at the fourth level of cognition, analysis, or higher. Furthermore, it is clear
Table 4

Highest Level of Cognition

<table>
<thead>
<tr>
<th>Level of Cognition</th>
<th>Intended</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>f</td>
<td>%</td>
</tr>
<tr>
<td>Knowledge</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Comprehension</td>
<td>5</td>
<td>16.7</td>
</tr>
<tr>
<td>Application</td>
<td>10</td>
<td>33.3</td>
</tr>
<tr>
<td>Analysis</td>
<td>4</td>
<td>13.3</td>
</tr>
<tr>
<td>Synthesis</td>
<td>2</td>
<td>6.7</td>
</tr>
<tr>
<td>Evaluation</td>
<td>9</td>
<td>30.0</td>
</tr>
<tr>
<td>Total</td>
<td>30</td>
<td>100.0</td>
</tr>
</tbody>
</table>

\[ \bar{x} = 3.97 \quad \bar{x} = 4.57 \]

\[ SD = 1.56 \quad SD = 0.85 \]

that the majority of the state agricultural specialists intended to deliver the OCES programs at the higher cognitive levels of evaluation and analysis whereas they actually delivered the OCES programs at the three higher levels of cognition (analysis, synthesis, and evaluation).
Table 5

**Number of Type of Agricultural Agents Found at the Intended and Actual Levels of Cognition**

<table>
<thead>
<tr>
<th>Agent Type</th>
<th>County</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Comprehension</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Application</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>Analysis</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Synthesis</td>
<td>2</td>
<td>--</td>
</tr>
<tr>
<td>Evaluation</td>
<td>--</td>
<td>2</td>
</tr>
</tbody>
</table>

Shifting of County Agricultural Agents'/State agricultural Specialists' Levels of Cognition from Intended to Actual

The shifting of levels of cognition from intended to actual by county agricultural agents and state agricultural specialists are presented in Table 6. Generally, fourteen county agricultural agents and state agricultural specialists shifted positively 1 to 4 levels of cognition from intended to actual. Nine county agricultural agents and state agricultural specialists did not shift levels of cognition from intended to actual. Seven county agricultural agents and state agricultural specialists shifted negatively 1 to 2 levels of cognition from intended to actual.
Specifically, nine of the county agricultural agents shifted positively 1 to 3 levels of cognition from intended to actual. One county agricultural agent shifted negatively one level of cognition. Five state agricultural specialists shifted positively 1 to 4 levels of cognition from intended to actual. Six state agricultural specialists shifted negatively 1 to 2 levels of cognition from intended to actual (Table 6).

Table 6

<table>
<thead>
<tr>
<th>Discrepancy</th>
<th>County</th>
<th>State</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>+4</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>+3</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>+2</td>
<td>3</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>+1</td>
<td>4</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>0</td>
<td>5</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>-1</td>
<td>1</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>-2</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

As a result of these findings, one can see that more county agricultural agents have shifted positively 1 to 3 levels of cognition than state agricultural specialists whereas more state agricultural specialists shifted negatively 1 to 2 levels of cognition. County agricultural
agents intended to deliver the OCES programs at lower cognitive levels while state agricultural specialists intended to deliver the OCES programs at higher levels of cognition. Therefore, county agricultural agents regressed upward while state agricultural specialists regressed downward.

**Differences Among Variables of Interest**

Significant differences were tested using the t-test or one-way analysis of variance for the research hypotheses (HM₁, HM₂, HR₆, HR₈₋₇, HR₈₋₉, HR₁, HR₅, HR₁, and HR₈₋₆). In cases where there was a significant difference among the means, the Tukey-post-hoc analysis test was utilized.

**Differences Between Highest Intended and Actual Levels of Cognition of County Agricultural Agents/State Agricultural Specialists**

Table 7 shows the results of the t-test on the highest average levels of cognition for the differences between intended and actual levels of cognition of both county agricultural agents and state agricultural specialists and of the county agricultural agents and state agricultural specialists separately. County agricultural agents' and state agricultural specialists' average intended level of cognition was 3.97 while their average actual level of cognition was 4.57. The calculated t-value of 2.07 was significant at the .05 level. The main research hypothesis (HM₁) was supported at the .05 alpha level. Therefore,
there was a statistically significant difference between the averages for the highest intended and actual levels of cognition of county agricultural agents and state agricultural specialists. The average highest actual level of cognition was higher than the average highest intended level of cognition of county agricultural agents and state agricultural specialists.

To determine which type of agent accounted for the differences in the highest averages for intended and actual levels of cognition, a dependent two tailed t-test of significant differences by type of agricultural agent was also calculated (Table 7). The results showed that there was a statistically significant difference between the highest average intended and actual levels of cognition of the county agricultural agents. The average highest intended level of cognition of the county agricultural agents was 3.27 while the average highest actual level of cognition was 4.27.

The calculated t-value of 3.24 was found to be significant at the .05 level. Therefore, a statistically significant difference between the county agricultural agents' average highest intended and actual levels of cognition was found. Thus, this revealed that the county agricultural agents intended to deliver the OCES programs at lower cognitive levels than the actual level of cognition at which they delivered the instruction.
Table 7

**t-test of Significance Difference Between Intended and Actual Highest Levels of Cognition of County Agricultural Agents/State Agricultural Specialists**

<table>
<thead>
<tr>
<th>Cognition Type</th>
<th>n</th>
<th>( \bar{x} )</th>
<th>SD</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intended</td>
<td>30</td>
<td>3.97</td>
<td>1.56</td>
<td>2.07*</td>
</tr>
<tr>
<td>Actual</td>
<td>30</td>
<td>4.57</td>
<td>0.90</td>
<td></td>
</tr>
</tbody>
</table>

**t-test of Significance by County Agricultural Agents**

<table>
<thead>
<tr>
<th>Cognition Type</th>
<th>n</th>
<th>( \bar{x} )</th>
<th>SD</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intended</td>
<td>15</td>
<td>3.27</td>
<td>0.88</td>
<td>3.24*</td>
</tr>
<tr>
<td>Actual</td>
<td>15</td>
<td>4.27</td>
<td>0.88</td>
<td></td>
</tr>
</tbody>
</table>

**t-test of Significance by State Agricultural Specialists**

<table>
<thead>
<tr>
<th>Cognition Type</th>
<th>n</th>
<th>( \bar{x} )</th>
<th>SD</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intended</td>
<td>15</td>
<td>4.67</td>
<td>1.80</td>
<td>0.68</td>
</tr>
<tr>
<td>Actual</td>
<td>15</td>
<td>4.87</td>
<td>0.83</td>
<td></td>
</tr>
</tbody>
</table>

* * p < .05

The average highest intended and actual levels of cognition of state agricultural specialists are 4.67 and 4.87, respectively. No significant difference was noted between the state agricultural specialists' cognitive levels at an .05 alpha level.
**Differences Between Type of Agricultural Agent and Levels of Cognition**

Table 8 shows the results of the t-test of significant differences on the average levels of cognition for type of agricultural agent. The county agricultural agents' average highest actual level of cognition was 4.27 while the state agricultural specialists' average highest actual level of cognition was 4.87. The calculated t-value of -1.91 was not significant at the .05 level. The main research hypothesis (HM2) was not supported. Therefore, no difference was found between the average for the highest actual levels of cognition of the county agricultural agents and state agricultural specialists.

However, a significant difference was found between the averages of the highest intended levels of cognition of the county and state agricultural specialists. The average highest intended levels of cognition of the county agricultural agents and state agricultural specialists were 3.27 and 4.67, respectively. The calculated t-value of -2.70 was significant at the .05 level. Therefore, there was a statistically significant difference between the averages for the highest intended levels of cognition of the county agricultural agents and state agricultural specialists. The state agricultural specialists' intended to deliver the OCES programs at higher cognitive levels than did county agricultural agents.
Table 8

**t-test of Significant Difference Between Type of Agent and Highest Levels of Cognition**

<table>
<thead>
<tr>
<th>Agent Type</th>
<th>n</th>
<th>$\bar{x}$</th>
<th>SD</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intended</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>County</td>
<td>15</td>
<td>3.27</td>
<td>0.88</td>
<td>-2.70*</td>
</tr>
<tr>
<td>State</td>
<td>15</td>
<td>4.67</td>
<td>1.80</td>
<td></td>
</tr>
<tr>
<td>Actual</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>County</td>
<td>15</td>
<td>4.27</td>
<td>0.88</td>
<td>-1.91</td>
</tr>
<tr>
<td>State</td>
<td>15</td>
<td>4.87</td>
<td>0.83</td>
<td></td>
</tr>
</tbody>
</table>

* p < .05

**Actual Level of Cognition by Major Program Area Emphasized in 1991/92**

Table 9 shows the results of the analysis of variance of the average highest actual levels of cognition for the three major program areas emphasized in 1991/92. The averages of the highest actual levels of cognition of the plant/animal production only, farm management/community development only, and both areas are 4.83, 4.00, and 4.60, respectively. An F value of 1.08 was not significant at an .05 alpha level. The rival research hypothesis (HR6) was rejected. Therefore, no significant difference was found among the average actual levels of cognition of the three major program areas emphasized in 1991/92.
Table 9

Analysis of Variance of Highest Actual Level of Cognition by Major Program Area Emphasized in 1991/92

<table>
<thead>
<tr>
<th>Program Area Emphasized</th>
<th>Fmgt/CD¹</th>
<th>P/A PROD²</th>
<th>Both³</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>4.00</td>
<td>4.83</td>
<td>4.60</td>
</tr>
<tr>
<td>SD</td>
<td>0.00</td>
<td>0.75</td>
<td>1.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups</td>
<td>2</td>
<td>1.73</td>
<td>0.87</td>
<td>1.08</td>
</tr>
<tr>
<td>Within groups</td>
<td>27</td>
<td>21.63</td>
<td>0.80</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>29</td>
<td>23.37</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹ Fmgt/CD = Farm management and community development only.
² P/A PROD = Plant and animal production only.
³ Both areas of emphasis.

Intended Level of Cognition by Major Program Area of Emphasis in 1991/92

Table 10 shows the results of the analysis of variance of the average of highest intended levels of cognition for the three major program areas emphasized in 1991/92. The averages of highest intended levels of cognition of the plant/animal production only, farm management/community development only, and both areas are 5.33, 2.25, and 3.90, respectively. An F value of 6.51 was found to be significant at the .05 level of significance. The rival research hypothesis (HR8-t) was supported. Therefore, significant differences were found among the highest average
intended levels of cognition of the three major program areas emphasized in 1991/92.

Table 10

Analysis of Variance of Intended Level of Cognition by Major Program Area Emphasized in 1991/92

<table>
<thead>
<tr>
<th>Program Area Emphasized</th>
<th>Fmg/CD¹</th>
<th>P/A PROD²</th>
<th>Both³</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>2.25</td>
<td>5.33</td>
<td>3.90</td>
</tr>
<tr>
<td>SD</td>
<td>0.50</td>
<td>1.63</td>
<td>1.33</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups</td>
<td>2</td>
<td>23.08</td>
<td>11.54</td>
<td></td>
</tr>
<tr>
<td>Within groups</td>
<td>27</td>
<td>47.88</td>
<td>1.77</td>
<td>6.51*</td>
</tr>
<tr>
<td>Total</td>
<td>29</td>
<td>70.97</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05.
Tukey's post-hoc revealed significant differences between program areas 1 and 2.

A Tukey post-hoc analysis was conducted to determine which major program areas differed significantly in the average for the highest intended levels of cognition. The results revealed that the county agricultural agents and state agricultural specialists who taught the plant and animal production program area only were at higher intended levels of cognition than the county agricultural agents and state agricultural specialists delivering farm management/community development program area only.
Difference by Years of Experience and Highest Levels of Cognition

Table 11 shows the results of a t-test on the average for the highest intended and actual levels of cognition for less than and more than 5 years of experience by the county agricultural agents and state agricultural specialists. The average highest intended level of cognition for the county agricultural agents and state agricultural specialists with less than 5 years of experience was 3.8 while the county agricultural agents and state agricultural specialists with more than 5 years of experience had an average highest intended level of cognition of 4.0. The t value of -0.26 was not found to be significant at the .05 level. The rival research hypothesis (HR8_a) was rejected. Therefore, this indicate that county agricultural agents and state agricultural specialists with more than or less than 5 years of experience did not differ in the average highest intended levels of cognition.

Table 11 also shows the results of a t-test on the averages highest actual level of cognition for less than and more than 5 years of experience of the county agricultural agents and state agricultural specialists. The average highest actual level of cognition of the county agricultural agents and state agricultural specialists with less than 5 years of experience was 4.20 while the agent with more than 5 years of experience has an average highest intended level of cognition of 4.64. A t value of -1.0 was not found to be
significant at the .05 level. The rival research hypothesis (HR₁) was rejected. Therefore, county agricultural agents and state agricultural specialists with more than or less than 5 years of experience did not differ in the average highest actual levels of cognition.

Table 11

**Difference by Years of Experience and Levels of Cognition**

<table>
<thead>
<tr>
<th>Years of Experience</th>
<th>n</th>
<th>(\bar{x})</th>
<th>SD</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intended</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 5</td>
<td>5</td>
<td>3.80</td>
<td>1.30</td>
<td>-0.26</td>
</tr>
<tr>
<td>More than 5</td>
<td>25</td>
<td>4.00</td>
<td>1.60</td>
<td></td>
</tr>
<tr>
<td><strong>Actual</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 5</td>
<td>5</td>
<td>4.20</td>
<td>1.30</td>
<td>-1.00</td>
</tr>
<tr>
<td>More than 5</td>
<td>25</td>
<td>4.64</td>
<td>0.81</td>
<td></td>
</tr>
</tbody>
</table>

**Percent of Time Spent in Agriculture Programming by County Agricultural Agents or in Extension by State Agricultural Specialists and Intended and Actual Levels of Cognition**

Table 12 shows the results of a t-test on the average highest intended and actual levels of cognition for percent of time spent, less than and more than 50 percent of time spent, in agriculture programming by county agricultural agents and in extension by state agricultural specialists. The average highest intended level of cognition for county agricultural agents who had less than 50 percent of their time spent in agriculture programming was 3.40 while state
agricultural specialists with less than 50 percent appointment in extension had an average of 4.57 for highest intended level of cognition. The county agricultural agents with more than 50 percent appointments in agriculture programming had an average of 3.20 for highest intended level of cognition while state agricultural specialists with more than 50 percent appointment in extension had an average of 4.75 for highest intended level of cognition. A t value of -0.19 was not found to be significant at the .05 level. The rival research hypothesis (HR8-g) was not supported. Therefore, county agricultural agents and state agricultural specialists with more than or less than 50 percent of time spent in agriculture programming by county agricultural agents or in extension by state agricultural specialists did not differ in the average highest intended levels of cognition.

Table 12 further shows the results of a t-test on the average highest actual levels of cognition for percent of time spent by county agricultural agents in agriculture programming and in extension by state agricultural specialists. The average highest actual level of cognition for the county agricultural agents with less than or more than 50 percent appointment in agriculture programming were 4.60 and 4.10, respectively. The average for the highest
Table 12

**Difference by Percent of Time Spent in Agriculture Programming by County Agricultural Agents or in Extension by State Agricultural specialists and Highest Intended and Actual Levels of Cognition**

<table>
<thead>
<tr>
<th>% of Time</th>
<th>County Agents</th>
<th>State Specialists</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 15</td>
<td>n = 15</td>
</tr>
<tr>
<td></td>
<td>n  x  SD  t</td>
<td>n  x  SD  t</td>
</tr>
<tr>
<td>Intended</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>5  3.40  1.14</td>
<td>7  4.57  1.90</td>
</tr>
<tr>
<td>More than</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>10  3.20  0.79</td>
<td>8  4.75  1.83</td>
</tr>
<tr>
<td>Actual</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>5  4.60  0.89</td>
<td>7  4.57  0.79</td>
</tr>
<tr>
<td>More than</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>10  4.10  0.88</td>
<td>8  5.13  0.84</td>
</tr>
</tbody>
</table>

actual levels of cognition for the state agricultural specialists with less than or more than 50 percent appointment in extension were 4.57 and 5.13, respectively. A t value of -1.32 was not found to be significant at the .05 level. The rival research hypothesis (HR7) was rejected. Therefore, county agricultural agents with less than or more than 50 percent of time spent in agriculture programming by county agricultural agents or in extension by state agricultural specialists did not differ in the average highest actual levels of cognition.
Field of Study in Bachelor, Masters, or Doctorate/DVM Degree and Level of Cognition

Table 13 shows the results of a t-test on the average highest intended and actual levels of cognition for county agricultural agents' and state agricultural specialists' field of study in the bachelor, masters, and doctorate/DVM degrees completed as social science and technical studies. The average highest intended level of cognition for county agricultural agents and state agricultural specialists who earned social science degrees in their college education was 3.08 while the average highest intended level of cognition for county agricultural agents and state agricultural specialists who earned technical studies degrees was 4.65. A t value of -3.10 was found to be significant at the .05 level. The rival research hypothesis (HR8_e) was supported. Therefore, county agricultural agents and state agricultural specialists with degrees in technical fields of study intended to deliver the OCES programs at higher levels of cognition than county agricultural agents and state agricultural specialists with social science fields of study.

In addition, Table 13 presents the results of a t-test on the average highest actual levels of cognition for county agricultural agents' and state agricultural specialists' fields of study as social science or technical studies in their degrees completed. The average highest actual level of cognition for county agricultural agents and state
agricultural specialists who earned social science degrees was 4.39 while the average highest actual level of cognition for county agricultural agents and state agricultural specialists who earned technical studies degrees was 4.71. A t value of -0.97 was not found to be significant at the .05 level. The rival research hypothesis (HR5) was rejected. Therefore, county agricultural agents and state agricultural specialists with fields of social science or technical studies degrees earned did not differ in the average highest actual levels of cognition in delivering the OCES programs.

Table 13
Differences Between Fields of Study in Bachelor, Masters, and Doctorate/DVM Degrees and Highest Level of Cognition

<table>
<thead>
<tr>
<th>Field of Study</th>
<th>n</th>
<th>( \bar{x} )</th>
<th>SD</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intended</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Science</td>
<td>13</td>
<td>3.08</td>
<td>0.86</td>
<td>-3.10*</td>
</tr>
<tr>
<td>Technical Studies</td>
<td>17</td>
<td>4.65</td>
<td>1.66</td>
<td></td>
</tr>
<tr>
<td><strong>Actual</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Science</td>
<td>13</td>
<td>4.39</td>
<td>0.87</td>
<td>-0.97</td>
</tr>
<tr>
<td>Technical Studies</td>
<td>17</td>
<td>4.71</td>
<td>0.92</td>
<td></td>
</tr>
</tbody>
</table>

* p < .05

Relationships Among Highest Levels of Cognition, Type of Agricultural Agents, and Selected Demographic Characteristics

In order to assess the relationships among variables, Pearson Product Moment, Kendalls \( r_c \), Point Biserial,
Biserial, and $\phi$ correlation coefficients were used to answer the research objectives number 3, 4, and 6 and research hypothesis (HR$_2$, HR$_3$, HR$_4$, HR$_8$-$b$, HR$_8$-$c$, HR$_8$-$d$, HR$_9$-$a$, HR$_9$-$b$), hypothesis (HR$_2$, HR$_3$, HR$_4$, HR$_8$-$b$, HR$_8$-$c$, HR$_8$-$d$, HR$_9$-$a$, HR$_9$-$b$), used to describe the magnitude of the relationships found among the variables:

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>.70 or higher</td>
<td>Very strong association</td>
</tr>
<tr>
<td>.50 to .69</td>
<td>Substantial association</td>
</tr>
<tr>
<td>.30 to .49</td>
<td>Moderate association</td>
</tr>
<tr>
<td>.10 to .29</td>
<td>Low association</td>
</tr>
<tr>
<td>.01 to .09</td>
<td>Negligible association</td>
</tr>
</tbody>
</table>

Tables 14 and 15 show the association among highest intended level of cognition, highest actual level of cognition, type of agricultural agent, and selected demographic characteristics of the county agricultural agents and state agricultural specialists who participated in the study. The results in Tables 14 and 15 were used to answer research objectives number 3, 4, and 6.

Research objective number 3 was to ascertain the relationship among the highest intended level of cognition of instruction and selected characteristics of the OCES county agricultural agents and state agricultural specialists. Research objective number 4 was to ascertain the relationship among the highest actual level of cognition of instruction and selected characteristics of the OCES county agricultural agents and state agricultural specialists, and research objective number 6 was to
ascertain the relationship among the type of agricultural agent and selected characteristics of the county agricultural agents and state agricultural specialists.

**Relationship Between Highest Intended Level of Cognition and Selected Demographic Characteristics of the County Agricultural Agents/State Agricultural Specialists**

The results in Table 14 show that a negative moderate association was found between the highest intended level of cognition and years of experience ($r = -0.46$). As the number of years of experience of the county agricultural agents and state agricultural specialists decreased, the highest intended level of cognition tended to increase. A positive substantial association was noted between the highest intended level of cognition and field of study in bachelor, masters, and doctorate/DVM degrees earned in social science and technical studies ($r_{pb} = 0.51$). County agricultural agents and state agricultural specialists with technical studies degrees intended to deliver the OCES program at higher levels of cognition than county agricultural agents and state agricultural specialists with social science degrees.

A positive moderate association was found between highest intended level of cognition and degrees completed as bachelors, masters, and doctorate/DVM ($r_c = 0.36$). The higher the degree completed the higher the highest intended
Table 14

Relationship Among Highest Levels of Cognition of Instruction, Type of Agent, and Selected Demographic Characteristics

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Intended</th>
<th>Actual</th>
<th>Type of Agent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years of experience</td>
<td>-0.46</td>
<td>0.16</td>
<td>0.21^b</td>
</tr>
<tr>
<td>Number of pedagogy courses completed</td>
<td>-0.14</td>
<td>-0.07</td>
<td>-0.23^b</td>
</tr>
<tr>
<td>Number of hours in andragogy</td>
<td>-0.03</td>
<td>-0.11</td>
<td>-0.16^b</td>
</tr>
<tr>
<td>Degree completed^1</td>
<td>0.36^a</td>
<td>0.29^a</td>
<td>0.95^c</td>
</tr>
<tr>
<td>Program area^2</td>
<td>0.17^b</td>
<td>0.15^b</td>
<td>0.51^d</td>
</tr>
<tr>
<td>Field of study^3</td>
<td>0.51^b</td>
<td>0.18^b</td>
<td>0.47^d</td>
</tr>
</tbody>
</table>

^a Kendall's $\tau_c$
^b Point Biserial
^c Biserial
^d $\phi$ coefficient

^1 Bachelor of Science or Arts; Master of Science or Arts; and Doctorate/DVM degree.
^2 Farm management/community development only; plant/animal production only; and both areas.
^3 Social science or technical studies.

level of cognition, i.e., state agricultural specialists with a doctorate/DVM degree tended to plan the OCES programs at higher intended levels of cognition. A positive low association was found between highest intended level of cognition and major program area emphasized by the county agricultural agents and state agricultural specialists in 1991/92 ($r_{pb} = 0.17$). A negative low and negligible association was found between highest intended level of cognition and number of pedagogical courses completed and number of andragogical hours completed ($r = -0.14$ and $r = -0.03$, respectively).
The results in Table 15 show that a negative moderate association was found between county agricultural agents' highest intended level of cognition and percent of time spent on other job responsibilities such as 4-H programming, home owner horticulture, multi-county, and service to their college/profession ($r = -0.33$). This indicates that as the percent of time spent on other job responsibilities tended to decreased, county agricultural agents' highest intended level of cognition increased. A positive low association was found between county agricultural agents' highest intended level of cognition and percent of time spent in CNRD programming ($r = 0.22$). County agricultural agents' highest intended level of cognition tended to increase as percent of time spent in CNRD programming increased. Negative low and negative negligible associations were found between highest intended level of cognition and percent of time spent in agriculture programming or as county chair ($r = 0.11$ and $r = -0.07$, respectively).

A positive moderate association was found between state agricultural specialists' highest intended level of cognition and percent of time spent in resident instruction ($r = 0.35$). State agricultural specialists' highest intended level of cognition tended to increase as the percent of time spent in resident instruction increased. This indicated that state agricultural specialists tended to plan the OCES programs at higher intended level of cognition.
as their percent of time spent in resident instruction increased. A positive low association was found between state agricultural specialists' highest intended level of cognition and the percent of time they spent in research \((r = 0.20)\). This indicated that state agricultural specialists tended to deliver the OCES programs at higher levels of cognition as their percent of time spent in research increased. A positive negligible association was found between state agricultural specialists' highest intended level of cognition and the percent of time they spent in extension \((r = 0.05)\).

Table 15

**Correlation Between Distribution of County Agricultural Agents'/State Agricultural Specialists' Job Responsibilities and Highest Intended and Actual Levels of Cognition**

<table>
<thead>
<tr>
<th>Responsibilities</th>
<th>County Agents</th>
<th>State Specialists</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of Time</td>
<td>Intended</td>
<td>Actual</td>
</tr>
<tr>
<td>Agriculture programming</td>
<td>-0.11</td>
<td>-0.28</td>
</tr>
<tr>
<td>County chair</td>
<td>-0.07</td>
<td>0.19</td>
</tr>
<tr>
<td>CNRD programming</td>
<td>0.22</td>
<td>0.50</td>
</tr>
<tr>
<td>Other % of time</td>
<td>-0.33</td>
<td>-0.93</td>
</tr>
</tbody>
</table>
Relationship Between Highest Actual Level of Cognition and Selected Demographic Characteristics of the County Agricultural Agents/State Agricultural Specialists

According to the correlations in Table 14, a positive low association between highest actual level of cognition and degree completed \((r_c = 0.29)\). The higher the degree completed, the higher the highest actual level of cognition -- county agricultural agents and state agricultural specialists with doctorate/DVM degrees displayed higher actual levels of cognition. Positive low associations were found between highest actual level of cognition and years of experience, program area emphasized in 1991/92, and field of study as social science or technical studies \((r = 0.16, r_{pb} = 0.15, \text{and } r_{pb} = 0.18, \text{respectively})\). Negative low and negligible associations were found between number of hours completed in andragogy, number of pedagogical courses completed, and highest actual level of cognition \((r = -0.11 \text{ and } -0.07, \text{respectively})\).

According to the correlations in Table 15, a negative very strong association was found between county agricultural agents' highest actual level of cognition and percent of time spent in other job responsibilities such as 4-H programming, home owners horticulture and multi-county and service to their college/profession \((r = -0.93)\). As percent of time spent on other job responsibilities decreased, county agricultural agents actually delivered the OCES programs at higher levels of cognition. A positive
substantial association was found between county agricultural agents' highest actual level of cognition and percent of time spent in CNRD programming \( (r = 0.50) \). County agricultural agents' highest actual level of cognition in delivering the OCES programs tended to increase as their percent of time spent in CNRD programming increased. A negative low association was found between county agricultural agents' highest actual level of cognition and percent of time spent in agriculture programming \( (r = -0.28) \). County agricultural agents' highest actual level of cognition in delivering the OCES programs tended to increase as their percent of time spent in agriculture programming decreased. A positive low association was found between county agricultural agents' highest actual level of cognition and the percent of time they spent as county chair \( (r = 0.19) \).

A positive moderate association was found between state agricultural specialists' highest actual level of cognition and the percent of time they spent in extension \( (r = 0.34) \). State agricultural specialists tended to actually deliver the OCES programs at higher cognitive levels as their percent of time spent in extension increased. Negative moderate associations were found between state agricultural specialists' highest actual level of cognition and the percent of time they spent in resident instruction and in research \( (r = -0.33 \text{ and } r = -0.34, \text{ respectively}) \). State
agricultural specialists' highest actual level of cognition of delivering the OCES programs tended to increase as the percent of time they spent in resident instruction and research decreased (Table 15).

**Relationship Between Type of Agricultural Agents and Selected Characteristics of the County Agricultural Agents/State Agricultural Specialists**

According to Table 14, a positive very strong association existed between type of agricultural agents and degree completed ($r_b = 0.95$). State agricultural specialists have completed more advanced degrees (PhD/DVM) than county agricultural agents. A positive substantial association was found between program area emphasized in 1991/92 and type of agricultural agents ($\phi = 0.51$). State agricultural specialists emphasized both farm management/community development and plant/animal production types of programs. A positive moderate association was found between type of agricultural agents and field of study as social science or technical studies ($\phi = 0.47$). The majority of state agricultural specialists had completed technical studies degrees. A low positive association was found between years of experience and type of agricultural agents ($r_{pb} = 0.21$). State agricultural specialists had more years of experience than the county agricultural agents. Negative low associations were found between number of pedagogical courses completed, number of andragogical
hours earned, and type of agricultural agents ($r_{pb} = -0.23$ and $r_{pb} = -0.16$, respectively). State agricultural specialists had completed less pedagogical courses and enrolled in less andragogical hours than county agricultural agents.

**Variance Explained**

The intercorrelations between each rival independent variables and the two main independent variables and the dependent variable were calculated. Then, all variables that had correlations of 0.25 or higher were entered into the hierarchical regression model. Two hierarchical regression models were formed to test the unique variance explained in the dependent variable by each main independent variable. The first model contained both the rival independent variables (degree completed, percent of time spent by county agricultural agents on other job responsibilities; percent of time spent by state agricultural specialists as resident instruction) and the main independent variable (highest intended level of cognition). The second model contained both the rival independent variable (degree completed) and the main independent variable (type of agricultural agents).

Semi-partial multiple regression correlation coefficients were computed to determine the proportion of variance in the dependent variable (highest actual level of cognition) that could be explained uniquely by controlling
for the other rival independent variables. The rival independent variables (degree completed, percent of time spent by county agricultural agents on other job responsibilities, and percent of time spent by state agricultural specialists as resident instruction) were controlled to determine the amount of variance uniquely explained by the main independent variable (highest intended level of cognition) in the dependent variable (highest actual level of cognition). The semi-partial squared multiple regression correlation coefficient of 0.009 (0.9 %) was not found to be significant (p=0.6119) (Appendix K).

Also, the rival independent variable (degree completed) was held constant to determine the amount of variance uniquely explained by the main independent variable (type of agricultural agents) in the dependent variable (highest actual level of cognition). The semi-partial squared multiple regression correlation coefficient of 0.006 (0.6 %) proved to be not significant (p=0.6633) (Appendix K).
CHAPTER V

SUMMARY, CONCLUSIONS, RECOMMENDATIONS
AND IMPLICATIONS

The Cooperative Extension Service (CES) is facing a new challenge in the wake of the changing agricultural scenario in the American society. This demands that the CES set new standards of excellence to meet the great varieties of information needs. Ironically, while the number of clientele in rural areas has been rapidly declining, the clientele in the urban areas is increasing (Warner and Christenson, 1989).

Changes in the demographic composition of contemporary American society make it obvious that there is a need for educational programs to address a wide range of issues across the subjects to meet the needs of newly emerging clientele groups. Also, the literature revealed that the CES agents are not familiar with the application of the taxonomy of the educational objectives which might encourage learning by clientele. Furthermore, a paucity of research has been conducted concerning the intended and actual level of cognition of instruction regarding informal educational

110
programs as compared to formal educational programs.

Purpose and Objectives of the Study

The purpose of this study was to describe the highest intended and actual levels of cognition for agricultural instruction delivered by the Ohio Cooperative Extension Service (OCES). In addition, the study sought to describe the relationships among intended level of cognition, actual level of cognition, and type of agricultural agents and selected personal and professional demographic characteristics of the OCES county agricultural agents and state agricultural specialists. Specifically, the study sought to:

1. Describe the highest intended level of cognition or instruction in selected OCES programs.
2. Describe the highest actual level of cognition for instruction in selected OCES programs.
3. Ascertain the relationship between the highest intended level of cognition of instruction and selected characteristics of the OCES county agricultural agents and state agricultural specialists.
4. Ascertain the relationship between the highest actual level of cognition of instruction and selected characteristics of the OCES county agricultural agents and state agricultural specialists.
5. Ascertain the relationship between the highest intended level of cognition of instruction and the highest actual level of cognition of instruction of the OCES programs.

6. Ascertain the relationship between the type of agricultural agents and selected characteristics of the OCES county agricultural agents and state agricultural specialists.

Hypotheses

The following main hypotheses were tested.

1. The highest actual level of cognition of the instruction delivered by OCES county agricultural agents and state agricultural specialists will be significantly higher than the highest intended level of cognition of instruction.

2. State agricultural specialists deliver instruction at significantly higher actual levels of cognition in their instruction than county agricultural agents do in their programs.

The rival hypotheses were:

1. County agricultural agents and state agricultural specialists who have had more years of experience deliver significantly higher actual levels of cognition in their instruction than those who have had fewer years of experience.

2. County agricultural agents and state agricultural
specialists with more pedagogical courses, as part of their academic program, deliver instruction at significantly higher actual levels of cognition than those who have had fewer pedagogical courses.

3. County agricultural agents and state agricultural specialists with more hours of preparation in andragogy deliver instruction at significantly higher actual levels of cognition than those who have had fewer hours of preparation in andragogy.

4. County agricultural agents and state agricultural specialists with different educational degrees completed differ significantly in actual levels of cognition of instruction in delivering OCES programs.

5. County agricultural agents and state agricultural specialists with different major educational areas of study differ significantly in actual levels of cognition of instruction in delivering OCES programs.

6. Significant differences in actual levels of cognition of instruction will exist among types of educational programs county agricultural agents and state agricultural specialists emphasize in agriculture.

7. County agricultural agents and state agricultural specialists with different distributions of job
responsibilities differ significantly in actual levels of cognition of instruction.

8. There is a positive relationship between intended level of cognition of instruction and
   a. Years of experience
   b. Number of pedagogical courses completed
   c. Number of hours enrolled in andragogy
   d. Degree completed
   e. Major field of study
   f. Program emphasized in 1991/92
   g. Distribution of job responsibilities.

9. There is a positive relationship between type of agricultural agent with county agricultural agents coded 1 and state agricultural specialists coded 2 and
   a. Years of experience
   b. Number of pedagogical courses completed
   c. Number of hours enrolled in andragogy
   d. Degree completed
   e. Major field of study
   f. Program emphasized in 1991/92

Methodology

The design of this study was ex post facto research. The main independent variables were the highest intended level of cognition and type of agricultural agent which had
already occurred. The dependent variable was the highest actual level of cognition. The rival independent variables were years of experience, number of pedagogical courses completed, number of hours earned in andragogy, educational degree earned, major area of study, program area emphasized in 1991/92, and distribution of job responsibilities.

The target population of this study consisted of 73 county agricultural agents and 72 state agricultural specialists. The accessible population was comprised of 30 county agricultural agents and state agricultural specialists randomly selected for the study.

**Measuring the Intended Levels of Cognition of Instruction**

The study utilized an existing interview schedule developed by Kitinoja and Miller (1989) to collect data. The instrument was examined for validity and intra-rater reliability. The instrument had an intra-rater reliability of 99% agreement.

To verify validity, the researcher established a panel of experts of three members (Appendix D) from the faculty of the Department of Agricultural Education at The Ohio State University to assess the interview schedule for content and face validity. In terms of the inter-rater reliability, the researcher listened to the tapes recorded during the interviews and wrote the complete answers for each question in the interview schedule instrument. Also, another panel
of experts of four members (Appendix E) from the Department of Agricultural Education at The Ohio State University and an outside expert who worked in this area of research assessed the inter-rater reliability.

A paired comparison was made between each member of the panel of experts' assessment and those of the researcher and between one and another members of the panel of experts to determine the percent of agreement. The average percent of agreement of the pair comparisons of 82.7 percent was obtained and reported as inter-rater reliability.

The means, standard deviations, and correlations for each paired comparison were obtained and reported (Table 1). The average correlation of \( r = .99 \) was also obtained using Fisher's \( z \)-transformation procedures.

**Measuring the Actual Levels of Cognition of Instruction**

To measure the actual levels of cognition of instruction, the researcher used the Florida Taxonomy of Cognitive Behavior (FTCB) instrument adapted by Kitinoja and Miller (1989). The FTCB instrument was modified to be used with Bloom's taxonomy of six categories (knowledge, comprehension, application, analysis, synthesis, and evaluation). The categories of translation and interpretation were combined to be represented by the comprehension category of Bloom's taxonomy.

The validity of the FTCB instrument is based on its
direct development from Bloom's taxonomy and the support generally given by scholarly community for Bloom et al.'s hierarchy for the classification of cognitive behaviors. Reliability of the modified FTCB instrument is based on the rater's utilization of the instrument. Therefore, inter-rater and intra-rater reliability of the instrument were established.

Inter-rater reliability was assessed by a panel of three experts (Appendix G) from the Department of Agricultural Education and an outside expert who worked in this area of research. The percent of agreement resulting from the assessment made by the panel of experts and those made by the researcher and between one and another members of the panel of experts were computed. The average percent of agreement of 81.3 percent was obtained and reported as inter-rater reliability.

The intra-rater reliability was assessed by computing the percent of agreement upon rating a given tape twice with an interval of one week between the first and second ratings. The percentage of agreement of 96 percent was obtained and reported as an intra-rater reliability. The researcher reported the highest actual levels of cognition which occurred in each instruction session as evidence of behavior.
Collecting Personal and Professional Demographic Data

The researcher developed an instrument to collect personal and professional demographic information. The content and face validity of the personal and professional demographic information instrument were assessed using a panel of three experts (Appendix I) from the Department of Agricultural Education and the Ohio Cooperative Extension Service.

Measuring County Agricultural Agents'/State Agricultural Specialists' Actual Levels of Cognition of Instruction

The highest levels at which county agricultural agents and state agricultural specialists actually deliver the OCES programs were determined through an audio taping of the actual teaching conducted by the county agricultural agents and state agricultural specialists. The researcher telephoned or met face-to-face with all of the county agricultural agents and state agricultural specialists selected to participate in the study. The researcher explained to them the purpose of the study and asked them to participate in the study and to audio tape at least one of their group presentations during the months of January, February, March, or April, 1991. The study had prior approved by the OCES Administrative Cabinet.

Letters co-signed by the researcher and Dr. Keith Smith, Associate Director of the OCES, were sent to all of
the county agricultural agents and state agricultural specialists who agreed to participate in the study. Two of the 15 county agricultural agents who were randomly selected and initially agreed to participate in the study decided not to participate. The researcher randomly selected two other county agricultural agents to replace them. However, all state agricultural specialists who were randomly selected and initially agreed participated in the study.

The researcher also sent a ninety-minute blank audio tape to each participant to record the presentation along with a self-addressed stamped return envelope. For the researcher to gain clear insight into actual delivery of instruction, the researcher traveled with ten of the fifteen State agricultural specialists who agreed to participate in the study to audio tape and observe their presentations.

Approximately one week later, the researcher selected a random sample from the participants and telephoned them to make sure that the letters and blank tapes were received by the participants. During the telephone calls, each participant selected a convenient program and date to audio tape his/her presentation. A week before the selected date, telephone calls were made to remind participants about audio taping the presentations. Furthermore, one week after the date was arranged, telephone calls were made to the participants. Those finished with audio taping their presentations were asked to return the tapes.
Measuring County Agricultural Agents'/State Agricultural specialists’ Intended Levels of Cognition of Instruction

The highest levels at which the county agricultural agents and state agricultural specialists intended to deliver the OCES programs were determined through face-to-face interviews. The interviews were conducted by the researcher with all 30 county agricultural agents and state agricultural specialists using an interview schedule (Appendix F) developed by Kitinoja and Miller (1989). The interviews were tape-recorded, with the permission of the participants.

The interviews were conducted during the months of May and June, 1991. Arrangements for time and meeting places were made over the telephone or face-to-face with all 30 county agricultural agents and state agricultural specialists selected to participate in the study. The researcher made a follow-up telephone call to remind the participants of the interview dates.

Measuring Personal and Professional Demographic Factors

Demographic data related to certain factors influencing the delivery of instruction were collected during the face-to-face interviews scheduled during May and June, 1991. All 30 county agricultural agents and state agricultural specialists were asked to complete the questionnaire developed by the researcher (Appendix J) before the face-to-face interview started.
Data Analysis

The data were analyzed using the Statistical Package for the Social Sciences PC version (SPSS-PC+) program. The statistical information obtained in the analysis included frequencies, means, median, percentages, standard deviations, correlation coefficients, t-test, regression, and one-way analysis of variance. The alpha level for testing the research hypotheses was set a priori at 0.05.

Summary of Findings

Personal and Professional Demographic Characteristics of the County Agricultural Agents and State Agricultural Specialists

Demographic information data in this study were collected from a sample of 30 county agricultural agents and state agricultural specialists in the State of Ohio. Data were collected on the following rival independent variables. The length of years of experience ranged from 2 to 38 years. The majority (60.0%) had 2 to 20 years of experience. Approximately 17% had less than 5 years of experience.

About three-fourths of the county agricultural agents and state agricultural specialists had between 0 and 25 hours in andragogy. Forty-seven percent had less than ten hours in andragogy. The average and the median number of courses were 1.6 and 1.0 courses respectively. About 43% had not completed pedagogical courses and nearly 28% had
Professional Demographic Characteristics of the County Agricultural Agents and State Agricultural Specialists

Program Area Emphasized

Sixty percent of the county agricultural agents and state agricultural specialists had emphasized both farm management/community development and plant/animal production in their programming during 1991/92. Approximately 27% emphasized plant/animal production only in 1991/92 programming.

Field of Study of the Educational Degree Earned

Sixty-nine percent of the 29 county agricultural agents and state agricultural specialists had completed a bachelor in technical studies. Fifty-two percent of the 29 county agricultural agents and state agricultural specialists had completed a master’s in technical studies. Eighty percent of the 15 state agricultural specialists had completed doctorate/DVM in technical studies.

Job Responsibilities Percent of Time Spent

All county agricultural agents had agricultural programming appointments. Ninety percent had CNRD
programming and 73.0% had county chair appointments. All state agricultural specialists had extension appointments with 73% having research appointments and 60.0% had resident instruction appointments.

Cognitive Level of Instruction

Data were collected related to the highest intended and the highest actual levels of cognition.

Highest Levels of Cognition

Fifty percent of all county agricultural agents and state agricultural specialists intended to deliver the OCES programs at comprehension and application levels of cognition while 93.0% of all county agricultural agents and state agricultural specialists actually delivered the OCES programs at the analysis, synthesis, and evaluation levels of cognition. Two-thirds of the county agricultural agents and state agricultural specialists interviewed reported that they had no written lesson plans or objectives written for the lesson.

Seventy-three percent of the county agricultural agents intended to deliver the OCES programs at the comprehension and application levels of cognition while 60.0% of the county agricultural agents actually delivered the OCES programs at the analysis level of cognition. Sixty percent of the state agricultural specialists intended to deliver...
the OCES programs at the evaluation level of cognition while all state agricultural specialists actually delivered the OCES programs at the analysis, synthesis, and evaluation levels of cognition. Sixty percent of the county agricultural agents regressed upward 1 to 3 levels from intended to actual levels of cognition while approximately seven percent regressed downward 1 level from intended to actual levels of cognition. One-third of the state agricultural specialists regressed upward 1 to 4 levels while 40.0% regressed downward 1 to 2 levels from intended to actual levels of cognition.

**Differences Among Variables of Interest**

Data were collected to test significant differences using t-test or one-way analysis of variance for the research hypothesis (HM₁, HM₂, HR₆, HR₈₋₇, HR₈₋₆, HR₈₋₅, HR₇, HR₅, HR₁, and HR₈₋₄).

**Differences Among the Highest Intended and the Highest Actual Levels of Cognition of County Agricultural Agents and State Agricultural Specialists**

The results of the t-test between the highest intended and the highest actual levels of cognition by county agricultural agents and state agricultural specialists and type of agricultural agent indicated that significant differences were found between the highest intended and the highest actual levels of cognition for the county agricultural agents and state agricultural specialists.
No significant differences between the highest intended and the highest actual levels of cognition were found for the state agricultural specialists. Differences between the type of agricultural agent and levels of cognition were tested and significant differences were found between county agricultural agents and state agricultural specialists’ highest intended levels of cognition. No differences were found between the county agricultural agents’ and state agricultural specialists’ highest actual levels of cognition.

The results of the analysis of variance of the highest actual and the highest intended levels of cognition by major program area emphasized in 1991/92 indicated that there were no significant differences among the averages highest actual levels of cognition of the three major program areas emphasized in 1991/92. However, significant differences were found among the averages highest intended levels of cognition for the three major program areas emphasized in 1991/92.

Differences by years of experience and levels of cognition were tested and no significant differences were found in the intended and actual levels of cognition for county agricultural agents and state agricultural specialists with less than or more than five years of experience. Percent of time spent in agriculture programming by county agricultural agents or in extension by state agricultural specialists and
intended and actual levels of cognition were examined. The results indicated that county agricultural agents and state agricultural specialists do not differ in the averages highest intended and actual levels of cognition for less than or more than 50% of time spent in agriculture programming by county agricultural agents or in extension by state agricultural specialists.

The results of the study related to the field of study as social science or technical studies for college educational degrees earned and levels of cognition indicated that county agricultural agents with technical studies delivered the OCES programs at higher intended levels of cognition. However, county agricultural agents and state agricultural specialists with degrees in the social science or technical studies did not differ in the average highest actual levels of cognition in delivering the OCES programs.

**Relationship Among the Highest Intended Level of Cognition and Selected Personal and Professional Demographic Characteristics of the County Agricultural Agents and State Agricultural Specialists**

Correlation between highest intended level of cognition and years of experience showed that as the number of years of experience of the county agricultural agents and state agricultural specialists who participated in the study decreased, the highest intended level of cognition at which the county agricultural agents and state agricultural specialists planned to deliver the OCES programs increased.
The correlation between the highest intended level of cognition and field of study revealed that county agricultural agents and state agricultural specialists with technical studies degrees planned to deliver the OCES programs at higher intended levels of cognition than county agricultural agents and state agricultural specialists with social studies degrees ($r_{pb} = 0.51$). Correlation between the highest intended level of cognition and degree completed revealed that county agricultural agents and state agricultural specialists with doctorate/DVM degrees completed planned to deliver the OCES programs at higher intended levels of cognition ($r_c = 0.36$).

The correlation between the highest intended level of cognition and job responsibilities as other percent of time spent revealed that as percent of time spent by county agricultural agents on other job responsibilities decreased, the intended level of cognition at which the OCES programs were delivered increased ($r = -0.33$). Also, as percent of time spent by state agricultural specialists as resident instruction increased, the intended level of cognition at which the OCES programs were to be delivered increased ($r = 0.35$).
Relationship Between the Highest Actual Level of Cognition and Selected Demographic Characteristics of the County Agricultural Agents and State Agricultural Specialists

The correlation between the highest actual level of cognition and degree completed showed that county agricultural agents and state agricultural specialists with doctorate/DVM degrees delivered the OCES programs at higher actual levels of cognition ($r_c = .29$). The association between the highest actual level of cognition and percent of time spent by county agricultural agents and state agricultural specialists showed that as percent of time spent by county agricultural agents on other job responsibilities and agriculture programming decreased, actual level of cognition at which the OCES programs were delivered increased ($r=-.93$ and $-.28$ respectively).

Also, the association showed that as percent of time spend on CNRD programming by county agricultural agents increased, the actual level of cognition at which the OCES programs were delivered increased ($r=.50$). Moreover, as percent of time spent by state agricultural specialists on resident instruction and in research decreased, the actual level of cognition at which the OCES programs delivered increased ($r=-.33$ and $-.34$ respectively). In addition as percent of time spent in extension by state agricultural specialists increased, the actual level of cognition at which the OCES programs were delivered increased ($r=.34$).
Relationship Between Type of Agricultural Agent and Selected Demographic Characteristics of the County Agricultural Agents and State Agricultural Specialists

Correlations between type of agricultural agent and college degree completed, program area emphasized, and field of study revealed that state agricultural specialists earned higher college educational degrees than county agricultural agents. State agricultural specialists emphasized on both farm management/community development and plant/animal production in their 1991/92 major programming area. The majority of state agricultural specialists had earned technical studies degrees in their college educational degrees. State agricultural specialists had completed a fewer number of pedagogical courses in their college educational background as compared to the county agricultural agents.

Conclusions

A typical county agricultural agent who participated in this study had 15.7 years of experience, had completed 2 pedagogical courses, had participated in 20 (Median) hours of andragogy, had a master’s degree of science or arts in his/her college education, had social science as the field of study, had emphasized both farm management/community development and plant/animal production, and had spent most of his/her time in agriculture programming.

A typical state agricultural specialists who
participated in this study had 17.5 years of experience, had completed 1 pedagogical course, had participated in 10 (Median) hours in andragogy, had a doctorate/DVM degree, had a technical area as the field of study for the degree, had emphasized plant/animal production program area only, and had spent most of his/her time in extension.

Based on the findings from this study, the following conclusions can be made on the basis of the 30 county agricultural agents and state agricultural specialists who participated in this study.

1. County agricultural agents and state agricultural specialists who participated in the study delivered the OCES programs at higher actual cognitive levels than they originally intended (\( \bar{x} \) intended = 3.97; \( \bar{x} \) actual = 4.57). This is contradictory to previous studies conducted by Kitinoja and Miller (1989) and Whittington (1991) in which OCES extension agents’ planned and delivered OCES programs almost at the same highest levels from intended to actual while college professors aspired to teach at higher cognitive levels than they were actually do.

2. The majority (73%) of the county agricultural agents planned the OCES programs with their highest intended levels of cognition being at the comprehension or application levels, while the
majority (73%) delivered the OCES programs with their highest actual level of cognition being analysis, synthesis, or evaluation levels of cognition. Although the majority (73%) of the state agricultural specialists intended to deliver the OCES programs at the two highest cognitive levels (evaluation and analysis), they actually delivered the OCES programs at the three highest levels of cognition (analysis, synthesis, and evaluation). This showed that state agricultural specialists intended and actually delivered the OCES programs at higher cognitive levels than county agricultural agents.

3. County agricultural agents regressed upward more levels of cognition from intended to actual than did state agricultural specialists. State agricultural specialists regressed downward more than upward from intended to actual levels of cognition. This showed that those county agricultural agents and state agricultural specialists who tended to plan the OCES programs at lower levels of cognition delivered them at higher levels than they intended. However, those county agricultural agents and state agricultural specialists who tended to plan the OCES programs for higher cognitive levels delivered them at
County agricultural agents and state agricultural specialists in the plant/animal production program area only taught at higher intended levels of cognition (synthesis) than the county agricultural agents and state agricultural specialists teaching the farm management/community development program area only. County agricultural agents and state agricultural specialists actually taught the three program areas at the analysis level of cognition. This meant that the nature of the subject matter had an influence on the intended level of cognition. Those county agricultural agents and state agricultural specialists who emphasized plant and animal production program area only tended to plan the OCES programs at a higher intended level of cognition than county agricultural agents and state agricultural specialists who emphasized the farm management and community development program area only. However, subject matter did not have an influence on the level of cognition at which the OCES program was delivered.

County agricultural agents and state agricultural specialists who had experience of less than or more than 5 years did not differ in the average
highest intended or actual levels of cognition. Moreover, less experienced county agricultural agents and state agricultural specialists tended to deliver the OCES programs at higher intended level of cognition \( (r=-.46) \). This showed that years of experience may have an inverse influence on level of cognition at which county agricultural agents and state agricultural specialists delivered the OCES programs because less experienced county agricultural agents and state agricultural specialists delivered the OCES programs at higher levels of cognition than their more experienced counterparts.

6. County agricultural agents who had more than 50% of job responsibilities in agriculture programming or extension by state agricultural specialists did not differ in the average highest intended and actual levels of cognition. However, county agricultural agents with less job responsibilities in agriculture programming delivered the OCES programs at higher actual level of cognition, whereas state agricultural specialists with more job responsibilities in extension delivered the OCES programs at higher actual level of cognition \( (r=.28 \text{ and } .34 \text{ respectively}) \).

7. County agricultural agents and state agricultural
specialists with degrees in technical studies planned the OCES programs at higher intended levels of cognition than county agricultural agents and state agricultural specialists with social science degrees ($r_{pb}=.51$). This finding supported a previous study conducted by Bhardwaj (1989). This meant that county agricultural agents and state agricultural specialists with degrees (for example) in agricultural education or agricultural economic planned to deliver the OCES programs at lower level of cognition than those who studied horticulture or animal science. However, regardless of degree earned (social science or technical studies), county agricultural agents and state agricultural specialists did not differ in the average highest actual levels of cognition found in delivering the OCES programs.

8. County agricultural agents and state agricultural specialists with doctorate/DVM degrees delivered the OCES programs at higher intended and actual levels of cognition ($r_c=.36$ and .29; respectively) than county agricultural agents and state agricultural specialists with master’s degrees. This meant that state agricultural specialists delivered the OCES programs at higher intended and actual levels of cognition than county
agricultural agents with master’s degree.

9. County agricultural agents who spent less time on other job responsibilities were inclined toward delivering the OCES programs at higher intended and actual levels of cognition ($r = -0.33$ and $-0.93$; respectively) than county agricultural agents and state agricultural specialists who spent more time on other job responsibilities. This may mean that when county agricultural agents are loaded with more job responsibilities they do not have enough time to plan and teach the OCES programs at higher levels of cognition.

10. State agricultural specialists tended to deliver the OCES program at higher intended levels of cognition as percent of time spent in resident instruction increased ($r = 0.35$). Surprisingly, as percent of time spent in resident instruction decreased, state agricultural specialists delivered the OCES programs at higher actual level of cognition ($r = -0.33$). This meant that state agricultural specialists who have more job responsibilities in college teaching tend to plan the OCES programs at higher intended level of cognition, but they do not deliver them at higher actual levels of cognition. This conclusion supports a previous study conducted by
Whittington (1991) for college professors in agriculture.

11. A substantial positive association (r=.50) existed between the percent of appointment time spent by county agricultural agents in CNRD programming and the level of cognition at which programs are delivered.

12. A moderate negative association (r=-.34) existed between the percent of appointment time spent by state agricultural specialists in research and the level of cognition at which programs are delivered.

**Recommendations**

Based on the findings of the study, the following recommendations are made for six groups: the county agricultural agents, the state agricultural specialists, the OCES administrators, the Department of Agricultural Education, the technical departments in the College of Agriculture, and the College of Agriculture.

The *County Agricultural Agents*

1. Data show that on the average county agricultural agents plan and deliver the OCES programs at the application and analysis levels of cognition. Therefore, county agricultural agents should place
more emphasis on planning and delivering the OCES program at the higher levels of cognition (synthesis and evaluation).

2. County agricultural agents should attend workshops conducted by the Department of Agricultural Education or OCES to familiarize themselves with the use of the taxonomies of educational objectives such as Bloom's Taxonomy or Newcomb and Trefz Model. This should help county agricultural agents to write educational objectives at highest levels of cognition.

3. County agricultural agents should apply the knowledge they learned from the pedagogical courses they have taken to their planning and teaching of OCES programs.

The State agricultural specialists

1. State agricultural specialists need to consider more fully the levels of cognition in planning and delivering the OCES programs. This could be achieved through determining the levels of cognition at which a particular program should be planned and delivered based on the needs of the individuals anticipated to participate in the program.

2. State agricultural specialists should participate in workshops on the use of the taxonomies of
educational objectives conducted by the Department of Agricultural Education or OCES. This participation will help them to gain more knowledge and understanding of how to teach at the different levels of Bloom’s Taxonomy or Newcomb and Trefz Model.

3. State agricultural specialists should participate in workshops planned by the Department of Agricultural Education or OCES related to teaching at the higher levels of cognition. This may enable state agricultural specialists to achieve higher levels of teaching proficiency by sharpening their teaching abilities.

**The OCES Administrators**

1. When hiring county agricultural agents and state agricultural specialists, the OCES should place more emphasis upon selecting individuals who have knowledge about taxonomies of Education Objectives such as Bloom’s Taxonomy or Newcomb and Trefz Model.

2. Regardless of an agent’s position, education, and experience; in-service training programs on the use of the taxonomies of education objectives should be part of the agent’s professional growth.

3. The OCES should tie the teaching portion of performance appraisal of its county agricultural
agents and state agricultural specialists to the use of the taxonomy of educational objectives in planning and delivering the OCES educational programs, and eventually document actual teaching.

4. The OCES should educate district directors or establish a team of faculty with expertise in teaching techniques and knowledgeable in the Taxonomies of Educational Objectives to observe county agricultural agents and state agricultural specialists teaching and provide feedback for improvement.

The Department of Agricultural Education

1. The Department of Agricultural Education should review the courses offered related to teaching methods, developing lesson plans, and continuing education. These courses should emphasize the application of the principles of teaching and learning at higher cognitive levels because the findings of this study revealed that county agricultural agents and state agricultural specialists with social science field of study degrees intended to deliver the OCES programs at lower cognitive levels.

2. The Department should take the initiative to arrange workshops on the use of the taxonomies of
educational objectives directed specifically toward extension educators.

**Technical Departments in the College of Agriculture**

1. Technical departments in the College of Agriculture should require their students to take courses in teaching methods during their undergraduate program, or during their graduate program if none was taken previously.

**College of Agriculture**

1. Since most of the students enrolled in the College of Agriculture in one way or another are going to teach or be presenting seminars in their future jobs, the College should require all undergraduate students to take courses in teaching and learning.

2. OCES is the third arm of this land-grant university and its teaching represents the College of Agriculture to the public of the state. Therefore, the college should endorse the developments of higher order teaching and/or thinking skills in its participants.

**Implication of the Study**

Two areas of implications are raised from the study. One implication is to the current body of knowledge and the second implication is to the need for further study.
Implication for the Body of Knowledge

**Intended Level of Cognition**

The data from this study showed that the highest intended level of cognition at which most of the county agricultural agents and state agricultural specialists who participated in this study delivered the OCES programs were comprehension, application, analysis, and evaluation. Although a small percentage of the county agricultural agents and state agricultural specialists intended to deliver the OCES programs at the synthesis level of cognition, none of the county agricultural agents and state agricultural specialists intended to deliver the OCES programs at the lower cognitive level, knowledge. These data were consistent with the findings by Kitinoja and Miller (1989) who found that the majority of the OCES county agricultural agents and state agricultural specialists intended to deliver the OCES programs at the comprehension, application, analysis, and synthesis levels of cognition (Table 16).

The data from this study revealed that 37% of the county agricultural agents and state agricultural specialists intended to deliver the OCES programs at the synthesis and evaluation levels of cognition. These data were consistent with the findings by Cano (1988), Kitinoja and Miller (1989), and Whittington (1991). Cano found that
about 31% of vocational agricultural teachers' written objectives were at the synthesis and evaluation levels of cognition while Whittington found that college professors aspired to spend 29% of their time at the synthesis and evaluation levels of cognition. Kitinoja and Miller (1989) found that 33% of the OCES county agricultural agents' and state agricultural specialists' objectives were at the evaluation level of cognition (Table 16). This implied that about one-third of the educational objectives in these three studies were written at the synthesis and evaluation levels of cognition or the evaluation level only. This was higher than the literature suggested it might be.

Furthermore, data in this study showed that the majority of the county agricultural agents and state agricultural specialists (64%) intended to deliver the OCES programs at the processing (comprehension, application, and analysis) level of cognition. These data were higher than those found in previous studies (Cano, 1988; Bhardwaj, 1989; and Whittington, 1991) whose findings across the written objectives by teachers/agents or percent of time aspired by college professors at each level of cognition are 38%, 46%, and 32%, respectively (Table 16). The data in this study were also in agreement with the Kitinoja and Miller (1989) study which found that OCES agents did not plan OCES programs at the lower level of cognition (knowledge).

However, these data contradicted the findings by Cano
Bhardwaj (1989), and Whittington (1991) whose findings are reported in Table 16. Cano found that 31% of the objectives written by vocational agricultural teachers were at the knowledge level of cognition while Bhardwaj found 41% of the objectives written by the OCES county agricultural agents were at the knowledge level of cognition. Whittington found that college professors aspired to teach at the knowledge level of cognition 39% of the time.

However, this does not imply that OCES county agricultural agents and state agricultural specialists

Table 16

Comparison of Intended Level of Cognition Across Studies.

<table>
<thead>
<tr>
<th>Level of Cognition</th>
<th>Cano 1</th>
<th>Bhardwaj 2</th>
<th>Kitinoja &amp; Miller 3</th>
<th>Whittington 4</th>
<th>Ismail 5</th>
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<td>0.0</td>
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<td>14.3</td>
<td>33.3</td>
<td>15.0</td>
<td>30.0</td>
</tr>
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</table>

1 1988, (n=10), Vocational agriculture teachers written objectives.
2 1989, (n=20), Ohio Cooperative Extension Service agents written objectives.
3 1989, (n=9), OCES agents written objectives (highest intended level of cognition).
4 1991, (n=10), College of Agriculture professors percent of time aspired.
5 1992, (n=30), OCES county agricultural agents and state agricultural specialists highest intended level of cognition.
skipped the lower level of cognition which emphasizes the basic foundation on which to move to the next higher level of cognition, comprehension. Bloom et al.'s (1956) theory, on which this study was grounded, assumed that the Taxonomy of Educational Objectives-Cognitive Domain was a cumulative hierarchy, where each category integrated with previous categories in the next higher category. The validity of this assumption has been examined through empirical research. Educators have to address all cognitive levels in their teaching progressing from simple to complex. This helps learners develop their thinking by moving from basic knowledge to higher order thinking.

All subject matter requires basic knowledge and, at the same time, higher order thinking is also needed. No ideal proportion for cognitive levels was found in the literature establishing that an educator can use as a recipe in his/her teaching to make learners think at higher levels. The author's opinion is that the amount of time to be spent at each level is based on the needs of learners. Some learners need more basic knowledge and others may be ready to develop higher level skills such as synthesis or evaluation.

The data from this study, and by Kitinoja and Miller (1989), reported the highest levels of cognition at which participants were planning to deliver the OCES programs whereas other studies reported either the percent of objectives written at each level of cognition or the percent
of time aspired to spend at each level of cognition. As a result of these different methodologies, county agricultural agents and state agricultural specialists in this study appear to have skipped the knowledge level of cognition. But based on practical experience, county agricultural agents and state agricultural specialists write a considerable number of educational objectives at and teach for the knowledge level of cognition.

Actual Level of Cognition

The data from this study showed that the highest actual levels of cognition at which most of the county agricultural agents and state agricultural specialists delivered the OCES programs were analysis, synthesis, and evaluation. Few county agricultural agents and state agricultural specialists were actually delivering the OCES programs at the application level and none of the county agricultural agents and state agricultural specialists delivered the OCES programs at the lower levels of cognition of knowledge or comprehension as their highest levels.

These data were consistent with the findings by Kitinoja and Miller (1989) who found that the majority of the OCES county agricultural agents and state agricultural specialists who participated in their study actually delivered the OCES programs at the analysis and evaluation levels of cognition (Table 17). In addition, this study
supported the Kitinoja and Miller (1989) study which found that 11% of the county agricultural agents and state agricultural specialists actually delivered the OCES programs at the application level of cognition and zero percent at the knowledge and comprehension levels of cognition. However, in this study, a higher percent of the county agricultural agents and state agricultural specialists were found to have delivered the OCES programs at the synthesis level of cognition (Table 17) than was found by Kitinoja and Miller (1989).

When the three levels of cognition (comprehension, application, and analysis) are grouped together in one category called the processing level of cognition as suggested by Newcomb and Trefz (1987), the data from this study agreed with those studies conducted by Pickford (1988), Miller (1989), and Whittington (1991) who studied the percent of discourse spent on each level of cognition (Table 17). This study found that 57% of the county agricultural agents and state agricultural specialists actually delivered the OCES programs at the higher level of cognition (processing). Pickford found that College of Agriculture professors spent 48% of discourse at the processing level of cognition. Miller (1989) found 58% of the discourse for college professors occurred at the processing level of cognition and Whittington found 53% of the discourse occurred at the processing level of cognition.
The data from this study (Table 17) contradicted previous studies conducted by Pickford (1988), Miller (1989), and Whittington (1991). Pickford (1988) found that 46% of the discourse occurred at the knowledge level of cognition while only 6% of the discourse occurred at the synthesis and evaluation levels of cognition. Miller (1989) found that 58% of the discourse occurred at the lower level of cognition of knowledge whereas less than 6% of the discourse occurred at the higher two levels of cognition (synthesis and evaluation). Whittington (1991) found 42% of

<table>
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<th>Level of Cognition</th>
<th>Pickford 1</th>
<th>Miller 2</th>
<th>Kitinoja &amp; Miller 3</th>
<th>Whittington 4</th>
<th>Ismail 5</th>
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<td>&lt;1.0</td>
<td>11.1</td>
<td>5.0</td>
<td>23.3</td>
</tr>
<tr>
<td>Evaluation</td>
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<td>1.0</td>
<td>22.2</td>
<td>&lt;1.0</td>
<td>20.0</td>
</tr>
</tbody>
</table>

1 1988, (n=3), Percent of time spent at each level of cognition by College of Agriculture professors.
2 1989, (n=4), Percent of time spent at each level of cognition by College of Agriculture professors.
3 1989, (n=9), The highest actual level of cognition of OCES county agricultural agents and state agricultural specialists.
4 1991, (n=10), Percent of time spent at each level of cognition by College of Agriculture professors.
5 1992, (n=30), The highest actual level of cognition of OCES county agricultural agents and state agricultural specialists.
the discourse occurred at the knowledge level of cognition and less than 6% occurred at the synthesis and evaluation levels of cognition.

This implied that county agricultural agents and state agricultural specialists who participated in this study actually delivered the OCES programs at higher cognitive levels as compared to the College of Agriculture professors. The interpretation of this could be that the nature of the information presented to the audiences by the agents and the college professors is different. The OCES county agricultural agents and state agricultural specialists may have presented information based on research findings while college professors in the undergraduate program gave greater emphasis to facts, knowledge, and principles. College professors tended to give less emphasis to higher levels of cognition while county agricultural agents and state agricultural specialists emphasized, to a certain degree, higher order thinking processes.

**Need for Further Studies**

1. This study needs to be replicated with Home Economics Agents, 4-H Agents, and Community and Natural Resources Development Agents to determine the levels of cognition at which these groups of agents intend and actually deliver OCES programs.
2. This study needs to be replicated with Cooperative Extension Service (CES) programs in other states to determine the levels of cognition at which the different types of agents in the different programs plan and actually deliver the CES programs.

3. Another study is needed to determine the intended and actual levels of cognition based on subject matter taught to find out the extent to which subject matter may influence the levels of cognition. For example, the study may investigate subjects related to animal production, plant production, record book keeping, pesticide application, marketing, farm management, etc.

4. A study is needed to assess the achievement of the clientele who participated in a particular program conducted by OCES county agricultural agents and state agricultural specialists. The study could examine the levels of cognition at which a particular program was taught, the levels of cognition at which tests items was written and levels of cognition at which participants achieved.

5. A study is needed to investigate the extent to which having or not having a lesson plan and written objectives may influence the levels of cognition at which OCES programs planned and delivered.

6. Other methods of data collection such as direct
observation or video tapes of the county agricultural agents' and state agricultural specialists' presentations is necessary to more fully determine the actual level of cognition at which the agents' deliver the OCES programs. These methods may let the researcher see the interaction between the agents and the clientele and activities which take place in the classroom.

7. This study needs to be replicated with a larger sample size and at different points in time to collect different types of data to obtain more empirical evidence on the levels of cognition at which the county agricultural agents and state agricultural specialists deliver the OCES programs.

8. Data from this study may need to be reanalyzed by reporting the percent of time spent by agents in each actual level of cognition. This type of analysis would ascertain the levels of cognition at which the county agricultural agents and state agricultural specialists spent most of their time in teaching a particular class.
APPENDIX A
Counties Included in the Sample
Ohio Counties Included in the 1991 Cognitive Study
APPENDIX B
Description of Bloom's Taxonomy of Education Objectives
I. KNOWLEDGE LEVEL

A. Consist of memorizing and identifying facts. It is a student's "file" of information that can be recalled or brought to mind later. It provides the basis for greater understanding (Chamberlain and Kelly, 1981).

B. The Knowledge level ranges from specific concrete facts or information to more complex and abstract theory. The knowledge level of the taxonomy is divided into the following sub-levels (Hunkins, 1972).

1. Knowledge of specifics -- the recall of specific, separate bits of information. This type of information provides the student with a data base.
   a. knowledge of terminology -- definitions
   b. knowledge of specific facts -- includes dates, events, persons, places, etc.

2. Knowledge of ways and means of dealing with specifics -- knowledge of the ways of organizing, studying, judging and criticizing. Does not require the student to be able to understand or use the concept; only requires an awareness of the concept.
   a. knowledge of conventions -- awareness of the accepted way of dealing with type of information or situations. Example: "What is the correct form for a business letter?"
   b. knowledge of trends and sequences -- questions students' knowledge of various phenomena in relation to the dimension of time. The emphasis is not on student understanding of the trend, but only that they recognize that it exists. Example: "What were the events that led up to World War II?
   c. knowledge of classifications of categories -- emphasis is placed upon students remembering certain groups of information. They are not required to do anything with the categories; they are only asked to recall from memory certain classifications. Example: "What are the four basic food groups, and which foods are contained in each?"
   d. knowledge of criteria -- emphasis is on awareness of criteria developed. Identification of listing of criteria is requested; not an understanding of the basis for establishment of criteria. Example: "Name three criteria for judging the quality of a cut of meat."
   e. knowledge of methodology -- this dimension is only concerned with the student's awareness of several methods or processes, not his ability to apply them to actual situations. Example: "If a teacher wishes to individualize instruction, the first step should be to

(1) Select materials.
(2) Consider his/her own competencies.
(3) Diagnose the abilities, needs, and interests of the students in class.
(4) Get permission from the principal.
f. knowledge of the universals and abstraction in a Field -- deals with knowledge of principles and generalizations and knowledge of theories and structures. Questions at this level are asking only for an awareness of various abstractions. Example: "What is the basis structure on the discipline of economics, as presented in class?"

II COMPREHENSION

A. This level focuses on the meaning and intent of the material. It involves the ability to understand the literal meaning of the subject matter. The comprehension level has been divided into three sub-levels (Hunkins, 1972).

1. Translation -- focuses on the student's ability to translate or paraphrase information from one to another. Knowledge is required, but the emphasis is on using this knowledge to understand material. Translation could involve:
   a. repeating what the author said, using the learner's own words.
   b. translation of a foreign language into English.
   c. translation of material from technical terms into layman's terms

2. Interpretation -- the emphasis is on grasping the basic ideas or general meaning of the material.
   a. the learner must be able to translate each major part of the material so that it becomes meaningful.
   b. the learner must then rearrange or reorder the material to determine significant and non-significant portions.
   c. the learner must finally be able to relate the information (fact, generalization, definition, skill, etc.) to new situations.

3. Extrapolation -- extends the ability to translate and interpret by student's expanding the information to determine implications, consequences, effects, etc., based on the original communication.

III. APPLICATION

A. Education should be preparation for life. Application questions are designed to give students practice in the transfer of training; applying what has been learned to other situations and learning tasks.

B. There are three main characteristics of questions in the application category (Sanders, 1966).

1. They deal with knowledge which has explanatory or problem solving power -- the kind of knowledge transferable to many situations.
2. They deal with whole ideas and skills, rather than solely with parts.
3. They include a minimum of directions or instructions; part of the challenge lies in the student being able to determine the appropriate problem solving process to use.

C. Evidence shows that once the ability to make application is developed, it is likely to be one of the more permanent acquisitions in learning (Bloom et al., 1981).

V. ANALYSIS

A. Analysis may be regarded as a further step in the "comprehension" of an ideas, product, or document. It requires the student to "see" the underlying ideas, devices, and workings of a document or communication (Bloom et al., 1981).

B. While analysis is slower and more difficult than the comprehension process, it is very important to use where deeper understanding is required before decisions are reached and problems are attacked (Bloom et al., 1981).

C. It is likely that once analytical abilities are developed in a number of fields of knowledge, they can be applied to new problems in a creative way (Bloom et al., 1981).

D. Analyzing include: (1) separating relevant material from trivia; (2) distinguishing facts from hypotheses; and (3) differentiating between objective data and value judgement (Chamberlain and Kelly, 1981).

E. Bloom and others (1956) divided the analysis level into three sub-levels:

1. Analysis of Elements -- the student is expected to break down the material into its constituent parts, then identify and classify those parts.
2. Analysis of Relationships -- differentiate between various relationships among the elements and determine their connection and interaction.
3. Analysis of Organizational Principles -- the student is able to determine the author's purpose, point of view, attitude, or general conception of a field, in order to better comprehend the meaning of the material.

V. SYNTHESIS

A. Synthesis questions encourage students to think creatively and make original conclusions. It is the ability to put parts and elements together in a form new to the student (Chamberlain and Kelly, 1981).

B. This is the category in the cognitive domain which most clearly provides for creative behavior on the part of the learner; this work is still expected to be within the limits set by particular problem theories or method.
C. Bloom and other (1956) have divided the synthesis level into three sub-levels; these levels are distinguished on the basis of the product developed through the synthesis process.

1. Production of a unique communication -- the student originates a product that produces ideas, feelings, and experiences that are uniquely his/her; the interpretation should represent the student's individual thinking and personality.

2. Production of a plan -- requires the student to produce a plan or solution to a particular situation.

3. Derivation of a set of Abstract Relations -- requires students to create or derive some type of statement to explain or classify data or a situation. The student can formulate a concept or generalization from the analysis of data.

D. Sanders (1966) has identified various strengths and weaknesses of synthesis questions:

1. Strengths of Synthesis Question:
   a. Allows students great freedom in seeking solutions.
   b. The question has many possible approaches to achieve the answer; the student must understand that the teacher does not have a definite answer in mind.
   c. The solution requires a product.

2. Weaknesses of Synthesis Questions
   a. Ask questions that call for mental creativity, but often may have no correlation with course objectives.
   b. There is the possibility of forming questions that are totally beyond the competence of the student.
   c. It is difficult to provide conditions favorable for creative work.

VI. EVALUATION

A. Evaluation questions are those requiring the student to make a judgement about something, using some criteria or standard for making the judgement (Clegg, 1967).

B. Bloom makes the point that evaluation is not an activity done after all the other levels of intellectual skills have been used. To some degree, evaluation can be considered a "floating" category, in that it can be used at each level of intellectual activity (Hunkins, 1972).

C. Unfortunately, too often only the knowledge level in the cognitive domain is emphasized and evaluated. Students are taught facts and specifics and are then asked to repeat them in various ways (Chamberlain and Kelly, 1981).
D. Bloom and others (1956) have divided the evaluation level into two sub-levels.

1. Evaluation in terms of Internal Evidence -- requires the student to analyze data or conclusions from standpoints such as logical accuracy, consistency, and other internal criteria.

2. Evaluation in Terms of External Criteria -- focus is on having students apply known criteria to judge various situations or conditions that they encounter or develop.

APPENDIX C
Letter to OCES Agents
Jan. 7, 1991

Dear:

In regard to our telephone conversation, I am sending this letter to indicate that I am a graduate student in the Department of Agricultural Education (Ph.D. program). I have undertaken a research study entitled "Assessing Intended and Actual Levels of Cognition in Ohio Cooperative Extension Service (OCES) Instruction Delivery Programs". The study's main objective is to investigate the intended and actual levels of cognition (thinking required) for agricultural instruction delivered by the OCES. Since the OCES has been attempting to provide more specialized programming for clientele, the findings of this study should help improve educational instructional programs.

The advisory committee members for my research are Dr. Larry E. Miller, Professor, Department of Agricultural Education as adviser, Dr. Keith Smith, and Dr. Emmalou Norland. Also, approval has been obtained from Administrative Cabinet to conduct this study.

In order to conduct this study, I request that you record on audio cassette your teaching of at least one formal presentation and send the tape to me. I am enclosing a blank tape. After the analysis is complete, a copy of the recorded tape along with a critique of your teaching will be sent to you. I assure you that the information will be kept strictly confidential between you and I. You can decide whether or not to share this in your portfolio but this could be useful documentation for the teaching portion of your document. A peer reviewed critique is highly regarded. If you have any questions, feel free to write or call me at (614-293-0903). Please leave a message if I am unavailable. I will return your call as soon as possible.

Thank you in advance for your cooperation.

Sincerely,

Ali Kasim Ismail
Graduate Student
The Ohio State University

Keith L. Smith
Associate Director
Ohio Cooperative Extension Service

CC: District Directors
D. Pritchard
APPENDIX D
Panel of Experts to Establish Validity for the Interview Schedule
1. Jo Jones, Assistant Professor (Ohio Cooperative Extension Service)

2. Nikki S. Conklin, Program Planning Leader (Ohio Cooperative Extension Service)

3. Emmalou Van Tilburg Norland, Associate Professor (Department of Agricultural Education)
APPENDIX E
Panel of Experts to Establish
Inter-Rater Reliability for the Interview Schedule
1. Jamie Cano, Associate Professor (Department of Agricultural Education)

2. Lisa Kitinoja, Private consultant, Extension Systems International, Columbus, Ohio (Private Entrepreneur)

3. Charles Miller, Assistant Professor (Department Of Agricultural Education)

4. Lowell E. Hedges, Associate Professor (Department of Agricultural Education)
APPENDIX F

Interview Schedule to Assess the Highest Intended Level of Cognition
Interview Schedule for use with County Ag. agents and State Ag. Specialists Intended Level of Cognition (LoC)

1. Do you have a written lesson plan for the presentation you recorded/taped? (If yes, record verbatim)

2. Do you have written objectives for this presentation/meeting? (If yes, record verbatim).

If instructor answered no to question 1 and/or 2, ask question 3 and 4.

3. What did you want participants to learn/think/be able to do after taking this class? (knowledge, skills, attitudes).
4. How did you plan to help the participants achieve these outcomes? (activities, teaching methods, practice, participation, feedback, etc.).

5. Were there any requirement for the participants to attend the program and to use the knowledge/skills gained? (required for certification, license, by law, etc.).
APPENDIX G
Panel of Experts to Establish Inter-Rater Reliability for the Modified (FTCB) Instrument
1. Lisa Kitinoja, Principal Consultant, Extension System International, Columbus, Ohio (Private Entrepreneur)

2. Charles Miller, Assistant Professor (Department of Agricultural Education)

3. Lowell E. Hedges, Associate Professor (Department of Agricultural Education)
APPENDIX H
The Modified (FTCB) Instrument to Assess the Highest Actual Level of Cognition
Actual Levels of Cognition

1. Knowledge
Spells, Read, Identify, Labels, Recalls something by name, Defines meaning, Gives a fact,
Tells of an event, Recognizes a symbol, Cites a rule, Cites a trend, Gives a list,
Chronological sequence, Steps of a process, Method, Names a classification system or
standard, Names what fits given system, States a generalized concept, Idea, Principle, Law,
Theory, Tells about organization or structure

2. Comprehension
Restates or paraphrases, translates, converts, Gives concrete examples of abstract idea,
Illustrates, Clarifies, Verbalizes from a graphic representation, Translates figurative
Literal, Gives a reason, Asks why, Summarizes, Concludes from observation of evidence,
Shows similarities/differences, Differentiates, Compares/Contrasts, Gives analogy, Simile,
Metaphor, Extrapolates, Performs a directed task or process

3. Application
Applies learning, Principle to new situation, Transfers, Applies abstract knowledge in practical
situation, Demonstrates, Uses, Estimates, Identifies, Selects and carries out a task, Prepares

4. Analysis
Distinguishes fact from opinion, Hypothesis, Conclusion from fact, Points out unstated
assumption, Recognizes bias or propaganda, Categorizes, Classifies, Outlines, Derives, Shows
interaction, Relation of elements, Associates, points out particulars to justify conclusions,
Checks hypotheses with facts, Distinguishes relevant from irrelevant information, Detects
error in thinking, Point of view, Thoughts, Feelings

5. Synthesis
Organizes ideas, Processes, Rearranges, Modifies, Produce(creates)unique communication, Divergent
idea, Intelligent guess, Propose, Produces a plan, Integrates, Combines, Designs
an apparatus, Structure, Revises a plan, Design, etc., Devises a scheme for classifying
information, Synthesizes, Formulates hypotheses, Makes deductions from abstract symbols,
Propositions, Draws inductive generalizations from specifics

6. Evaluation
Evaluates something from evidence, from criteria, Argues merit, Assesses value, Decides,
Judges
APPENDIX I
Panel of Experts to Establish Validity for Demographic Instrument
1. Keith L. Smith, Acting Director (Ohio Cooperative Extension Service)

2. Emmalou Van Tilburg Norland, Associate Professor (Department of Agricultural Education)

3. Nikki S. Conklin, Program Planning Leader (Ohio Cooperative Extension Service)
APPENDIX J
Instrument to Collect Demographic Data
Demographic Information

Please complete the following questions by either circling or filling in the appropriate blanks.

1. Please indicate the number of total years of experience you have in teaching and or extension related work.

   ___ years

2. Please circle the number of teaching methods courses (pedagogy) you have had in your academic education?

   0 
   1 
   2 
   3 
   4 or more

3. Please indicate the number of total hours of in-service training or teaching method courses in teaching adults (andragogy) you have attended.

   ___ Hours

4. Please indicate the highest educational degree completed. (please circle)

   B.S. or B.A. 
   M.S. or M.A. 
   Ph.D. 
   Other (please specify)
5. Please circle your major field of study for each degree completed.

<table>
<thead>
<tr>
<th>Field of study</th>
<th>Degree completed</th>
</tr>
</thead>
<tbody>
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<td>Engineering</td>
<td>B.S.</td>
</tr>
<tr>
<td>Food science</td>
<td></td>
</tr>
<tr>
<td>Animal science</td>
<td></td>
</tr>
<tr>
<td>Social science (e.g.: Ag. Ed., Ag. Econ., Rural Sociology, etc.)</td>
<td></td>
</tr>
<tr>
<td>Plant science</td>
<td></td>
</tr>
<tr>
<td>Natural resources</td>
<td></td>
</tr>
<tr>
<td>Other (please specify)</td>
<td></td>
</tr>
</tbody>
</table>

6. Please list the major programs you are emphasizing in 1991-92. For example:
- dairy nutrition
- farm program regulations
- pesticides applications
(please list all major programs emphasized)

1. 
2. 
3. 
4. 
5. 
6. 

7. Please indicate the estimated percentage of your appointment spent in the following areas of responsibility:

A. County Agents
   Responsibility
   1. Agriculture programming
   2. County chair
   3. CNRD programming
   4. Other (please specify)

   Total

   OR

B. State Ag. Specialists
   Responsibility
   1. Extension
   2. Resident instruction
   3. Research
   4. Other (please specify)

   Total

   OR
APPENDIX K
Hierarchical Regression Tables
Table 18
Regression of Highest Actual Level of Cognition on % of Time Spent by County Agricultural Agents on Other Job Responsibilities, % of Time Spent by State Agricultural Specialists in Resident Instruction and Highest Intended Level of Cognition (Hierarchical Entry)

<table>
<thead>
<tr>
<th>Variables</th>
<th>R²</th>
<th>sR²</th>
<th>b</th>
<th>t</th>
<th>p</th>
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<tbody>
<tr>
<td>Set 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>% of time spent by county agri. agents on other job activities</td>
<td>.003</td>
<td>.295</td>
<td>.771</td>
<td></td>
<td></td>
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<tr>
<td>% of time spent by state agri. specia. in resident instruction</td>
<td>.12</td>
<td>.12</td>
<td>-.008</td>
<td>-.269</td>
<td>.794</td>
</tr>
<tr>
<td>Degree</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Set 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highest intended level of cogni.</td>
<td>.13</td>
<td>.009</td>
<td>.065</td>
<td>.514</td>
<td>.612</td>
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For model: F=.9211; p<.4673

Table 19
Regression of Highest Actual Level of Cognition on Degree and Type of Agricultural Agents (Hierarchical Entry)

<table>
<thead>
<tr>
<th>Variables</th>
<th>R²</th>
<th>sR²</th>
<th>b</th>
<th>t</th>
<th>p</th>
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<tr>
<td>Degree</td>
<td>.11</td>
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<td>.142</td>
<td>.158</td>
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<tr>
<td>Type of agricultural agents</td>
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<td>.448</td>
<td>.440</td>
<td>.663</td>
</tr>
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</table>

For Model: F=1.778; p<.1882
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Shibata, K. E. (1968). *Teacher guide: classification of educational objectives*. Educational Service Unit, No. 6, Milford, Nebraska.


