Computer technology use by Iowa State University Extension personnel with implications for training and support: an analysis of alternative structural equation models

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Computer technology use by Iowa State University Extension personnel with implications for training and support: An analysis of alternative structural equation models

Park, Sung-Youl, Ph.D.

Iowa State University, 1994
Computer technology use by Iowa State University Extension personnel with implications for training and support: An analysis of alternative structural equation models

by

Sung-Youl Park

A Dissertation Submitted to the Graduate Faculty in Partial Fulfillment of the Requirements for the Degree of

DOCTOR OF PHILOSOPHY

Department: Agricultural Education and Studies
Major: Agricultural Education
(Agricultural Extension Education)

Approved:

Signature was redacted for privacy.

In Charge of Major Work
Signature was redacted for privacy.

For the Major Department
Signature was redacted for privacy.

For the Graduate College

Iowa State University
Ames, Iowa
1994
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CHAPTER I: INTRODUCTION

Society is rapidly changing and complex, producing an ever increasing amount of information. The speed of technological change has been faster than expected with the results of technological change apparent everywhere and everyday. One of the remarkable technologies developed for a better educational environment is the computer.

Educators of today are living in the transition between the information age and the computer or communication age. One area greatly influenced by this transition to the communication age is Extension. Ezell (1989) contended that Extension's future depends on its ability to interpret trends and use technology to deliver programs and teach problem solving as people leave the information age and enter the communication age. Others may argue that the terms, information age and communication age, are interchangeable. The impact of computers can be seen in most areas of everyday life.

... computers have become integral to the operation of most organizations. In fact, these machines are proliferating at an unprecedented rate in every sort of business, for the utilization of computers is thought to improve the output of all workers. Even in the area of social delivery, which is typically labor-intensive, emphasis has been placed on the use of computers. (Murphy & Pardeck, 1991, p.2).

In order for organizations to more efficiently utilize the computer, it is essential that personnel become computer literate and that systems wherein people work become computerized in the most efficient manner (Sherman, 1981). According to Lind (1991), computerization refers to an on-going process whereby computers and computer technology are introduced and adopted.
Computerization, however, doesn't mean simply diffusing hardware and software components. It is a whole process that involves economic, social, cultural, and even cognitive matters related to computer technology. The difference between the two terms, computerization and computer literacy, is that computerization is mainly understood in a social and organizational context, while computer literacy emphasizes more strongly the human being. These terms, however, are sometimes used interchangeably.

A necessary prerequisite of computer literacy is a positive, anxiety-free attitude toward computing. Simonson et al. (1987) defined computer literacy as "... an understanding of computer characteristics, capabilities and applications, as well as an ability to implement this knowledge in the skillful, productive use of computer applications suitable to individual roles in society" (p. 233). Therefore, they categorized computer literacy into four components: computer application, computer systems, computer programming, and computer attitudes.

The trend in Extension in the United States is toward more involvement with both computerization and computer literacy. The Future Application of Communication Technology Committee recommended that the Cooperative Extension System (CES) should strive to network all Extension professionals with computers or computer work stations, and by 1993, each Extension professional should have computer access and file transfer capability (FACT Committee, 1991). This continues a trend begun in the 1970s. In the early 1980s, many Extension offices were using computer network systems not only to provide information to farmers but also to communicate and exchange information within the Extension organization (Nieuwsma, 1984).
Sonka (1983) defined a computer as: "... an electronic device capable of receiving and storing data, performing prescribed numeric or logical operations on the data, and reporting the results of those operations" (p. 7). Today, computers are classified as microcomputers, minicomputers, mainframe computers, and super computers. Differences among the computers lie in price, memory capacity, and speed. Microcomputers, sometimes referred to as personal computers, can now do basically the same work at a decreased price as larger computers because of improvements in hardware and software. Personal computers, minicomputers, and mainframe computers that provide work stations and networks were used in Extension systems by the early 1990s (Ezell, 1989; Miller et al., 1989; Shih & Evens, 1991).

The computers used at the Iowa State University Extension Service (ISUES) are mainly microcomputers with a mainframe computer that services the Iowa State University Extension Computer Network (EXNET). The Extension Computer Network provides an on-line information system supporting E-mail, markets and weather information, updated reports and news releases, newsletters, utilities and on-line computing, a reference library, and new staff appointments (Coates & Karamagianis, 1991). Extension staff and county offices in Iowa have been encouraged to adopt and use EXNET programs to better serve their clientele (Lee, 1987). In addition, ISUES continues to provide in-service training programs and updating of its computer system in order to make Extension more computerized and Extension personnel computer literate (Information Technology Training Support and Service Infrastructure Committee Report, 1992).
The basic function of Extension is to help people to solve their problems and to make good decisions with information available and tested scientific knowledge (Boone, 1989). As information technology continues to advance and as the clientele of Extension need various information, the Extension system must develop new delivery systems and opportunities (Clark, 1989). In other words, to meet clientele needs, it is urgent for Extension to become computerized, and Extension should be a system that helps people become computer literate in the information age (Pirch, 1993).

Cross et al. (1990) contended that: "...profitability in agriculture is a major Extension concern and a national initiative ... for a computerized solution is needed ..." (p. 14). Richardson (1984) also urged that Extension be charged with the responsibility of increasing educational emphasis in the area of microcomputer technology.

Statement of the Problem

In terms of specific uses of microcomputers in Extension, three functional areas may be identified on a short-term basis:

1. Using microcomputers for management in the Extension systems, such as clientele databases, record files, sending information among Extension organizations, reports, and ordering of publications;

2. Using microcomputers as educational tools such as computer-assisted instruction and computer-based instruction to educate clientele or to transfer knowledge and information to clientele; and

3. Teaching clientele to use microcomputers in their farms, homes, and business.
In order to fulfill these tasks, Extension personnel should be computer literate and Extension system should be computerized (Goode & Elliott, 1992).

A limited number of Extension personnel, whether at the county or state level, have the knowledge, competency and convenience of access to utilize computers as a link to sources of information. A needs analysis conducted by the Iowa State University Extension indicated that barriers currently existed to the adoption of computer technology in Extension (Anderson, 1992). Results of the analysis indicated that available information and technology in the form of equipment, electronic mail, and information exchange were under-utilized. It was also determined that access to information and technology was impaired by skill deficiencies among staff and a lack of organizational support for technology and development. In addition, several studies reported that Extension personnel were not comfortable with computers (Worden, 1985; Brown, 1992).

Therefore, it was evident that several questions remained unanswered even though steps had already been taken by Extension to help prepare personnel to more effectively utilize computer technology:

1. If Extension wants to become computerized to meet the diverse needs of its clientele in the information age, what kinds of training and support are the most urgent?
2. What do Extension personnel need to learn about computers before they can educate clientele to use computer technology regularly as a management tool in their farms, homes, and businesses?
3. What attitudes do Extension personnel have towards computer technology?
4. What kinds of factors are affecting computer use by Extension personnel?
Educators in the past decade have focused a lot of attention on students' learning styles (Rojewski & Holder, 1990). In spite of increased attention and importance placed on students' learning styles in school systems, little research has been done with Extension personnel relating their computer use and training to their preferred learning styles. Many educators argued that training programs and teaching style should match learners' learning style and matched training programs can bring about better learning effects (Pollack, 1984). Therefore, a study was needed to investigate computer use by Extension personnel in relationship to preferred training programs and learning style.

Purpose and Objectives of the Study

The purpose of this study was to analyze the relationship of computer use with selected factors such as computer attitudes, computer experience, computer knowledge, learning styles and job position, and to develop a linear structural model of computer technology for use by Iowa State University Extension personnel that would provide implications for training and support needs for Extension personnel. Also determined were some descriptive characteristics of educational computer technology use. The specific objectives of the study were:

1. Identify and quantify computer educational training and support needs of Extension personnel;
2. Determine the attitudes of Extension personnel towards computer technology;
3. Determine current computer technology use by Extension personnel including amount of time spent, frequency, and programs in use;
4. Identify selected characteristics of Extension personnel regarding computer technology such as experience, knowledge, learning style, and job position; and

5. Develop and analyze a linear model to reveal relationships between computer technology use of Extension personnel and selected factors such as training and support, attitudes toward computers, knowledge, experience, educational level, age, gender, length of service, and program area of responsibility.

Research Hypotheses

In accordance with the previously stated objectives and consistent with related literature, this study tested the following hypotheses:

**Hypothesis 1:** For all Extension personnel in ISUES, there are no significant differences in responses on educational training and support, attitudes towards computers, computer knowledge, computer experience, and computer use in a multivariate analytic sense when grouped by the following variables:

1.1 Extension personnel's learning styles

1.2 Job position

**Hypothesis 2:** Experience with computers is related to the following variables:

2.1 Age

2.2 Gender

2.3 Education

2.4 Length of service

2.5 Program area of responsibility
2.6 Educational training and support

*Hypothesis 3:* Knowledge about computers is related to the following variables:

3.1 Age
3.2 Gender
3.3 Education
3.4 Length of service
3.5 Program area of responsibility
3.6 Educational training and support
3.7 Previous experience with computers

*Hypothesis 4:* Attitudes about computers are related to the following variables:

4.1 Age
4.2 Gender
4.3 Education
4.4 Length of service
4.5 Program area of responsibility
4.6 Educational training and support
4.7 Previous experience with computers
4.8 Knowledge with computers

*Hypothesis 5:* Attitudes about computers are related to a set of factors, so-called second-order factors, which are anxiety, confidence, enjoyment, usefulness.

*Hypothesis 6:* Computer technology use is related to the following variables:

6.1 Age
6.2 Gender
6.3 Education
6.4 Length of service
6.5 Program area of responsibility
6.6 Educational training and support
6.7 Previous experience with computers
6.8 Knowledge with computers
6.9 Attitudes towards computers

Limitations

The limitations of the study were identified as follows:

1. The research was limited to Iowa State University Extension personnel. Therefore, the results from this study should be generalized only to them.
2. The questionnaire items related to training and support did not represent the total efforts of ISUES toward its training programs.
3. The results of the study should not be used to evaluate the effectiveness of ISUES's computerization action plans.

Operational Definitions of Terms

Selected terms were operationally defined as follows:

Attitudes towards computers: Refers to an individual's feeling about the personal and societal use of computers in appropriate ways. Attitudes as used in this study have four sub-parts:

1. Anxiety, defined as fear of learning to use computers;
2. Confidence, defined as surety in one's ability to learn about or use computers;
3. Enjoyment, defined as attachment to or liking of computers; and
4. Usefulness, defined as the ability to perceive computers as practical tools after exposure to computers.

Computer: Refers to all levels of computers including a mainframe computer as well as a minicomputer. The word "computer" as used in this study is not limited to microcomputers because EXNET functions through the connections between the mainframe computer and terminals or microcomputers.

Computer knowledge: The ability to responsibly evaluate, select, and implement a variety of hardware and software used in computer applications.

Computer system: A system consisting of the hardware, operating system, application programs, and the users.

Educational training and support: ISUES's formal training programs and assistance to provide Extension personnel with educational opportunity and instruction for better computer technology use by Extension personnel.

Extension personnel: Professionals and staff formally engaged in providing and supporting Extension education. These include field specialists, state specialists, county Extension education directors, area directors, administrative staff, support staff, and office workers. All branches of University Extension, including Extension to Business and Industry and Continuing Education, are a part of this study (See Figure 1).
Figure 1. The Iowa State University Extension system
EXNET: Iowa State University Extension Computer Network. An on-line communication system currently supporting Extension personnel, researchers, farmers and others who are interested in accessing and exchanging information on a variety of topics.

Hardware: A physical, real device that when used with software is able to accomplish tasks. Microcomputer hardware typically consists of a keyboard for typing, a monitor or television-type screen, a printer, a central processing unit (CPU) and a modem.

ISUES: Iowa State University Extension Service. A publicly supported, nonformal, out-of-school, educational organization of the United States and Iowa State University, the Land Grant University. Local people, county Extension offices, county governments, Iowa State University and the United States Department of Agriculture cooperate in planning, financing, conducting and evaluating this system.

Learning styles: The unique way in which learners perceive, interact with, and respond to their learning environment during the teaching/learning process.

Microcomputer: A small computer system for personal use.

Software: An application program able to accomplish certain tasks or to perform certain actions on a computer.

Summary

There has been concern that Extension personnel's use of computer technology is impaired by skill deficiencies, discomfort, and a lack of organizational support for technology and development. Even though ISUES has taken several steps such as providing educational training programs enable to personnel to more effectively and efficiently use computer
technology, several questions still remain. Therefore, the purpose of this study was to analyze the relationship of computer use with selected factors such as computer attitudes, computer experience, computer knowledge, learning styles and job position, and to develop a linear structural model of computer technology for use by Iowa State University Extension personnel that would provide implications for training and support needs for Extension personnel. Also determined were some descriptive characteristics of educational computer technology use.
CHAPTER II: REVIEW OF LITERATURE

This chapter presents a review of applicable literature and research related to use of computer technology which helped the researcher develop insight into previous works and trends that have emerged and to develop a rationale for this study. The review of literature is divided into five sections: (1) The Extension Service and Its Computerization; (2) Theories Related to the Use of Computer Technology; (3) Previous Research Related to Use of Computer Technology; (4) Learning Style Theory; and (5) Structural Equation Modeling.

The Extension Service and Its Computerization

The foundation of the Cooperative Extension Service (CES) dates back long before 1914 when the Smith-Lever Act was passed. According to the Smith-Lever Act, the purposes of the CES were to aid in diffusing among the people of the United States useful and practical information on subjects related to agriculture and home economics, and to encourage the application of the same. When the Smith-Lever Act created the CES, the land-grant colleges provided the administrative base for an organized, structured system which involved the federal, state and local governments. The Smith-Lever Act was patterned after the Hatch Act in 1887 that created the experiment stations and the Morrill Act in 1862 that established the land-grant colleges (Prawl et al., 1984).

The Smith-Lever Act provided the organizational form for the Cooperative Extension Service. Another organizational form arose in the 1960s called University or "General" Extension expanded Extension from the Cooperative Extension to include all out-reach functions at the University. At Iowa State University, Extension brought together
Engineering Extension and the Center for Industrial Research and Service, (later combined into Extension to Business and Industry), and the Agricultural short course (later renamed Continuing Education), in addition to the four CES program areas (youth-4H, families, communities, and agriculture) (Schwieder, 1993).

In the 1990s, the Extension Service continued to educate people to deal with their problems and to help make appropriate decisions based on both scientific and applied knowledge. However, the teaching methods and communicating approaches Extension had adopted in earlier times are changing because today's society is so diverse and quickly transforming. Deshler (1988) contended that the forces of change are unstoppable, and Extension has to take this change into account because of increased complexity, diversity, and uncertainty in the information and communication age.

To meet the needs of a changing society, the FACT Committee (1991) recommended that CES adopt the following all of which dealt with computer technology in the information and communication age:

1. Computer network infrastructure and digital information
2. Video networking and program development
3. Strategic planning
4. Staffing, training and human resource development
5. Audience-oriented organization
6. Distance education.

Taylor et al. (1991) insisted that CES needed to move into more computerized systems and personnel in CES needed to become computer competent. Goode and Elliott
(1992) argued that computer knowledge and skills must be developed and maintained by Extension personnel, and the system was encouraged to use computer technology in providing viable educational opportunities to expanded audiences.

In summary, it is evident that CES has a clear direction to continue to achieve its purpose of a being computerized system. Personnel in CES need to be computer literate to meet societal and clientele needs in the information and communication age.

Theories Related to Computer Use

Theories contribute to development of all sciences. They explain how various factors, more precisely called theoretical constructs, are causally related to one another (Borg & Gall, 1989).

There are numerous theories related to computer use. Administrative theory, systems theory, contingency theory, motivational theory, behaviorism, and cognitive theory could be helpful in understanding and explaining computer use in many kinds of institutions. Administrative theory, systems theory, and contingency theory are important in relation to the environment and organization of the technology. On the contrary, motivational theory and cognitive theory focus more on psychological guidance to use of the technology, and behaviorism lies in between the environmental and the humanistic approach. Among these theories, systems theory, behaviorism, and cognitive theory will be discussed in the following section. Simonson and Thompson (1990) contended that these three theories are the basis for investigating the impact of computers in educational settings.
**Systems theory**

As researchers began to realize the interaction between the structural (mechanistic) and human (behavioral) dimensions of organizations and the influence of the external environmental forces, the concept of a business firm as a system began to dominate organizational theory (Bowditch & Buono, 1985). From this perspective, a system consists of several subunits or subsystems that continually interact with and are mutually dependent on one another, and human beings may be considered a subsystem in an organization.

An organization, an open system, is affected by a multitude of environmental forces or inputs such as availability of raw materials, changes in technology, competition, changing worker values and governmental policies. In education, systems theory is a new philosophy that evolved from industrial management and organizational sociology (Saettler, 1990).

Extension is also a system composed of several subsystems that interact with their environment and are influenced by external forces. Extension personnel are also considered as a subsystem that can be affected by surroundings and external forces. There are limits or boundaries to the openness of organizational systems. These boundaries are based on the input-transformation-output processes that link the organization to other systems. Considering this statement, organizational support such as educational training programs and funding for the computerization of Extension system can be referred to as input and Extension personnel's computer use can be understood as output. Thus, the assumption is that Extension systems' organizational support and Extension personnel's computer use are related to one another.
Behaviorism

The key assumption of behavior theory is that if psychology is to be a science, it must study only that which is observable, namely, behavior (Crider et al., 1989). Behaviorism has its roots in the works that were conducted by Pavlov, Thorndike, and finally Watson. Pavlov's conditional reflex, Thorndike's law of effect, and Watson's stimuli and responses, indeed, contributed to behaviorism as it is known today. For example, Skinner's works--reward or punishment--is based on Thorndike's law of effect (Crider et al., 1989).

Behaviorism has had considerable impact on education in general and on computer-based learning specifically (Simonson & Thompson, 1990). Behaviorists consider the mental state of a learner to be merely a predisposition to behave. If this statement is true, an Extension personnel's mental state toward computers may affect his or her computer use (behavior).

Thorndike believed that learning was based on a series of associations, or connections, between the problems of a particular situation and what had been accomplished previously. This connectionism is worthy of consideration in terms of human computer use. Thus, Thorndike's connectionism presumes that one's previous experience should be related to one's computer use. Another of Thorndike's contribution to behaviorism was the law of effect which states that when a modifiable connection between a situation and a response is made and is accompanied or followed by a satisfying state of affairs, then that connection's strength is increased (Simonson, 1990). Finally, connectionism stresses the importance of practice because it permits the power of the reward to strengthen the bond between the stimulus and the response. Therefore, educational computer training courses supported by Extension
service may provide formal practice opportunities to Extension personnel, an interesting
researchable variable.

The idea that consequences of behavior are critical in determining future behavior
remains important today in the work of Skinner. Building on Thorndike's law of effect,
Skinner insisted that when a particular behavior is performed, there may be two general
consequences: reinforcement (a positive outcome) or punishment (a negative outcome)
(Cosgrove, 1982). Skinner further reasoned that reinforcement would increase the possibility
that a behavior would recur; on the other hand, punishment would decrease the probability a
behavior would recur. Considering this theory, anxiety about computers (a negative outcome)
and enjoyment of computers or confidence towards computers (positive outcomes) should be
related to computer use, and those outcomes also should be related to previous experience.
Skinner also believed that human behavior is basically environmentally determined (Cosgrove,
1982). Therefore, the environmental factors that surround Extension personnel's computer
use such as educational training and support, availability of computers, and expectations from
clientele and supervisors need to be considered.

Cognitive theory

Cognitive theory was developed to move away from the behaviorist approach that
focused on environmental stimuli and ignored mental life. From the perspective of cognitive
learning theory, information will be understood when it is integrated into a student's existing
knowledge structure (Royer, 1984). Cognitive theory concentrates on the conceptualization
of students' learning processes and focuses on the exploration of the way information is
received, organized, retained, and used by the brain (Simonson & Tompson, 1990).

Considering the previous statements, students' learning styles are important because the learning processes are greatly dependent upon student's learning styles.

One of the cognitive theorists who emphasized the organization of experience within the mind of the learner as a major variable in learning was Gestalt. Insight is an important concept in this theory and is related to the ways the mind organizes information. Gestalt's theory deals with the ways experience is recorded in the mind so that it can be brought to bear in the solution of problems (Griffith, 1984). According to the Gestalt theory, understanding is important to explain future learning.

Cognitive theory suggests that not only are previous experience and previous knowledge of computers important, but also the organization of mental state and experiences. In other words, cognitive theorists tend to believe that instruction for students must be based on students' existing states of mental organization, or schema. How knowledge is internally structured or organized by a student has considerable impact on whether new learning will occur. Therefore, it may be said that an existing mental state is related to behavior, and an existing mental state is closely related to previous knowledge and experience. Thus, considering the above statement, Extension personnel's previous knowledge and experience are related to their mental state (e.g., anxiety, confidence, enjoyment, and valuing) and their mental state affects future behavior and computer use. Cognitive theory emphasizes the learner in an active role rather than as a passive recipient of environmental stimulation (Saettler, 1990).
Simonson and Tompson (1990) concluded that cognitive scientists look at learners; behaviorists look at outcomes; and systems theorists look at the factors that affect entire entities or systems. It is evident that, among these theories, there are ideas that can be used to explain Extension personnel's computer use and need for additional support and training.

**Previous Research Related to Computer Technology**

This section reviews previous research and discusses the variables used in the study. This review of previous research helped the researcher construct a model to be investigated. In this study, the exogenous variables were age, gender, education, length of service, program area of responsibility, and training and support. In addition, endogenous variables such as computer experience, computer knowledge, and computer attitudes were hypothesized as variables related to computer use, the key dependent variable.

**Age**

Studies investigating Extension personnel as well as other social studies have usually employed age as a fundamental variable for the purpose of verifying differences among the different groups. Usually, research on the relationship between age and innovation acceptance behavior has been mixed (Paula & Martin, 1988). A study conducted by Chesler and Barakat (1967) explored the age issue and found a curvilinear relationship between years of experience and acceptance of innovations.

In terms of Extension personnel's attitudes towards computers, Cantrell (1983) used age as one of the individual characteristics to assess differences toward computer application. Richardson (1984) reported that the attitude of the respondents towards microcomputers
gradually became more positive until the age of 50 and then began to decrease. Therefore, it was appropriate to include age in the model.

**Gender**

Much research has been conducted focusing on whether or not there is a gender difference toward computer attitudes and computer use. It is still debatable whether or not gender differences exist. For example, Swadener and Jarrett (1986) focused on the inequity of computer use by males versus females and contended that males spent a greater percentage of time working with computers than did females. Patterson (1984) reported similar findings from an observational study in which boys chose to participate in non-class computer activities more frequently than did girls.

On the contrary, Webb (1985) conducted two studies wherein girls were found to perform as well as boys in computer programming courses. Kay (1990) supported a similar view in a study which found that being male was a significant, but minimal, predictor of commitment to computer use. An interesting finding was shown in a study done by Collins (1985) wherein girls in high school perceived themselves personally to be less competent and less likely to be computer users, although the same girls viewed women in general as equal to men in computer skills.

A synthesis of this previous research is that there were various results on the relationship of gender to computer attitudes and use. Therefore, the researcher adopted gender as a variable, as the effect of gender needs further study.
Educational level

Educational level is one of the most frequently used variables in social research. Many researchers use educational level to investigate whether or not this variable has a relationship to educational achievement (Williams, 1983). Bear and Richards (1987) reported that attitudes towards computers were found to be related to educational level and career plans. On the contrary, no significant differences were found in the attitudes of Extension personnel toward the use of microcomputers in Extension work when grouped according to educational level (Richardson, 1984).

Even though educational level was not significant in some studies, it has been adopted as an exogenous variable because it is hypothesized that educational level is related to computer experience and knowledge which are important variables to predict computer use. In addition to these three demographic variables, length of service and main area of responsibility were exogenous variables that were included into the model to investigate their relationships to computer use and attitudes.

Computer knowledge

Since research has shown that a relationship between computer use and computer knowledge exists, computer knowledge was adopted as one of the variables for the model. Along with computer experience, computer knowledge was found to be a major factor influencing computer use and attitudes towards computers. Marcoulides (1988) insisted that lack of knowledge produced anxiety about computers and increasing familiarity with computers was important for the use of computers. Paula and
Martin (1988) revealed that knowledge about computers had a strong positive relationship with computer use.

**Computer experience**

Much research has been done to examine the extent that computer experience, including previous training attendance, affects computer use and attitudes (Hall & Cooper, 1991; Levin & Gordon, 1989). Results vary among the researchers. The reason may be concluded from a study wherein Kay (1990) explained a possible cause:

Computer experience, although highly correlated with other indices of computer literacy, was not a significant predictor of commitment. The emphasis of frequency of computer experience as opposed to quality might explain this anomaly. (p. 307)

There is no doubt that computer experience is related to computer use and attitudes toward computers. Levin and Gordon (1989) suggested that the dominant aspect of computer exposure, participation in computer training courses, affected attitudes. Hall and Cooper (1991) examined the interrelationships of gender and experience with computer use. They found that males who had more computer experience felt more comfortable than did females. Bear and Richards (1987) argued in their research that there would be positive relationships among attitudes towards computers and computer usage and computer experience.

Paulson (1985) concluded that there was a moderate association between computer use by teachers of vocational agriculture in high schools and amount of computer training. Furthermore, Paulson contended that the primary reasons for teachers' limited computer use were lack of money, training, software, and administrative support. Similar results were
found by Cantrell (1983) who concluded that more positive attitudes were expressed by participants who either had previously used a computer or had participated in some type of microcomputer training.

Considering the number of studies related to computer experience, it is obvious that training and experience are key factors. Computer experience, including participation in computer training courses, are important to include in a model of computer use and attitudes towards computers.

**Educational training and support for computer use**

Much research has been conducted to verify the importance of training and support for better computer use (Bowen & Escolme, 1990). According to Anastasio and Morgan (1972), teacher training is considered to be a prerequisite to full acceptance of computer use in education. Numerous research studies centering on Extension investigated the relationship between computer technology use and training. Shaffer (1991) found that Extension personnel who had not received computer training had less usage of the computer information service compared to personnel who had received training.

Many Extension personnel want to receive in-service training to learn computer-related competencies and expect administrative support for keeping current with computer technology (Goode, 1990). A study done by Quintana (1992) pointed out that lack of training was identified as a barrier inhibiting the use of educational technology. Thus, perceptions towards educational training and support for computer use was selected as an exogenous variable and hypothesized as having a relationship with computer use.
Computer anxiety

The concept of anxiety towards computers has gained increased attention in studies during the last decade. Several studies have dealt with exploring anxiety about computers from many different aspects (Bandalos & Benson, 1990; Cambre & Cook, 1987; Titus, 1983). Howard (1986) described anxiety towards computer as a high stress response to interaction or anticipation of interaction with electronic data processing systems. Anxiety about computer takes three distinct forms: the general fear of working with computers, the fear of failure in using them, and the fear of being replaced by a machine.

Anxiety about computers is one of the important constructs of computer attitudes. Munger and Loyd (1989) categorized computer attitudes into three subfactors: anxiety, confidence, and enjoyment (liking). Loyd and Gressard (1984) suggested the importance of anxiety, indicating that as many as one quarter of students may experience some anxiety towards computers when required to learn about or use computers.

Researchers have found that negative emotional reactions toward computers affect the degree to which computers can be effectively utilized (Byrnes & Jonson, 1981; Koohang, 1987; Sherman, 1981). A recent study conducted by Marcoulides (1988) indicated that anxiety seems to be a good predictor of computer achievement and use and that the higher the level of anxiety, the lower the computer experience and computer use. Consequently, anxiety towards computers was adopted as one of the key independent variables to explain the variance among computer use.

Several studies explored the relationships between anxiety and other variables such as gender, age, confidence, and computer experience (Loyd & Gressard, 1984; Massoud, 1991).
Loyd and Gressard (1984) found that computer experience was a factor influencing anxiety towards computers because anxiety was produced, in part, by lack of familiarity. On the subject of gender relationships with anxiety, researchers found that males had less anxiety than females (Collins, 1985; Loyd et al., 1987). On the other hand, a number of studies revealed no gender differences (Mackowiak, 1988; Honeyman & White, 1987).

Like gender, the relationship between age and anxiety towards computers is not straightforward. For example, one study found that young people were less anxious (Francis, 1988), while another study reported no affect for age (Kuhn, 1989). This kind of inconsistency may be resolved through the LISREL model because LISREL indicates spurious effects and indirect effects as well as direct effects (Sobel, 1987). In other words, one can control the effect of computer experience while investigating the relationships between anxiety and age and gender.

**Computer confidence**

Computer confidence has been defined as confidence in the ability to learn about or use computers (Loyd & Gressard, 1984). Chen (1986) found that computer confidence and amount of computer experiences were positively related. Koohang (1987) also found that computer experience was one of the factors which was significantly and positively related to computer confidence.

Computer confidence may interact with other factors and affect students' decisions to take computer courses (Campbell & Williams, 1990). Factors such as gender, educational level, and use of computers may be related to both computer experiences and confidence. For
example, several studies suggested that males had more confidence with respect to computers than did females (Chen, 1986; Miura, 1987). Many researchers adopted education as an independent variable and tried to explore the relationship between educational level and computer confidence (Felter, 1983; Sanders, 1984).

Considering previous research studies, computer confidence was deemed important to have an significant effect on computer use. Thus, it was also adopted as a variable in this study.

**Computer enjoyment**

Computer enjoyment is one of the aspects of computer attitude that was of interest in this study. Numerous people divided computer attitude into three subgroups: anxiety, confidence, and enjoyment (liking) (Gressard & Loyd, 1986; Koohang, 1987; Massoud, 1991; McCaslin & Torres, 1992).

Massoud (1991) found that males had more positive computer enjoyment than females and that computer enjoyment had a significant relationship with age. Further, Massoud suggested that computer enjoyment had a significant relationship with computer knowledge.

Since computer knowledge has been found to be related to computer experience, use and anxiety, one can hypothesize that computer enjoyment may be positively related to computer use. For that reason, the researcher added computer enjoyment to the model.

**Computer usefulness**

The last subfactor under attitudes toward computers is computer usefulness. In this study, the perceptions of the usefulness of computers in Extension personnel's work will be
examined, along with the other subfactors, anxiety, confidence, and enjoyment. According to Koohang (1989), computer usefulness has significant relationships with computer experience and knowledge. Further, it was revealed that gender is significantly related to computer usefulness. Male students had higher scores on computer usefulness than did female students. Another study done by Loyd and Gressard (1986) indicated similar results wherein computer experience was significantly related to computer usefulness. Computer usefulness was also related to the use of computers according to the research conducted by Wu and Morgan (1989).

Computer usefulness in this study was viewed as a perception of computers as helpful in one's work. This usefulness contains expectancies regarding the consequences of computer use. Paula (1988) categorized behavior-outcome expectancies into two groups: negative outcomes and positive outcomes. Positive outcomes were considered as those that were beneficial to computer use in some way.

Learning Style Theory

In 1979, the National Association of Secondary School Principals (NASSP) defined learning style as an umbrella term comprising cognitive, affective, and physiological/environmental dimensions regarding students' learning processes (NASSP, 1979). For this study, a definition proposed by Keefe was adopted. According to Keefe (1988), learning styles were defined as: "... characteristic cognitive, affective, and physiological behaviors that serve as relatively stable indicators of how students perceive, interact with, and respond to the learning environment" (p.3).
There are numerous theories related to learning style. Energetic model theory, social learning theory, and experiential learning theory are helpful in understanding learning process and style. According to the energetic model theory (Gregorc, 1982), every mind has two abilities: perceptual ability to perceive the world in concrete and abstract form, and the ordering ability to order the world in sequential (linear) and random (nonlinear) way. Gregorc insisted that one's learning consists of four learning modes: concrete/abstract, and sequential/random. Some people learn perceiving their world more abstractly than concretely while others are the reverse. Similarly, some people are more sequential than random in dealing with information and vice versa (Butler, 1986).

Social learning theory postulates that psychological functioning can be explained in terms of the interaction of personal characteristics, previous behavior (learning) and environmental determinants (Chapman, 1984).

Kolb's (1984) experiential learning theory was used to understand and determine learning styles for this study. Kolb maintained that learning consists of a four-stage cycle, including the following learning modes: concrete experience (CE), reflective observation (RO), abstract conceptualization (AC), and active experimentation (AE). The cycle suggests two diametrically opposed dimensions (poles) to diagnose learning preferences wherein CE is the polar opposite of AC while RO is the polar opposite of AE.

The learning style inventory developed by Kolb (1985) explains each characteristic of the four stages. In the concrete experience stage (CE), one would tend to rely more on one's feelings rather than on a systematic approach to problems and situations. On the other hand, one's learning in the abstract conceptualization stage (AC) involves using logical ideas rather
than feelings to understand ideas and situations. In the reflective observation stage (RO), one would understand ideas and situations from different points of view with careful observation but would not necessarily take any action. Finally, learning in the active experimentation stage (AE) takes an active form, experiencing with, influencing or changing the situation. One may value getting things done and seeing the results of influence or change. Based on one's preference for a particular phase of learning cycle, one may have one of four basic learning styles: converger, diverger, assimilator, and accommodator.

The converger learning style combines learning steps of abstract conceptualization (AC) and active experimentation (AE). This person is interested in finding practical uses for ideas and theories to solve specific problems and to make decisions based on finding solutions to questions or problems. This learning style is more important to the effectiveness of specialists in technological careers than it is to those in social work and careers requiring interpersonal skills.

The diverger learning style emphasizes concrete experience (CE) and reflective observation (RO). A person who learn in this style is best at viewing concrete situations from various perspectives. This person may have cultural interests and operates well in situations that call for generating a wide range of ideas. This learning style, which is dependent on feelings, is necessary for careers in the with arts, entertainment, and the service realm.

The assimilator learning style employs abstract conceptualization (AC) and reflective observation (RO). This person is best at inductive reasoning and theory construction to assimilate observations into an integrated logical framework and finds it more important that a
theory has logical soundness than practical value. This style is important to those who wish to be effective in information and science careers.

The accommodator learning style combines concrete experience (CE) and active experimentation (AE). A person with this learning style emphasizes learning primarily from hands-on experience, and tends to rely more heavily on people for information rather than on his or her own technical analysis. A person employing this learning style is usually effective in practical business areas such as marketing or sales.

Many people have utilized Kolb's learning style inventory (LSI) in their research studies. Carricato (1983) implemented and evaluated a modular practical management course based on experiential learning theory. After evaluation, Carricato concluded that management development courses must respond to the needs of both the operation and the trainees. McCall (1983) also supported learning styles identified by Kolb's LSI and found that the learning environment interacted with learning styles to affect adults students' achievement of computer programming.

On the contrary, Pollack (1984) concluded that matching students' learning styles and teachers teaching styles was not significant in determining course achievement. Another study conducted by Pigg et al. (1980) using a sample of County Extension agents revealed that the relationship between learning styles and educational techniques was moderate to weak. On the basis of their findings, they suggested that Extension educators designing educational programs be well advised to consider both information on learning styles and learners' preferences for a particular educational technique. However, they indicated the LSI appeared
to be a useful instrument and reported that the inventory really captured tendencies in Extension personnel's learning behavior.

Therefore, in this study, the LSI, based on Kolb's experiential learning theory was adopted to meet one of the objectives—relationships between Extension personnel's learning styles and preferred training support and other variables such as computer use, computer attitudes, computer knowledge, and computer experience.

Structural Equation Modeling (SEM)

Structural equation modeling is sometimes called covariance structure modeling, and latent variable modeling, depending on the people who use it. Linear Structural Relationship (LISREL) is the name of the computer program developed by Jöreskog in 1974 and is a synonym for linear structure equation modeling (Jöreskog & Sörbom, 1974). There are also other programs people use to run structural equations, such as EQS (Bentler & Weeks, 1979) and RAM (McArdle & McDonald, 1984). However, LISREL is the most popular program among the programs available now.

Several studies dealing with computer attitudes have employed SEM. For example, Marcouldies and Wang (1990) adopted SEM to test invariance of computer anxiety for American and Chinese college students. Another study conducted by Violato et al. (1989) proposed a four-factor model of computer attitudes. They conducted a confirmatory factor analysis with LISREL, and found that the model which consisted of sex differences, computer comfort, computer liking, and computer value fit the collected data (Violato et al, 1989).
One reason for the wide use of SEM is that this confirmatory method provides researchers with a comprehensive means for assessing and modifying theoretical models. As such, this program offers great potential for furthering theory development (Anderson & Gerbing, 1988). The other reason is that SEM overcomes the limitations of path analysis (Gallini & Mandeville, 1984). Path analysis, even though it is more reliable and powerful to test theory than regression, has three weaknesses. Lee (1990) described the three weakness as follows:

First, it uses only one measurement variable for one hypothetical construct. This results in a critical problem because the hypothetical construct (sometimes called a latent variable, unobserved variable or factor) cannot be measured by only one observed variable. For example, one's health status cannot be measured by one indicator such as a question that asks about a smoking habit. Second, path analysis assumes that errors are random and not correlated. Unfortunately, this is not true in many social science studies since many errors are systematic and correlated. Third, path analysis presumes there is no reciprocal relationship between the variables. This is not realistic in many social cases either. These three assumptions can be overcome by using SEM.

The basic difference between SEM and the regression approach including path analysis is that SEM uses maximum likelihood squares to estimate effect as described by the model specifications while regression uses ordinary least squares (Bentler & Chou, 1987). Linear Structural Relationships basically consists of two models: a measurement model and a structural model. The measurement model specifies the relationships between the factors, latent variables, constructs, unobservable variables and multiple indicators. This model is mathematically similar to the factor analysis. The structural model is similar to path analysis since both of them use path diagrams to test theories. In practice, linear structural equation analysis is similar to path analysis when it uses only a single indicator to measure each factor.
In general, the structural equations model involves several steps such as model specification, identification, parameter estimation, and assessment of fit. Each step is discussed as follows.

Model specification

Lee (1990) outlined the steps required to use SEM. First, the model to be tested should be generated based on theory or previous research. Second, the underlying assumptions of the covariance between variables contained in the model are used to develop the implications of the data. Finally, the third step is to set the parameters of the model to be fixed to a specified value (usually zero), constrained to be equal to one or more other parameters, or free, unknown and unconstrained to be equal to any other parameter.

The equation used for the structural model is defined:

\[ \eta = B\eta + \Gamma \xi + \zeta \]

Each symbols' characteristics are explained in Table 1. The measurement model's equation takes the form of:

\[ X = \Lambda_X \xi + \delta \]

Each symbol's characteristics in the measurement model are explained in Table 2.

Identification

Once the model is developed and specified its parameters should be identified. Two equations are available to check for the identification according to the t-rule, \( t \geq q (q + 1)/2 \), where \( q \) is the number of observed variables and \( t \) is the number of unknown parameters (Lee, 1991; Long, 1983). The other is \( t \geq (1/2)(p + q)(p + q + 1) \), where \( p \) is the number
of endogenous variables and \( q \) is the number of exogenous variables (Bollen, 1989). The two equations are mathematically identical.

There are three identifications using those equations. When the \( t \) is greater than \( (1/2)(p + q)(p + q + 1) \), it is said to be under-identified. Under-identified models are not meaningful, and should be rejected or revised. Meanwhile, when the \( t \) is less than \( (1/2)(p + q)(p + q + 1) \), it is called to be over-identified. This is meaningful and worthy in terms of the parsimony principle. The last is just-identified or saturated when \( t \) is equal to \( (1/2)(p + q)(p + q + 1) \). Either the over-identified model or just-identified model should be achieved. It should be, however, noted that these conditions are necessary but not sufficient. Consequently, there are some techniques with which one can improve the possibility of the model identification. For example, fix the parameters to zero or use equalization (when the model has a reciprocal relationship and each path is \( a \) and \( b \), then have \( a = b \)) (Lee, 1991).

Another rule can be used to check for model identification. Unlike the \( t \)-rule, the recursive rule is a sufficient condition for model identification, but it is not a necessary one. According to the recursive rule, the \( B \) matrix must be triangular, and the \( \Psi \) matrix must be diagonal. When both conditions are met, then the model is identified (Bollen, 1989).

**Parameters estimation**

After the model is identified, the maximum likelihood may be used to test unknown parameters and to permit the adequacy of the model to be assessed (Jöreskog & Sörbom, 1989). According to Jöreskog and Sörbom (1989), the maximum likelihood obtains estimates
Table 1. Components of the structural model

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Symbol</th>
<th>Name (LISREL)</th>
<th>of matrix</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Variables</strong></td>
<td>η</td>
<td>eta</td>
<td>m x 1</td>
<td>Vector of latent endogenous variables</td>
</tr>
<tr>
<td></td>
<td>ξ</td>
<td>xi</td>
<td>n x 1</td>
<td>Vector of latent exogenous variables</td>
</tr>
<tr>
<td></td>
<td>ζ</td>
<td>zeta</td>
<td>m x 1</td>
<td>Vector of latent endogenous residuals</td>
</tr>
<tr>
<td><strong>Coefficients</strong></td>
<td>B</td>
<td>beta (BE)</td>
<td>m x m</td>
<td>Coefficients matrix for endogenous variables</td>
</tr>
<tr>
<td></td>
<td>Γ</td>
<td>gamma (GA)</td>
<td>m x n</td>
<td>Coefficient matrix for exogenous variables</td>
</tr>
<tr>
<td><strong>Covariance matrices</strong></td>
<td>Φ</td>
<td>phi (PH)</td>
<td>n x n</td>
<td>Covariance matrix of ξ</td>
</tr>
<tr>
<td></td>
<td>Ψ</td>
<td>psi (PS)</td>
<td>m x m</td>
<td>Covariance matrix of ζ</td>
</tr>
</tbody>
</table>

*Adapted from Bollen (1989)

Table 2. Components of the measurement model

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Symbol</th>
<th>Name (LISREL)</th>
<th>of matrix</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Variables</strong></td>
<td>y</td>
<td>p x 1</td>
<td></td>
<td>Observed indicators of η</td>
</tr>
<tr>
<td></td>
<td>x</td>
<td>q x 1</td>
<td></td>
<td>Observed indicators of ξ</td>
</tr>
<tr>
<td></td>
<td>ε</td>
<td>p x 1</td>
<td></td>
<td>Measurement errors of y</td>
</tr>
<tr>
<td></td>
<td>δ</td>
<td>q x 1</td>
<td></td>
<td>Measurement errors of x</td>
</tr>
<tr>
<td><strong>Coefficients</strong></td>
<td>Λ_y</td>
<td>Lambda y (LY)</td>
<td>p x m</td>
<td>Coefficients relating y to η</td>
</tr>
<tr>
<td></td>
<td>Λ_x</td>
<td>Lambda x (LX)</td>
<td>q x n</td>
<td>Coefficients relating x to ξ</td>
</tr>
<tr>
<td><strong>Covariance matrices</strong></td>
<td>θ_ε</td>
<td>Theta-epsilon (TE)</td>
<td>P x P</td>
<td>Covariance matrix of ε</td>
</tr>
<tr>
<td></td>
<td>θ_δ</td>
<td>Theta-delta (TD)</td>
<td>q x q</td>
<td>Covariance matrix of δ</td>
</tr>
</tbody>
</table>

*Adapted from Bollen (1989)
by means of the iterative procedure that minimizes a particular fit function by improving the parameter estimates. There are other possible mathematical tests such as unweighted least squares, generalized least squares, generally weighted least squares, and diagonally weighted least squares. Each method is based on its own assumptions. However, they will be close to the true parameter values in large samples.

**Assessment of fit**

The assessment of fit and the detection of lack of fit of a model is an important part in the application of LISREL. In the assessment of fit, there are two types of fit measure. One is a overall fit measure; the other, a focused measure of goodness of fit. Using LISREL V7, it is possible to get several indexes for the overall fit measure such as the chi-square, the goodness-of-fit index (GFI), the adjusted goodness-of-fit index (AGFI), and the root mean squared residual (RMR). The purpose of overall fit measure is to determine whether or not the model is correct for the collected information.

If the model is correct and the sample size is sufficiently large, the chi-square procedure can be used for testing the model (Jöreskog & Sörbom, 1989). Large chi-square values correspond to a bad fit and small values represent a good fit of the model to the data. The GFI is a measure of the difference between $\Sigma$ and $\Sigma(\theta)$, where $\Sigma$ (sigma) is the population covariance matrix of observed variables, $\theta$ (theta) is a vector that contains the model parameters, and $\Sigma(\theta)$ is the covariance matrix written as a function of $\theta$ (Bollen, 1989). The AGFI takes account of degrees of freedom. Both GFI and AGFI should be between zero and one, with a higher value representing a more satisfactory fit. The RMR is a
measure of standardized residuals' difference between observed and expected covariance. If the RMR is zero, it indicates a perfect fit of data.

From the focused measure of goodness of fit, one can inspect for individual parameter estimates using standard errors. Small standard errors correspond to good precision and large standard errors to poor precision. Practically, t-values are often used. A t-value is the ratio between the parameter estimate and its standard error. In addition, LISREL V7 provides the squared multiple correlation and the coefficients of determination. The squared multiple correlation is a measure of the strength of a linear relationship between a latent variable and an observed variable. The coefficients of determination is a measure of the strength of several relationships jointly. Finally, LISREL V7 provides modification indices for each of the fixed and constrained parameters in the model. This index equals the expected decrease in the chi-square value when a single constraint is relaxed and the model is reestimated (Jöreskog & Sörbom, 1989).

Theoretically interesting model

Based on the previous research, theories related to computer use, and hypotheses of the study, a theoretically interesting model was developed. Figure 2 represents an empirical structural equation model to be tested. The arrows linking variables specify hypothesized relationships in the direction of the arrows. For example, the straight arrow (path) linking the variables age and knowledge indicates that age has a hypothesized effect on computer knowledge. In the model, age, gender, educational level, main area of responsibility, length of
Figure 2. Theoretically interesting model
service, and educational training and need training are exogenous variables that are in the context of the model, left unexplained. Computer knowledge, computer experience, computer attitudes, and computer use are endogenous variables that are explained by exogenous variables.

Summary

This chapter discussed in detail the Extension service and its computerization, systems theory, behaviorism, cognitive theory, learning style theory, previous research related to computer technology, and structural equation modeling. Systems theory, behaviorism, and cognitive theory provided a framework for the development of the various structural equation models.

According to systems theory, input is related to output. In the case of computer use by Extension personnel, input is related to organizational support while output is the extent of computer use by Extension personnel. Behaviorists consider that the mental state of a learner affects computer use (behavior) and mental state (attitudes) that reward and strengthen the possibility that the behavior will occur in the future. Cognitive theorists emphasize understanding as important to explain future learning, and previous knowledge and experience affect a learner's mental state (attitude). Learning style theory was used to understand the learning process and identify the learning styles of Extension personnel. An Extension personnel's learning style would be identified as one of four different learning categories (converger, diverger, assimilator, and accomodator).
CHAPTER III: DESIGN AND METHODOLOGY

The purpose of this chapter is to describe the research methods and procedures used in the study. The design and methodology is explained by a discussion of each of the following topics: (1) Research Design; (2) Population and Sample; (3) Instrumentation; (4) Data Collection; and (5) Statistical Analysis.

Research Design

Most educational research can be classified into two types: descriptive studies and studies designed to discover causal relationships (Borg & Gall, 1989). According to Borg and Gall (1989), a descriptive study is defined as finding out what is. Studies for causal relationships are divided into three types: causal comparative method, correlational studies, and experimental research.

This study was both a descriptive and a correlational study. Four of the five research objectives of the study were of a descriptive nature: What kinds of computer educational training and support were needed? What attitudes towards computer technology existed? How often and long were computers used? What characteristics regarding computer technology such as knowledge, experience, learning style, and educational level existed? Answering these questions was descriptive in nature.

Correlational research design was adopted to deal with the last objective: To develop and analyze a linear model to reveal relationships between computer technology use of Extension personnel and selected factors such as training and support, attitudes, knowledge, experience, educational level, age, and gender. Borg and Gall (1989) described LISREL as a
recent sophisticated method for multivariate correlational analysis that is used to measure latent variables reliably and validly and to test the validity of causal theories or models. Therefore, the study was a combination of descriptive and correlation.

Population and Sample

The population of the study consisted of all Iowa State University Extension Service personnel listed in the Iowa State University Extension Staff Directory in 1992. This population included field specialists, state specialists, county Extension directors, area directors, administrative staff, support staff, and office workers. All branches of University Extension, including Extension to Business and Industry and Continuing Education, were also included in this study. The directory listed 974 Extension staff. Permission to contact staff was granted by the Vice Provost for Extension, and names and addresses were supplied by the office.

The sample size was determined by calculation using an appropriate formula. The formula presented by McCall (1982) was considered suitable for estimating sample sizes when estimates for proportions are desired for any size population. The formula is defined as:

\[
 n = \frac{\pi (1-\pi)}{\left(\pi^2 / Z^2\right) + \pi (1-\pi)/N}
\]

where:

- \( n \) is the estimated number of individuals necessary in the sample for the desired precision and confidence;
- \( \pi \) is the preliminary estimate of the proportion of the sample to the population;
\[ Z \] is the two-tailed value of the standardized normal deviate associated with the desired level of confidence;

\[ \varepsilon \] is the acceptable error, or half of the maximum acceptable confidence interval; and

\[ N \] is the number of individuals or entities in the population.

According to McCall (1989), a safe assumption is \( \hat{\rho} = 0.50 \), when no prior information is available for the value of \( \hat{\rho} \). The value of \( Z \) was set by the researcher to be 1.96 with 95% confidence. The value of \( \varepsilon \) was also set by the researcher to be 0.05 as an acceptable error. Substituting the appropriate numbers, the formula produced 277 subjects.

Because of time and money constraints, this study used 200 subjects. This number was consistent with Tanaka's (1987) argument that 200 subjects are necessary to provide stable results using LISREL with moderately sized models (i.e., 20 or so variables). When a sample of 200 was divided by the total population, 974, the result was 0.21. When 0.21 was substituted into the formula as a preliminary estimate, the resulting estimates of the sample number was 155. Newcomb (1992) insisted that no one should use LISREL with any fewer than 100 subjects.

Most researchers surely consider two factors when doing surveys: time and cost (Babbie, 1973). The present researcher had to especially consider the cost of the study since a copyright fee for the learning style questions had to be paid for each copy. Considering the above statements, the number of subjects was set at 200. After deciding the number of sample subjects, the researcher adopted a simple random sampling method to select a sample from the population, a technique recommended when using LISREL (Bentler & Chou, 1987).
Instrumentation

The instrument was developed by the researcher based on the objectives of the study. The instrument and methods of collecting the data were reviewed and approved by the major professors associated with this study then submitted for approval by the Human Subjects Review Committee at Iowa State University. A copy of the signed approval form is shown in Appendix A. As shown in Appendix B, the completed instrument consisted of five parts: Computer Attitudes (Part I); Training and Support for Computer Use (Part II); Computer Experience, Knowledge and Use (Part III); Learning Style (Part IV); and Demographic Information (Part V).

The questions in Part I were originally adapted from the Computer Attitude Scales developed by Gressard and Loyd (1986). Woodrow (1991) argued that this scale is the most extensively used and tested among educational researchers. The items in the scale were originally divided into three sub-scales corresponding to three dimensions: computer anxiety, computer confidence, and computer liking. The reliability of the sub-scales and the findings from a factor analysis led Gressard and Loyd to suggest that the scores of the three sub-scales were sufficiently stable to be used as separate scores. The initial alpha reliabilities of each sub-scales were .86, .91, .91, respectively, with an overall reliability of .95 (Loyd & Gressard, 1984). Later, a fourth sub-scale, named computer usefulness, with a reliability of .82, was added to the Computer Attitude Scale (Loyd & Gressard, 1986).

In its original form, the scale was a Likert-type instrument composed of forty items. Each sub-scale consisted of ten items. Twenty-two items (six items from computer anxiety, computer confidence, computer liking, and four items from computer usefulness) were
extracted from the scale after deleting items with low factor loading scores; two items were added to the computer usefulness sub-scale. For the purpose of the study, the researcher changed computer liking to computer enjoyment.

Subjects were asked to respond to the items by selecting one of five responses ranging from strongly disagree (1) to strongly agree (5). Scores on any sub-scale could range from 6 to 30 and a higher score on any sub-scale indicates a more positive attitude.

The questions for Part II were developed by the researcher. This part was divided into two sub-parts. One was Extension personnel's preference of ways to receive computer training and support. The other was Extension personnel's needs related to computer training and support. Both used five point Likert-type scales. The preference part consisted of 11 items and the needs part consisted of 6 items.

Subjects were asked to respond to all items by selecting one of five responses ranging from strongly disagree (1) to strongly agree (5). A higher score corresponded to a higher degree of preference and need.

Part III was composed of three sub-parts: computer experience, computer knowledge, and computer use. Two items were employed to identify Extension personnel's computer experience: computer training courses participated in and years of computer use.

Computer knowledge was measured in terms of self-reported ability to use specific computer systems and programs. For this sub-part, a five-point Likert-type scale was used as follows: 1 = very poor; 2 = poor; 3 = average; 4 = good; and 5 = excellent.
In the computer use sub-part, three items were administered in terms of frequency, time length, and how often E-mail and EXNET were used. In addition, two items were added to determine the most frequently used program and the most needed-to-learn program.

Part IV was designed to identify and quantify Extension personnel's learning style. This part consisted of 12 items and asked the subjects to rank from most like you (4) to least like you (1). These items was originally developed by Kolb (1984) and a copyright fee was paid for the study.

Finally, Part V consisted of six demographic items: age, sex, educational level, years of service in Extension, position, and responsibility.

The validity of the instrument was established by means of content validity. A panel of experts of Iowa State University reviewed the survey instrument for content validity. This panel consisted of two professors serving on the researcher's graduate committee and three Iowa State University Extension Service computer support specialists. Reliability was established by pilot testing the instrument with 25 people: five off-campus staff, ten on-campus staff, and ten graduate students in the Department of Agricultural Education and Studies in Iowa State University. The measures of internal consistency of the results from the pilot test and final survey are presented in Tables 3 and 4, respectively.
Table 3. Internal consistency of the pilot test survey instrument (N = 25)

<table>
<thead>
<tr>
<th>Section of instrument</th>
<th>No. of items</th>
<th>Coefficient alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer anxiety</td>
<td>6</td>
<td>.75</td>
</tr>
<tr>
<td>Computer confidence</td>
<td>6</td>
<td>.81</td>
</tr>
<tr>
<td>Computer enjoyment</td>
<td>6</td>
<td>.69</td>
</tr>
<tr>
<td>Computer usefulness</td>
<td>6</td>
<td>.72</td>
</tr>
<tr>
<td>Total computer attitude</td>
<td>24</td>
<td>.92</td>
</tr>
<tr>
<td>Preferred training and support</td>
<td>11</td>
<td>.83</td>
</tr>
<tr>
<td>Needed assistance</td>
<td>6</td>
<td>.66</td>
</tr>
<tr>
<td>Total training and support</td>
<td>17</td>
<td>.84</td>
</tr>
<tr>
<td>Computer knowledge</td>
<td>7</td>
<td>.68</td>
</tr>
<tr>
<td>Concrete experience</td>
<td>12</td>
<td>.89</td>
</tr>
<tr>
<td>Reflective observation</td>
<td>12</td>
<td>.85</td>
</tr>
<tr>
<td>Abstract conceptualization</td>
<td>12</td>
<td>.89</td>
</tr>
<tr>
<td>Active experimentation</td>
<td>12</td>
<td>.92</td>
</tr>
</tbody>
</table>

Data Collection

Each questionnaire was numerically coded to provide for confidentiality and for follow-up purposes. Prior to mailing the questionnaire, an informative letter (see Appendix C) was sent to the Area Directors and Cabinet Members of Iowa State University Extension Service in order to request cooperation and to alert their staff regarding participation in the study.
Table 4. Internal consistency of the final test survey instrument (N = 184)

<table>
<thead>
<tr>
<th>Section of instrument</th>
<th>No. of items</th>
<th>Coefficient alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer anxiety</td>
<td>6</td>
<td>.84</td>
</tr>
<tr>
<td>Computer confidence</td>
<td>6</td>
<td>.85</td>
</tr>
<tr>
<td>Computer enjoyment</td>
<td>6</td>
<td>.83</td>
</tr>
<tr>
<td>Computer usefulness</td>
<td>6</td>
<td>.72</td>
</tr>
<tr>
<td>Total computer attitude</td>
<td>24</td>
<td>.94</td>
</tr>
<tr>
<td>Preferred training and support</td>
<td>11</td>
<td>.77</td>
</tr>
<tr>
<td>Needed assistance</td>
<td>6</td>
<td>.66</td>
</tr>
<tr>
<td>Total training and support</td>
<td>17</td>
<td>.75</td>
</tr>
<tr>
<td>Computer knowledge</td>
<td>7</td>
<td>.86</td>
</tr>
<tr>
<td>Concrete experience</td>
<td>12</td>
<td>.89</td>
</tr>
<tr>
<td>Reflective observation</td>
<td>12</td>
<td>.87</td>
</tr>
<tr>
<td>Abstract conceptualization</td>
<td>12</td>
<td>.86</td>
</tr>
<tr>
<td>Active experimentation</td>
<td>12</td>
<td>.90</td>
</tr>
</tbody>
</table>

The initial mailing consisted of a cover letter (Appendix D) explaining the significance of the study and the selection of the sample, and soliciting participation. A pre-addressed, pre-stamped questionnaire was included. Initially, 135 out of 194 responded, representing a return rate of about 70%. In fact, 200 questionnaires were mailed in the initial mailing, but five subjects transferred to other work and one person had the wrong address. Two weeks after the initial mailing 59 follow-up questionnaires were mailed to non-respondents. A cover letter for the follow-up is shown in Appendix E. Ten of the 59 non-respondent questionnaires
that were mailed were not returned. The final response rate for returned questionnaires was about 95%. Miller and Smith (1983) indicated that late respondents have been found to be very similar to non-respondents.

Simple t-tests were utilized to compare early respondents with late respondents in order to determine if significant differences existed. Since no significant differences were discovered, the groups were combined. Table 5 illustrates the differences between early respondents and late respondents. Because of the high return rate, no further effort was made to contact non-respondents.

Table 5. Differences between early respondents (N = 135) and late respondents (N = 49)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Early respondents</th>
<th>Late respondents</th>
<th>t-value</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N  Mean  S.D.</td>
<td>N  Mean  S.D.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer attitudes</td>
<td>138 98.59 12.73</td>
<td>46 97.65 15.22</td>
<td>.4133</td>
<td>.6799</td>
</tr>
<tr>
<td>Computer experience</td>
<td>138 12.81 8.60</td>
<td>44 11.93 8.69</td>
<td>.5839</td>
<td>.5600</td>
</tr>
<tr>
<td>Computer use</td>
<td>138 12.22 2.50</td>
<td>46 11.37 3.63</td>
<td>1.767</td>
<td>.0790</td>
</tr>
</tbody>
</table>
Statistical Analysis

Data were coded by the researcher as the questionnaires arrived. The data were stored on a microcomputer diskette and then transferred to the ISU's mainframe computer using the computer program called WYLBUR. Prior to doing statistical analyses, the accuracy of coding was determined by looking at the length of each row. A 10% random sample of entered data was checked for coding accuracy. After the first statistical program (Proc Print in SAS), no inconsistent data were found. SPSS, SAS, and LISREL were used for statistical analysis.

The sub-programs were as follows:

1. **FREQ** (frequency) and **MEANS** were performed to obtain descriptive statistics. TABLES statement with the CHISQ option was employed to achieve the chi-square test for independence in relation to learning style.

2. **CORR** (correlation) was used to detect prerelationships among the variables, and to produce the correlation matrices to be used in LISREL.

3. **GLM** (general linear model) with the MANOVA option was employed to test Hypothesis 1. After the MANOVA, several individual one-way ANOVAs were used to find significant differences and the SCHEFFÉ was used to identify specific relationships.

4. **RELIABILITY** was performed to assess the internal consistency of each part of the instrument. Finally, for hypotheses 2, 3, 4, 5, and 6 the LISREL program was employed.
CHAPTER IV: FINDINGS

The purpose of this chapter is to present information pertaining to the collected data and to report the findings of this study. This chapter was organized under the following headings: (1) Demographic Information; (2) Computer Experience; (3) Computer Knowledge; (4) Computer Attitudes; (5) Computer Use; (6) Educational Training and Support for Computer Use; (7) Learning Styles; (8) Multivariate Analysis of Variance and Analysis of Variance; (9) Confirmatory Factor Analysis of Computer Attitudes; and (10) A Structural Model of Computer Use.

Demographic Information

The primary intent of this section was to describe respondent's existing demographic characteristics. This demographic information was used to infer the relationships with other variables. The information was depicted according to the following: job position, age, gender, educational level, length of service, and main area of responsibility.

Job position

The job position distribution of the 184 Extension personnel who participated in the study is shown in Figure 3. The group consisted of 25 county Extension education directors (13.8%), 38 field specialists (20.9%), 23 state specialists (12.7%), 10 administrators (3.9%), 47 office workers (26.0%), 12 program assistants (6.6%), 11 support staff (6.1%), and 15 others (8.3%). Furthermore, the participants were merged into three sets of job positions that might receive training as a group. The groups categorized by merged job positions consisted
Figure 3. Number of respondents by job position

of 75 off-campus professional and para-professional staff (41.44%), 59 on-campus professional staff (32.67%), and 47 office workers (26%).

Age

The age of the respondents was divided by decade into four groups: 20-30 years; 31-40 years; 41-50 years; and over 50 years. The largest was the 31-40 year-old group, with N = 63 (34.6%), while the smallest was the 20-30 year-old group, with N = 15 (8.2%). Figure 4 indicates a fairly balanced division among the three large groups, with age N = 63 (34.6%) age 31-40; N = 53 (29.1%) age 41-50; and N = 51 (28.0%) over 50. Two respondents did not answer the age item.
The findings of the study revealed that 116 respondents (63.7%) were female while 66 respondents (36.7%) were male. Two people did not respond to this item. This was inconsistent with other studies which showed reverse results (Richardson, 1984; Kesler, 1989). The possible explanation for this was a differently defined population.

For this study, subjects were sampled from the whole population of Iowa State University Extension Service including office workers, administrators, and personnel in Continuing Education and Extension to Engineering. Most office workers and personnel in Continuing Education were female. Since office workers were the largest group of participants, it is understandable that a larger percentage of the total sample was female.
addition, it appears that the proportion of females in Extension has increased over the years (Cassina, 1989). Data in Table 6 reveals the gender of respondents by job position.

**Educational level**

The educational level of respondents was classified into four categories: (1) high school degree; (2) bachelor's degree; (3) master's degree; and (4) doctorate degree. The largest group was of those who had completed a master's degree, with 30.2% (N = 55) of the total. The smallest group was of those who had a doctorate degree; N = 28 (15.4%). Figure 5 indicates that the educational level of Extension personnel was fairly evenly distributed across the categories.

<table>
<thead>
<tr>
<th>Job position</th>
<th>Male</th>
<th>Percent male</th>
<th>Female</th>
<th>Percent female</th>
</tr>
</thead>
<tbody>
<tr>
<td>County extension</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>education director</td>
<td>16</td>
<td>64.00</td>
<td>9</td>
<td>36.00</td>
</tr>
<tr>
<td>Field specialist</td>
<td>16</td>
<td>42.11</td>
<td>22</td>
<td>57.89</td>
</tr>
<tr>
<td>State specialist</td>
<td>17</td>
<td>73.91</td>
<td>6</td>
<td>26.09</td>
</tr>
<tr>
<td>Administrator</td>
<td>7</td>
<td>70.00</td>
<td>3</td>
<td>30.00</td>
</tr>
<tr>
<td>Office worker</td>
<td>0</td>
<td>0.0</td>
<td>47</td>
<td>100.00</td>
</tr>
<tr>
<td>Program assistant</td>
<td>0</td>
<td>0.0</td>
<td>12</td>
<td>100.00</td>
</tr>
<tr>
<td>Support staff</td>
<td>5</td>
<td>43.45</td>
<td>6</td>
<td>54.55</td>
</tr>
<tr>
<td>Others</td>
<td>5</td>
<td>33.33</td>
<td>10</td>
<td>66.67</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>66</td>
<td><strong>36.3</strong></td>
<td>116</td>
<td><strong>63.7</strong></td>
</tr>
</tbody>
</table>
Figure 5. Number of participants by educational level

Length of service

The participants were asked to indicate their length of service in Extension on a categorized scale. Figure 6 reveals the number of years the participants had been working in Extension. The highest group served 5-10 years, or almost 35 percent. A total of 68 (about 40%) had served more than 10 years. A total of 20 (11%) had served more than 20 years.

Main area of responsibility

The distribution of main area of responsibility is represented in Figure 7. This category was divided into nine groups: agriculture, home economics, youth, community development, engineering, education, administration, office worker, and other. Participants with responsibility for community development were the smallest group with 7 (3.8%) of the total, followed by the engineering group with 9 (4.9%). The largest group was of those who
Figure 6. Number of participants by length of service

had the responsibility of office worker with 37 (20.3%), followed by the agriculture group with 33 (18.1%). As shown in Figure 7, the other groups were relatively well balanced.

Computer Experience

The participants were asked to respond to two items: how many computer workshops and training courses they had participated in, and how many years they had used computers. The majority (N = 116) reported that they had participated in from 1 to 5 computer workshops or training courses. Only 9 indicated they had never participated in any computer workshops and training courses. This meant that almost 95% of Iowa State University Extension Service personnel had participated at least once in computer workshops and training courses. The mean number of computer workshops and training courses participated in was about 5, indicating a staff trained in computers. Data related to number of computer workshops and training courses participated in are displayed in Table 7.
Figure 7. Number of participants by main area of responsibility

Table 7. Participation in computer workshops and training courses

<table>
<thead>
<tr>
<th>Number of workshops/training courses</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>9</td>
<td>5.1</td>
</tr>
<tr>
<td>1-5</td>
<td>116</td>
<td>66.3</td>
</tr>
<tr>
<td>6-10</td>
<td>40</td>
<td>22.9</td>
</tr>
<tr>
<td>11-15</td>
<td>6</td>
<td>3.4</td>
</tr>
<tr>
<td>16-20</td>
<td>3</td>
<td>1.7</td>
</tr>
<tr>
<td>Over 20</td>
<td>1</td>
<td>0.6</td>
</tr>
<tr>
<td>Non-respondents</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>184</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Mean = 4.79
The years of computer use were categorized into 6 groups: never used; 1 to 5 years; 6 to 10 years; 11 to 15 years; 16 to 20 years; and over 20 years. A majority (N = 77) had used computers for 6 to 10 years. The second largest group was 1 to 5 years. Approximately 20% (N = 33) of the participants indicated they had used computers over 10 years. The mean years of computer use was about 8, indicating a staff experienced with computers. Data related to years of computer experience are displayed in Table 8.

Computer Knowledge

Computer knowledge of Extension personnel was identified by asking the participants to rate their own ability to use computer programs and systems. Responses were rated on a scale of: 1 = very poor; 2 = poor; 3 = average; 4 = good; and 5 = excellent. Table 9

Table 8. Number of years of computer use

<table>
<thead>
<tr>
<th>Number of years of computer use</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>0.6</td>
</tr>
<tr>
<td>1-5</td>
<td>61</td>
<td>35.5</td>
</tr>
<tr>
<td>6-10</td>
<td>77</td>
<td>44.8</td>
</tr>
<tr>
<td>11-15</td>
<td>25</td>
<td>14.5</td>
</tr>
<tr>
<td>16-20</td>
<td>2</td>
<td>1.2</td>
</tr>
<tr>
<td>Over 20</td>
<td>6</td>
<td>3.5</td>
</tr>
<tr>
<td>Non-respondents</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>184</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Mean = 7.94
illustrates the mean scores of the participants. The participants rated their word processing ability highest and computer systems as second highest. They were least confident of their abilities in the use of statistical programs and computer language.

Computer Attitudes

The participants were surveyed on their attitudes toward computers by responding to 24 computer attitude items. An individual’s attitude toward each item was identified by circling one of the possible responses: 1 = strongly disagree; 2 = disagree; 3 = undecided; 4 = agree; and 5 = strongly agree.

Table 9. Means and standard deviations of computer knowledge (N = 184)

<table>
<thead>
<tr>
<th>Type of programs</th>
<th>Mean</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer system</td>
<td>3.38</td>
<td>1.00</td>
</tr>
<tr>
<td>Word processing</td>
<td>3.92</td>
<td>0.85</td>
</tr>
<tr>
<td>Spreadsheet programs</td>
<td>2.92</td>
<td>1.07</td>
</tr>
<tr>
<td>Graphic programs</td>
<td>2.55</td>
<td>1.20</td>
</tr>
<tr>
<td>Statistical programs</td>
<td>2.34</td>
<td>1.11</td>
</tr>
<tr>
<td>Communication</td>
<td>3.16</td>
<td>1.10</td>
</tr>
<tr>
<td>Computer language</td>
<td>2.35</td>
<td>1.07</td>
</tr>
<tr>
<td>Total</td>
<td>2.94</td>
<td>0.78</td>
</tr>
</tbody>
</table>

Scale: 1 = very poor  
2 = poor  
3 = average  
4 = good  
5 = excellent
Computer attitudes were originally composed of four sub-scales: computer anxiety, computer confidence, computer enjoyment, and computer usefulness. Each sub-scale consisted of six items. As shown in Table 10, the total mean had a value of 4.10, and all of the items had means over 3.5, with a midpoint of 3.00. According to the means, Extension personnel exhibited positive attitudes toward computers.

The highest sub-scale mean was computer usefulness (4.27), while the lowest mean was computer enjoyment (3.79). The item that yielded the highest mean was *Learning about computers is worthwhile* (item number 4). The item with the lowest mean was *Figuring out computer problems does not appeal to me* (item number 15). Means and standard deviations are summarized in Table 10.

**Computer Use**

The participants were asked to indicate their computer use with three items: frequency of computer use, length of computer use, and frequency of use of E-mail and EXNET. The scale for frequency of computer use was: 1 = never; 2 = about one to three times a month; 3 = about once a week; 4 = about two to four times a week; and 5 = daily. The scale used for the length of computer use was: 1 = never; 2 = less than thirty minutes; 3 = thirty minutes to one hour; 4 = one to two hours; and 5 = over two hours. Finally, the scale used for the use of E-mail and EXNET was: 1 = never; 2 = one to three times per month; 3 = about one time per week; 4 = about two to four times per week; and 5 = daily. Table 11 illustrates the frequencies and percentages of frequency of computer use, length of computer use, and use of E-mail and EXNET.
Table 10. Means and standard deviations of computer attitudes (N = 184)

<table>
<thead>
<tr>
<th>Item</th>
<th>Item number</th>
<th>Mean</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer anxiety (lack of)</td>
<td></td>
<td>4.22</td>
<td>0.63</td>
</tr>
<tr>
<td>Make me feel uncomfortable*</td>
<td>1</td>
<td>4.24</td>
<td>0.83</td>
</tr>
<tr>
<td>Do not feel threatened</td>
<td>5</td>
<td>3.83</td>
<td>0.99</td>
</tr>
<tr>
<td>Get a sinking feeling*</td>
<td>9</td>
<td>4.40</td>
<td>0.71</td>
</tr>
<tr>
<td>Computer makes me nervous*</td>
<td>13</td>
<td>4.21</td>
<td>0.86</td>
</tr>
<tr>
<td>Does not bother me at all</td>
<td>17</td>
<td>4.17</td>
<td>0.88</td>
</tr>
<tr>
<td>Feel aggressive and hostile*</td>
<td>21</td>
<td>4.44</td>
<td>0.77</td>
</tr>
<tr>
<td>Computer confidence</td>
<td></td>
<td>4.12</td>
<td>0.67</td>
</tr>
<tr>
<td>Confident about trying new</td>
<td>2</td>
<td>3.86</td>
<td>1.03</td>
</tr>
<tr>
<td>Computer is very hard for me*</td>
<td>6</td>
<td>4.18</td>
<td>0.86</td>
</tr>
<tr>
<td>Not the type to do well*</td>
<td>10</td>
<td>4.32</td>
<td>0.80</td>
</tr>
<tr>
<td>I can work with computers</td>
<td>14</td>
<td>4.38</td>
<td>0.72</td>
</tr>
<tr>
<td>Not good with computers*</td>
<td>18</td>
<td>4.12</td>
<td>1.02</td>
</tr>
<tr>
<td>Perform well in workshops</td>
<td>22</td>
<td>3.84</td>
<td>0.88</td>
</tr>
<tr>
<td>Computer enjoyment</td>
<td></td>
<td>3.79</td>
<td>0.70</td>
</tr>
<tr>
<td>I find it hard to stop</td>
<td>3</td>
<td>3.61</td>
<td>1.01</td>
</tr>
<tr>
<td>Is enjoyable and stimulating</td>
<td>7</td>
<td>3.97</td>
<td>0.86</td>
</tr>
<tr>
<td>I stick with it until</td>
<td>11</td>
<td>3.51</td>
<td>1.00</td>
</tr>
<tr>
<td>Does not appeal to me*</td>
<td>15</td>
<td>3.45</td>
<td>1.10</td>
</tr>
<tr>
<td>As little work with computers*</td>
<td>19</td>
<td>4.40</td>
<td>0.80</td>
</tr>
<tr>
<td>Continue to think about it</td>
<td>23</td>
<td>3.83</td>
<td>0.90</td>
</tr>
<tr>
<td>Computer usefulness</td>
<td></td>
<td>4.27</td>
<td>0.56</td>
</tr>
<tr>
<td>Computer is worth while</td>
<td>4</td>
<td>4.53</td>
<td>0.70</td>
</tr>
<tr>
<td>Need a firm mastery</td>
<td>8</td>
<td>4.08</td>
<td>0.89</td>
</tr>
<tr>
<td>Expect me to be literate</td>
<td>12</td>
<td>3.74</td>
<td>1.03</td>
</tr>
<tr>
<td>Use computers in my career*</td>
<td>16</td>
<td>4.58</td>
<td>0.83</td>
</tr>
<tr>
<td>Increases job possibilities</td>
<td>20</td>
<td>4.49</td>
<td>0.70</td>
</tr>
<tr>
<td>Supervisor expects me to be</td>
<td>24</td>
<td>4.19</td>
<td>0.92</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>4.10</td>
<td>0.56</td>
</tr>
</tbody>
</table>

*Recoded negative item

Scale: 1 = strongly disagree; 2 = disagree; 3 = undecided; 4 = agree; and 5 = strongly agree
The results as shown in Table 11 indicate use of E-mail and EXNET by Extension personnel. About 42% (N = 77) used E-mail and EXNET about one time per week or less and about 20% (N = 36) did not ever use E-mail and EXNET. However, it was identified that computer use by Extension personnel was overall appreciable as about 66% (N = 122) had

Table 11. Frequencies and percentages of frequency of computer use, length of computer use, and use of E-mail and EXNET (N = 184)

<table>
<thead>
<tr>
<th>Item</th>
<th>Mean</th>
<th>S.D.</th>
<th>Weighted value</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. How often have you used computers?</td>
<td>4.43</td>
<td>0.99</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>1</td>
<td>5</td>
<td>2.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>One to three times a month</td>
<td>2</td>
<td>10</td>
<td>5.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>About once a week</td>
<td>3</td>
<td>8</td>
<td>4.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two to four times a week</td>
<td>4</td>
<td>39</td>
<td>21.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daily</td>
<td>5</td>
<td>122</td>
<td>66.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. How long do you usually work on computers?</td>
<td>4.10</td>
<td>0.96</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>1</td>
<td>2</td>
<td>1.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 30 minutes</td>
<td>2</td>
<td>10</td>
<td>5.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thirty minutes to one hour</td>
<td>3</td>
<td>34</td>
<td>18.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>One hour to two hours</td>
<td>4</td>
<td>59</td>
<td>32.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Over two hours</td>
<td>5</td>
<td>78</td>
<td>42.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. How often do you use E-mail and EXNET?</td>
<td>3.5</td>
<td>1.61</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>1</td>
<td>36</td>
<td>19.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>One to three times per month</td>
<td>2</td>
<td>25</td>
<td>13.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>One time per week</td>
<td>3</td>
<td>16</td>
<td>8.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two to four times per week</td>
<td>4</td>
<td>25</td>
<td>13.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daily</td>
<td>5</td>
<td>82</td>
<td>44.6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
used computers daily, and about 43% (N = 78) had used computers for over two hours at a time.

Two items were used to identify the most frequent use of and the need to learn about application programs. Word processing was the most frequently used program, a finding that was consistent with the results of the questions about computer knowledge. However, items indicating which programs respondents needed to learn produced a variety of results. A possible reason for this was the various job positions included in the survey. Figure 8 shows the distribution of the most frequently used program and Figure 9 illustrates the distribution of the most-needed-to-learn programs.

Figure 8. Number of respondents who used programs frequently
Figure 9. Number of respondents who designated programs as most-needed-to-learn

Educational Training and Support for Computer Use

The participants were asked to respond by disagreeing or agreeing to 11 items on their preferences for specific ways to receive computer training and support. They were also asked to respond to six items on their needed assistance with specific areas related to computer use. After choosing agree or disagree, they were then asked to indicate their level of disagreement or agreement on a five-point scale: 1 = strongly disagree; 2 = disagree; 3 = undecided; 4 = agree; and 5 = strongly agree.

The means and standard deviations are organized in Table 12 and 13. The information from these results would be valuable in designing future computer training and support. The highest preference expressed by participants was personalized at local level. The second-
Table 12. Means and standard deviations of preference to receive training and support for computer use (N = 184)

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Mean</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Personalized at local level</td>
<td>4.38</td>
<td>0.67</td>
</tr>
<tr>
<td>2.</td>
<td>Telephone hot-line</td>
<td>3.30</td>
<td>1.05</td>
</tr>
<tr>
<td>3.</td>
<td>On-campus workshop</td>
<td>3.41</td>
<td>1.17</td>
</tr>
<tr>
<td>4.</td>
<td>Periodical news letter</td>
<td>3.28</td>
<td>1.00</td>
</tr>
<tr>
<td>5.</td>
<td>Tutorial computer disks</td>
<td>3.31</td>
<td>0.96</td>
</tr>
<tr>
<td>6.</td>
<td>Video tapes</td>
<td>3.08</td>
<td>0.95</td>
</tr>
<tr>
<td>7.</td>
<td>Via EXNET</td>
<td>2.79</td>
<td>1.09</td>
</tr>
<tr>
<td>8.</td>
<td>Program documentation</td>
<td>3.21</td>
<td>0.98</td>
</tr>
<tr>
<td>9.</td>
<td>Satellite</td>
<td>2.84</td>
<td>0.95</td>
</tr>
<tr>
<td>10.</td>
<td>User friendly manual</td>
<td>3.83</td>
<td>0.94</td>
</tr>
<tr>
<td>11.</td>
<td>Combination of manual, video, and computer disk</td>
<td>3.67</td>
<td>0.91</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>3.36</td>
<td>0.56</td>
</tr>
</tbody>
</table>

Scale: 1 = strongly disagree; 2 = disagree; 3 = undecided; 4 = agree; 5 = strongly agree

Table 13. Means and standard deviations of needed computer assistance (N = 184)

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Mean</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Basic introduction to computers</td>
<td>1.88</td>
<td>1.12</td>
</tr>
<tr>
<td>2.</td>
<td>Specific software programs</td>
<td>3.85</td>
<td>0.87</td>
</tr>
<tr>
<td>3.</td>
<td>Computer programming</td>
<td>3.10</td>
<td>1.22</td>
</tr>
<tr>
<td>4.</td>
<td>Information retrieval and exchange (EXNET)</td>
<td>2.88</td>
<td>1.26</td>
</tr>
<tr>
<td>5.</td>
<td>Purchasing new equipment</td>
<td>2.87</td>
<td>1.26</td>
</tr>
<tr>
<td>6.</td>
<td>Upgrading software</td>
<td>3.32</td>
<td>1.12</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>2.98</td>
<td>0.67</td>
</tr>
</tbody>
</table>

Scale: 1 = strongly disagree; 2 = disagree; 3 = undecided; 4 = agree; 5 = strongly agree
The highest rated item was for a user friendly manual. The item on-campus work shop was ranked as the fourth with a mean of 3.41. The two lowest items of preference were the item via EXNET (2.79) and satellite (2.84). Therefore, these two items could be omitted by people who work in designing computer training and support because they were less than 3, the mid-point between 1 and 5. If used, they would need strong promotion as to their value.

The most needed computer training and support assistance was for the item specific software programs (3.85). The second highest item indicated as needing assistance was upgrading software (3.32). This was interesting enough to consider with care. Since computer software markets are so diverse in terms of price and quality, and new versions of software are produced so fast, Extension personnel need assistance and support in order to learn about and purchase new products. The lowest item needing assistance was the item of basic introduction to computers (1.88). This result was consistent with that of computer knowledge because the participants' knowledge about computer systems was ranked highly.

Learning Styles

The Learning Style Inventory (LSI), a self-descriptive instrument developed by Kolb (1985), was used to define Extension personnel's learning styles. Each participant's learning style was identified by combining a score of abstract conceptualization-concrete experience (AC-CE) with a score of active experimentation-reflective observation (AE-RO). After combining the two scores, each individual was identified as having one of four different learning styles: converger, diverger, assimilator, and accommodator (Kolb, 1985).

The converger learning style emphasizes abstract conceptualization and active
experimentation. One with this style is interested in finding practical uses for ideas and theories to solve specific problems and to make decisions based on finding solutions to problems. The diverger learning style combines learning steps of concrete experience and reflective observation. One with this style observes concrete situations from many different points of view, rather than taking action. The assimilator learning style combines abstract conceptualization and reflective observation. One with this style is best at understanding a broad range of information and summarizing it into logical form. The accommodator learning style reflects to concrete experience and active experimentation. One with this style has the ability to learn primarily from hands-on experience. However, one with this style relies more heavily on feelings rather than on logical analysis while solving problems (Kolb, 1985).

Information from knowledge of learning styles is useful in designing future computer training courses because matching learners' styles with an appropriate teaching method is considered helpful to maximize learning achievement (McCall, 1983). Figure 10 illustrates a fairly well-balanced division of participants' learning styles.

Several studies were conducted to reveal a relationship between Extension personnel's learning styles and their job responsibilities (Rollins & Yoder, 1993; Pigg et al., 1980). According to Rollins and Yoder (1993), more than half (55%) of the Extension agents who participated in their study were either convergers (26%) or accommodators (29%). Similar results were found in the present study. Over half of the participants were either convergers (28.9%) or accommodators (25.9%). Another similar finding from the two studies was that Extension personnel who have agriculture responsibilities preferred converger learning styles.
The assimilator learning style was the least-preferred style by the participants in this study. The same result was found in the study done by Pigg et al. (1980). Learning styles by main area of responsibility are summarized in Table 14.

Few studies have been conducted to determine the relationship between Extension personnel's learning styles and their job position (Rollins & Yoder, 1993). In order to determine a relationship between Extension personnel's learning styles and their position, respondents were categorized into 3 groups: off-campus professional and para-professional staff; on-campus professional staff; and office workers. Off-campus staff consisted of county Extension education directors, field specialists, and program assistants. On-campus staff consisted of state specialists, administrators, support staff; and others.

According to the results of this study, the converger learning style was the most-
Table 14. Distribution of Extension personnel by main area of responsibility and learning style

<table>
<thead>
<tr>
<th>Job responsibility</th>
<th>Converger</th>
<th>Diverger</th>
<th>Assimilator</th>
<th>Accommodator</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>Agriculture</td>
<td>12</td>
<td>36.36</td>
<td>7</td>
<td>21.21</td>
</tr>
<tr>
<td>Home economics</td>
<td>8</td>
<td>38.10</td>
<td>3</td>
<td>14.29</td>
</tr>
<tr>
<td>Youth</td>
<td>7</td>
<td>29.17</td>
<td>7</td>
<td>29.17</td>
</tr>
<tr>
<td>Community development</td>
<td>3</td>
<td>42.86</td>
<td>2</td>
<td>28.57</td>
</tr>
<tr>
<td>Engineering</td>
<td>3</td>
<td>37.50</td>
<td>4</td>
<td>50.00</td>
</tr>
<tr>
<td>Education</td>
<td>3</td>
<td>25.00</td>
<td>4</td>
<td>33.33</td>
</tr>
<tr>
<td>Administration</td>
<td>3</td>
<td>21.43</td>
<td>3</td>
<td>21.43</td>
</tr>
<tr>
<td>Office workers</td>
<td>7</td>
<td>18.92</td>
<td>13</td>
<td>35.14</td>
</tr>
<tr>
<td>Other</td>
<td>6</td>
<td>27.27</td>
<td>3</td>
<td>13.64</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>52</td>
<td>29.21</td>
<td>46</td>
<td>25.84</td>
</tr>
</tbody>
</table>

preferred style of off-campus and on-campus staff while the diverger style was most preferred by office workers. According to the chi-square value, there was a statistically significant relationship between Extension personnel's learning styles and their position. The chi-square value produced on a test of independence was 13.47 with 6 degrees of freedom and a p-value of .036. Therefore, it was concluded that Extension personnel's learning styles are related to their job position.

This information may be valuable to people who design educational computer training workshops because computer training workshops are usually offered by job position, and learning style was found to have a relationship with a preference for specific ways to receive
educational computer training. Learning styles by merged job position are summarized in Table 15.

Multivariate Analysis of Variance and Analysis of Variance

The testing of Hypothesis 1, educational training and support for computer use, was accomplished using a multivariate analysis of variance (MANOVA) and several univariate analyses with items grouped by learning styles. Wilk's Lambdas were used to test the overall effect of learning style on educational computer training and support items. Wilk's Lambda of preference items calculated by MANOVA was $0.72$, $F(33, 144) = 1.73$ and $p = 0.0081$, indicating an overall significant difference toward preference to receive educational training and support when grouped by Extension personnel's learning style. From the univariate analyses of variance, item 5, tutorial computer disks, and item 9, satellite, were significant at alpha = .05, with the accommodators indicating higher preference for these two.

The Wilk's Lambda of needed assistance items from MANOVA was $0.95$, $F(18, 160) = 0.53$ and $p = 0.9440$. Therefore, no significant difference was found toward needed assistance according to Extension personnel's learning styles. Each item's ANOVA statistics is reported in Table 16 and 17.

The Wilks' Lambda of computer experience items from MANOVA was $0.96$, $F(6, 162) = 1.07$ and $p = 0.3791$. Therefore, no overall significant difference toward computer experience items was found according to Extension personnel's learning styles. No significant difference among the items was found from the univariate analysis of variance. The results from the univariate analysis of variance are shown in Table 18.
Table 15. Distribution of Extension personnel by merged job position and learning style

<table>
<thead>
<tr>
<th>Job position</th>
<th>Converger</th>
<th>Diverger</th>
<th>Assimilator</th>
<th>Accommodator</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>On-campus staff</td>
<td>24</td>
<td>32.88</td>
<td>13</td>
<td>17.81</td>
</tr>
<tr>
<td>Off-campus staff</td>
<td>20</td>
<td>34.48</td>
<td>17</td>
<td>29.31</td>
</tr>
<tr>
<td>Office workers</td>
<td>8</td>
<td>17.39</td>
<td>16</td>
<td>34.78</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>52</td>
<td>29.38</td>
<td>46</td>
<td>25.99</td>
</tr>
</tbody>
</table>

Table 16. Analysis of variance of means of respondents' preference to receive training and support items by learning style

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Personalized</td>
<td>4.42</td>
<td>4.30</td>
<td>4.22</td>
<td>4.34</td>
<td>1.87</td>
<td>.1370</td>
</tr>
<tr>
<td>2.</td>
<td>Telephone</td>
<td>3.37</td>
<td>3.16</td>
<td>3.11</td>
<td>3.41</td>
<td>0.88</td>
<td>.4521</td>
</tr>
<tr>
<td>3.</td>
<td>On-campus</td>
<td>3.52</td>
<td>3.69</td>
<td>3.42</td>
<td>3.17</td>
<td>1.63</td>
<td>.1846</td>
</tr>
<tr>
<td>4.</td>
<td>Periodical</td>
<td>3.35</td>
<td>3.27</td>
<td>3.14</td>
<td>3.37</td>
<td>0.39</td>
<td>.7616</td>
</tr>
<tr>
<td>5.</td>
<td>Computer disks</td>
<td>3.08*</td>
<td>3.62b</td>
<td>3.08c</td>
<td>3.50d</td>
<td>4.09**</td>
<td>.0078</td>
</tr>
<tr>
<td>6.</td>
<td>Video tapes</td>
<td>2.85</td>
<td>3.20</td>
<td>3.08</td>
<td>3.24</td>
<td>1.73</td>
<td>.1629</td>
</tr>
<tr>
<td>7.</td>
<td>Via EXNET</td>
<td>2.60</td>
<td>3.02</td>
<td>2.64</td>
<td>2.93</td>
<td>1.74</td>
<td>.1611</td>
</tr>
<tr>
<td>8.</td>
<td>Documentation</td>
<td>3.27</td>
<td>3.44</td>
<td>2.89</td>
<td>3.15</td>
<td>2.28</td>
<td>.0811</td>
</tr>
<tr>
<td>9.</td>
<td>Satellite</td>
<td>2.50*</td>
<td>2.96b</td>
<td>2.75c</td>
<td>3.22d</td>
<td>5.39**</td>
<td>.0014</td>
</tr>
<tr>
<td>10.</td>
<td>Manual</td>
<td>4.10</td>
<td>3.74</td>
<td>3.61</td>
<td>3.80</td>
<td>2.23</td>
<td>.0866</td>
</tr>
<tr>
<td>11.</td>
<td>Combination</td>
<td>3.60</td>
<td>3.78</td>
<td>3.50</td>
<td>3.83</td>
<td>1.19</td>
<td>.3139</td>
</tr>
</tbody>
</table>

**Highly significant; p <= .01; 5. b > a; 9. d > a**
Table 17. Analysis of variance of means of needed assistance items by learning style

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction</td>
<td>1.79</td>
<td>1.87</td>
<td>1.89</td>
<td>1.98</td>
<td>0.24</td>
<td>.8681</td>
</tr>
<tr>
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<td>3.91</td>
<td>3.64</td>
<td>3.89</td>
<td>0.88</td>
<td>.4543</td>
</tr>
<tr>
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<td>Programming</td>
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<td>3.17</td>
<td>2.96</td>
<td>0.38</td>
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<tr>
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<td>Information</td>
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<td>2.80</td>
<td>0.32</td>
<td>.8100</td>
</tr>
<tr>
<td>5</td>
<td>Purchasing</td>
<td>3.02</td>
<td>2.87</td>
<td>2.67</td>
<td>2.89</td>
<td>0.56</td>
<td>.6444</td>
</tr>
<tr>
<td>6</td>
<td>Upgrading</td>
<td>3.48</td>
<td>3.36</td>
<td>3.06</td>
<td>3.33</td>
<td>1.03</td>
<td>.3795</td>
</tr>
</tbody>
</table>

Table 18. Analysis of variance of means of computer experience items by learning style

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Number of workshops and courses participated in</td>
<td>5.20</td>
<td>4.24</td>
<td>5.82</td>
<td>4.15</td>
<td>1.43</td>
<td>.2348</td>
</tr>
<tr>
<td>2</td>
<td>Number of years of use</td>
<td>9.02</td>
<td>7.73</td>
<td>8.12</td>
<td>6.73</td>
<td>1.19</td>
<td>.3154</td>
</tr>
</tbody>
</table>

The Wilks' Lambda of computer knowledge items from MANOVA was 0.88, F(21, 156) = 1.09 and p = .3569. Therefore, no overall significant difference was found toward computer knowledge items according to Extension personnel's learning styles. From the univariate analysis of variance, no significant item was found. The results from the univariate analysis of variance are included in Table 19.

The Wilks' Lambda of computer attitudes items from the MANOVA was 0.67,
Table 19. Analysis of variance of means of computer knowledge items by learning style

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>System</td>
<td>3.44</td>
<td>3.43</td>
<td>3.50</td>
<td>3.22</td>
<td>.65</td>
<td>.5835</td>
</tr>
<tr>
<td>2</td>
<td>Word</td>
<td>3.96</td>
<td>3.98</td>
<td>3.94</td>
<td>3.87</td>
<td>.15</td>
<td>.9286</td>
</tr>
<tr>
<td>3</td>
<td>Spreadsheet</td>
<td>3.08</td>
<td>2.83</td>
<td>3.03</td>
<td>2.80</td>
<td>.78</td>
<td>.5074</td>
</tr>
<tr>
<td>4</td>
<td>Graphic</td>
<td>2.54</td>
<td>2.48</td>
<td>2.83</td>
<td>2.46</td>
<td>.80</td>
<td>.4940</td>
</tr>
<tr>
<td>5</td>
<td>Statistical</td>
<td>2.33</td>
<td>2.33</td>
<td>2.69</td>
<td>2.09</td>
<td>1.98</td>
<td>.1192</td>
</tr>
<tr>
<td>6</td>
<td>Communication</td>
<td>3.29</td>
<td>3.09</td>
<td>3.19</td>
<td>3.11</td>
<td>.34</td>
<td>.7911</td>
</tr>
<tr>
<td>7</td>
<td>Language</td>
<td>2.08</td>
<td>2.50</td>
<td>2.53</td>
<td>2.41</td>
<td>1.81</td>
<td>.1471</td>
</tr>
</tbody>
</table>

F(72, 107) = 0.51 and p = .6881. Therefore, no overall significant difference was found toward computer attitudes according to Extension personnel's learning styles. No significant difference among the individual items was found in the univariate analysis of variance. The results from the univariate analysis of variance are shown in Table 20.

The Wilks' Lambda of computer use items from the MANOVA was 0.96, F(9, 167) = 0.76 and p = .6492. Therefore, no overall significant difference was found toward computer use according to Extension personnel's learning style. No significant difference among the computer use items was found in the univariate analysis variance. The results from the univariate analysis of variance are summarized in Table 21.

The testing of Hypothesis 1.2. dealing with relationships between job position and selected variables such as educational training and support, computer experience, computer knowledge, computer attitudes, and computer use was accomplished by several multivariate
Table 20. Analysis of variance of means of computer attitudes items by learning style

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Make me feel uncomfortable (CA)</td>
<td>4.21</td>
<td>4.37</td>
<td>4.62</td>
<td>4.24</td>
<td>.97</td>
<td>.4080</td>
</tr>
<tr>
<td>2.</td>
<td>Confident about trying new (CC)</td>
<td>4.02</td>
<td>3.89</td>
<td>3.78</td>
<td>3.74</td>
<td>.69</td>
<td>.5581</td>
</tr>
<tr>
<td>3.</td>
<td>I find it hard to stop (CE)</td>
<td>3.56</td>
<td>3.78</td>
<td>3.64</td>
<td>3.54</td>
<td>.54</td>
<td>.6532</td>
</tr>
<tr>
<td>4.</td>
<td>Computer is worth while (CU)</td>
<td>4.58</td>
<td>4.67</td>
<td>4.39</td>
<td>4.39</td>
<td>1.79</td>
<td>.1504</td>
</tr>
<tr>
<td>5.</td>
<td>Do not feel threatened (CA)</td>
<td>3.94</td>
<td>3.89</td>
<td>3.83</td>
<td>3.59</td>
<td>1.20</td>
<td>.3103</td>
</tr>
<tr>
<td>6.</td>
<td>Computer is very hard for me (CC)</td>
<td>4.12</td>
<td>4.28</td>
<td>4.17</td>
<td>4.22</td>
<td>.33</td>
<td>.8016</td>
</tr>
<tr>
<td>7.</td>
<td>Is enjoyable and stimulating (CE)</td>
<td>4.02</td>
<td>4.02</td>
<td>3.81</td>
<td>3.9</td>
<td>.54</td>
<td>.6545</td>
</tr>
<tr>
<td>8.</td>
<td>Need a firm mastery (CU)</td>
<td>4.27</td>
<td>3.98</td>
<td>3.83</td>
<td>4.17</td>
<td>2.15</td>
<td>.0961</td>
</tr>
<tr>
<td>9.</td>
<td>Get a sinking feeling (CA)</td>
<td>4.44</td>
<td>4.39</td>
<td>4.31</td>
<td>4.43</td>
<td>.31</td>
<td>.8210</td>
</tr>
<tr>
<td>10.</td>
<td>Not the type to do well (CC)</td>
<td>4.31</td>
<td>4.30</td>
<td>4.39</td>
<td>4.33</td>
<td>.09</td>
<td>.9645</td>
</tr>
<tr>
<td>11.</td>
<td>I stick with it until (CE)</td>
<td>3.52</td>
<td>3.61</td>
<td>3.69</td>
<td>3.30</td>
<td>1.21</td>
<td>.3050</td>
</tr>
<tr>
<td>12.</td>
<td>Expect me to be literate (CU)</td>
<td>3.92</td>
<td>3.70</td>
<td>3.72</td>
<td>3.61</td>
<td>.84</td>
<td>.4727</td>
</tr>
<tr>
<td>13.</td>
<td>Computer makes me nervous (CA)</td>
<td>4.21</td>
<td>4.26</td>
<td>4.22</td>
<td>4.17</td>
<td>.08</td>
<td>.9705</td>
</tr>
<tr>
<td>14.</td>
<td>I can work with computers (CC)</td>
<td>4.40</td>
<td>4.39</td>
<td>4.39</td>
<td>4.37</td>
<td>.02</td>
<td>.9962</td>
</tr>
<tr>
<td>15.</td>
<td>Does not appeal to me (CE)</td>
<td>3.62</td>
<td>3.67</td>
<td>3.36</td>
<td>3.22</td>
<td>1.81</td>
<td>.1476</td>
</tr>
<tr>
<td>16.</td>
<td>Use computers in my career (CU)</td>
<td>4.50</td>
<td>4.65</td>
<td>4.47</td>
<td>4.65</td>
<td>.57</td>
<td>.6335</td>
</tr>
<tr>
<td>17.</td>
<td>Does not bother me at all (CA)</td>
<td>4.02</td>
<td>4.41</td>
<td>4.11</td>
<td>4.20</td>
<td>1.75</td>
<td>.1588</td>
</tr>
<tr>
<td>18.</td>
<td>Not good with computers (CC)</td>
<td>4.08</td>
<td>4.28</td>
<td>4.14</td>
<td>4.02</td>
<td>.57</td>
<td>.6381</td>
</tr>
<tr>
<td>19.</td>
<td>As little work with computers (CE)</td>
<td>4.46</td>
<td>4.46</td>
<td>4.28</td>
<td>4.35</td>
<td>.51</td>
<td>.6783</td>
</tr>
<tr>
<td>20.</td>
<td>Increases job possibilities (CU)</td>
<td>4.42</td>
<td>4.57</td>
<td>4.31</td>
<td>4.63</td>
<td>1.78</td>
<td>.1521</td>
</tr>
<tr>
<td>21.</td>
<td>Feel aggressive and hostile (CA)</td>
<td>4.42</td>
<td>4.41</td>
<td>4.33</td>
<td>4.57</td>
<td>.66</td>
<td>.5791</td>
</tr>
<tr>
<td>22.</td>
<td>Perform well in workshops (CC)</td>
<td>3.96</td>
<td>3.93</td>
<td>3.72</td>
<td>3.74</td>
<td>.91</td>
<td>.4356</td>
</tr>
<tr>
<td>23.</td>
<td>Continue to think about it (CE)</td>
<td>3.90</td>
<td>3.78</td>
<td>3.81</td>
<td>3.78</td>
<td>.20</td>
<td>.8952</td>
</tr>
<tr>
<td>24.</td>
<td>Supervisor expects me to be (CU)</td>
<td>4.27</td>
<td>4.09</td>
<td>4.14</td>
<td>4.24</td>
<td>.40</td>
<td>.7551</td>
</tr>
</tbody>
</table>

*Mean

Categories: CA = Computer anxiety; CC = Computer confidence; CE = Computer enjoyment; CU = Computer usefulness
analyses of variance (MANOVA) and univariate analyses (ANOVA) with item by item grouped by job position. As used previously, Wilk's Lambdas were used to test overall job position effect on educational training and support items.

Wilk's Lambda of preference items calculated from MANOVA was 0.4862, $F(77, 101) = 1.6146$ and $p = .0009$. Considering this statistic, it was determined that there was an overall significant difference toward preference to receive educational training and support when grouped by Extension personnel's job position. From the univariate analyses of variance, item 3, *on-campus workshop* was found significant at alpha = .05. This is interesting enough to look at each group's mean. As might be expected off-campus staff were found to have less preference for on-campus workshops, compared to on-campus staff. Off-campus staff consist of County Extension Education Directors, Field Specialists, and Program Assistants. Each item's ANOVA statistics is displayed in Table 22.

Wilk's Lambda of need assistance items from the MANOVA was 0.5862, $F(42, 137) = 2.2592$ and $p = .0001$. Therefore, there was significant difference toward needed assistance according to Extension personnel's job position. From the univariate analyses of variance,
Table 22. Analysis of variance of means of preference to receive training and support items by job position

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>1a</th>
<th>2b</th>
<th>3c</th>
<th>4d</th>
<th>5e</th>
<th>6f</th>
<th>7g</th>
<th>8h</th>
<th>F Value</th>
<th>F-prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Personalized</td>
<td>4.16</td>
<td>4.47</td>
<td>4.26</td>
<td>4.30</td>
<td>4.57</td>
<td>4.40</td>
<td>4.25</td>
<td>4.27</td>
<td>1.30</td>
<td>.2539</td>
</tr>
<tr>
<td>2</td>
<td>Telephone</td>
<td>3.20</td>
<td>3.39</td>
<td>3.17</td>
<td>3.00</td>
<td>3.33</td>
<td>3.07</td>
<td>3.25</td>
<td>3.73</td>
<td>0.59</td>
<td>.7596</td>
</tr>
<tr>
<td>3</td>
<td>On-campus</td>
<td>2.72</td>
<td>2.87</td>
<td>4.09</td>
<td>3.90</td>
<td>3.63</td>
<td>4.07</td>
<td>3.17</td>
<td>3.18</td>
<td>5.61**</td>
<td>.0001</td>
</tr>
<tr>
<td>4</td>
<td>Periodical</td>
<td>2.92</td>
<td>3.11</td>
<td>3.48</td>
<td>3.30</td>
<td>3.52</td>
<td>3.40</td>
<td>3.08</td>
<td>3.27</td>
<td>1.10</td>
<td>.3639</td>
</tr>
<tr>
<td>5</td>
<td>Computer disks</td>
<td>3.16</td>
<td>3.34</td>
<td>3.22</td>
<td>3.30</td>
<td>3.30</td>
<td>3.67</td>
<td>3.42</td>
<td>3.27</td>
<td>0.43</td>
<td>.8843</td>
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<td>6</td>
<td>Video tapes</td>
<td>3.08</td>
<td>3.13</td>
<td>2.91</td>
<td>2.90</td>
<td>3.04</td>
<td>3.00</td>
<td>3.42</td>
<td>3.36</td>
<td>0.54</td>
<td>.8047</td>
</tr>
<tr>
<td>7</td>
<td>Via EXNET</td>
<td>2.56</td>
<td>2.61</td>
<td>2.96</td>
<td>2.60</td>
<td>3.20</td>
<td>2.47</td>
<td>2.92</td>
<td>2.54</td>
<td>1.68</td>
<td>.1178</td>
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<tr>
<td>8</td>
<td>Documentation</td>
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<td>2.87</td>
<td>3.48</td>
<td>3.60</td>
<td>3.30</td>
<td>3.33</td>
<td>3.42</td>
<td>3.18</td>
<td>1.37</td>
<td>.2217</td>
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<td>9</td>
<td>Satellite</td>
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<td>2.97</td>
<td>2.39</td>
<td>2.90</td>
<td>2.91</td>
<td>2.87</td>
<td>3.33</td>
<td>2.55</td>
<td>1.60</td>
<td>.1390</td>
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<td>3.71</td>
<td>4.30</td>
<td>3.70</td>
<td>3.81</td>
<td>3.93</td>
<td>3.83</td>
<td>4.00</td>
<td>1.26</td>
<td>.2721</td>
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<tr>
<td>11</td>
<td>Combination</td>
<td>3.56</td>
<td>3.58</td>
<td>3.83</td>
<td>3.40</td>
<td>3.80</td>
<td>3.60</td>
<td>3.92</td>
<td>3.36</td>
<td>0.79</td>
<td>.5931</td>
</tr>
</tbody>
</table>

*County Extension Education Director  
bField Specialist  
cState Specialist  
dAdministrator  
*Office Worker  
Other  
Program Assistant  
Support Staff

**Highly significant, p <= .01. 3. c > a, b; f > a

item 4, *Information retrieval and exchange (EXNET)* and item 5, *Purchasing new equipment* were significant at alpha = .05. Each item's ANOVA statistics is shown in Table 23.

Wilks' Lambda of computer experience items from MANOVA was 0.7125, F(42,137) = 4.2490 and p = .0001. Therefore, an overall significant difference was found toward computer experience items according to Extension personnel's job position.

results from the univariate analysis of variance are shown in Table 24.
Table 23. Analysis of variance of means of needed assistance items by job position

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>1&lt;sup&gt;a&lt;/sup&gt;</th>
<th>2&lt;sup&gt;b&lt;/sup&gt;</th>
<th>3&lt;sup&gt;c&lt;/sup&gt;</th>
<th>4&lt;sup&gt;d&lt;/sup&gt;</th>
<th>5&lt;sup&gt;e&lt;/sup&gt;</th>
<th>6&lt;sup&gt;f&lt;/sup&gt;</th>
<th>7&lt;sup&gt;g&lt;/sup&gt;</th>
<th>8&lt;sup&gt;h&lt;/sup&gt;</th>
<th>F Value</th>
<th>F-prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction</td>
<td>1.81</td>
<td>1.76</td>
<td>1.61</td>
<td>2.10</td>
<td>1.94</td>
<td>1.80</td>
<td>2.75</td>
<td>1.91</td>
<td>1.40</td>
<td>.2099</td>
</tr>
<tr>
<td>2</td>
<td>Software</td>
<td>3.88</td>
<td>3.87</td>
<td>4.04</td>
<td>3.60</td>
<td>3.81</td>
<td>3.93</td>
<td>4.17</td>
<td>3.27</td>
<td>1.25</td>
<td>.2801</td>
</tr>
<tr>
<td>3</td>
<td>Programming</td>
<td>2.64</td>
<td>2.95</td>
<td>3.13</td>
<td>3.20</td>
<td>3.30</td>
<td>2.93</td>
<td>3.50</td>
<td>3.64</td>
<td>1.33</td>
<td>.2366</td>
</tr>
<tr>
<td>4</td>
<td>Information</td>
<td>3.28</td>
<td>3.18</td>
<td>3.17</td>
<td>3.60</td>
<td>2.35</td>
<td>2.40</td>
<td>3.25</td>
<td>2.36</td>
<td>3.58**</td>
<td>.0013</td>
</tr>
<tr>
<td>5</td>
<td>Purchasing</td>
<td>3.56</td>
<td>2.29</td>
<td>2.61</td>
<td>3.00</td>
<td>2.91</td>
<td>3.40</td>
<td>4.42</td>
<td>2.36</td>
<td>3.65**</td>
<td>.0011</td>
</tr>
<tr>
<td>6</td>
<td>Upgrading</td>
<td>3.60</td>
<td>3.32</td>
<td>3.48</td>
<td>3.30</td>
<td>3.22</td>
<td>3.40</td>
<td>3.33</td>
<td>2.64</td>
<td>0.93</td>
<td>.4860</td>
</tr>
</tbody>
</table>

<sup>a</sup>County Extension Education Director  
<sup>b</sup>Field Specialist  
<sup>c</sup>State Specialist  
<sup>d</sup>Administrator  
<sup>e</sup>Office Worker  
<sup>f</sup>Other  
<sup>g</sup>Program Assistant  
<sup>h</sup>Support Staff

**Highly significant, p <= .01.  5. a > b

Table 24. Analysis of variance of means of computer experience items by job position

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>1&lt;sup&gt;a&lt;/sup&gt;</th>
<th>2&lt;sup&gt;b&lt;/sup&gt;</th>
<th>3&lt;sup&gt;c&lt;/sup&gt;</th>
<th>4&lt;sup&gt;d&lt;/sup&gt;</th>
<th>5&lt;sup&gt;e&lt;/sup&gt;</th>
<th>6&lt;sup&gt;f&lt;/sup&gt;</th>
<th>7&lt;sup&gt;g&lt;/sup&gt;</th>
<th>8&lt;sup&gt;h&lt;/sup&gt;</th>
<th>F Value</th>
<th>F-prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Number of workshops and courses participated in</td>
<td>3.96</td>
<td>3.61</td>
<td>5.64</td>
<td>7.60</td>
<td>6.47</td>
<td>3.20</td>
<td>2.17</td>
<td>4.78</td>
<td>3.57</td>
<td>.0013</td>
</tr>
<tr>
<td>2</td>
<td>Number of years of use</td>
<td>7.27</td>
<td>6.42</td>
<td>10.00</td>
<td>17.3</td>
<td>7.56</td>
<td>7.79</td>
<td>3.83</td>
<td>9.63</td>
<td>6.28**</td>
<td>.0001</td>
</tr>
</tbody>
</table>

<sup>a</sup>County Extension Education Director  
<sup>b</sup>Field Specialist  
<sup>c</sup>State Specialist  
<sup>d</sup>Administrator  
<sup>e</sup>Office Worker  
<sup>f</sup>Other  
<sup>g</sup>Program Assistant  
<sup>h</sup>Support Staff

**Highly significant, p <= .01.  2. d > a, b, e, f, g
Wilk's Lambda of computer knowledge items from MANOVA was 0.5469, F(49, 129) = 2.1689 and p = .0001. Therefore, an overall significant difference was found toward computer knowledge items according to Extension personnel's job position. From the univariate analysis of variance, all items were significant at alpha = .05 except item 5, Statistical programs. The results from the univariate analysis are included in Table 25.

Wilk's Lambda of computer attitudes items from MANOVA was 0.1945, F(168, 12) = 1.6731 and p = .0001. Therefore, an overall significant difference was found toward computer attitudes items according to Extension personnel's job position. From the univariate analysis of variance, all items were significant at alpha = .01 except item 5, Statistical software. The results from the univariate analysis are included in Table 25.

Table 25. Analysis of variance of means of computer knowledge items by job position

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>F Value</th>
<th>F-prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Computer systems</td>
<td>3.16</td>
<td>3.21</td>
<td>3.61</td>
<td>3.90</td>
<td>3.65</td>
<td>3.33</td>
<td>2.67</td>
<td>3.45</td>
<td>2.44*</td>
<td>.0210</td>
</tr>
<tr>
<td>2.</td>
<td>Wordprocessing</td>
<td>3.56</td>
<td>3.87</td>
<td>4.17</td>
<td>4.20</td>
<td>4.19</td>
<td>4.00</td>
<td>3.25</td>
<td>3.82</td>
<td>3.21**</td>
<td>.0032</td>
</tr>
<tr>
<td>3.</td>
<td>Spreadsheet</td>
<td>2.76</td>
<td>2.76</td>
<td>3.48</td>
<td>3.70</td>
<td>2.83</td>
<td>3.13</td>
<td>2.00</td>
<td>3.36</td>
<td>3.90**</td>
<td>.0006</td>
</tr>
<tr>
<td>4.</td>
<td>Graphic</td>
<td>2.12</td>
<td>2.47</td>
<td>3.13</td>
<td>3.20</td>
<td>2.45</td>
<td>2.60</td>
<td>1.75</td>
<td>3.36</td>
<td>3.47**</td>
<td>.0017</td>
</tr>
<tr>
<td>5.</td>
<td>Statistical</td>
<td>2.20</td>
<td>2.16</td>
<td>2.91</td>
<td>2.70</td>
<td>2.33</td>
<td>2.33</td>
<td>1.67</td>
<td>2.64</td>
<td>2.05</td>
<td>.0512</td>
</tr>
<tr>
<td>6.</td>
<td>Communication</td>
<td>3.08</td>
<td>3.11</td>
<td>3.61</td>
<td>3.20</td>
<td>3.47</td>
<td>2.73</td>
<td>1.73</td>
<td>3.45</td>
<td>5.07**</td>
<td>.0001</td>
</tr>
<tr>
<td>7.</td>
<td>Language</td>
<td>2.32</td>
<td>1.87</td>
<td>2.61</td>
<td>2.90</td>
<td>2.79</td>
<td>1.87</td>
<td>2.08</td>
<td>2.18</td>
<td>3.71**</td>
<td>.0009</td>
</tr>
</tbody>
</table>

*County Extension Education Director  
'State Specialist  
"Field Specialist  
'County Specialist  
'Office Worker  
'State Specialist  
'Office Worker  
'Support Staff  
'Significant, p < .05  
3. c, d > g  
6. b, c, e, h > g  
7. e > b  
**Highly significant, p < .01
analysis of variance, items 3, 7, 8, 11, 12, 15, 22, 23, and 24 were significant at alpha = .05. The results from the univariate analysis are included in Table 26.

Wilk's Lambda of computer use items from MANOVA was 0.7091, $F(21, 158) = 2.9597$ and $p = .0001$. Therefore, an overall significant difference was found toward computer use items according to Extension personnel's job position. From the univariate analysis of variance, all items were significant at alpha = .05. The results from the univariate analysis are included in Table 27.

To test Hypothesis 1.2, several univariate analysis of variance were administered to determine relationships between merged job position and selected variables such as computer experience, computer knowledge, and computer use, because almost all items from these variables showed significant relationships with job position. Information from these analyses could be used in planning future educational training and support. Participants were merged and categorized into three groups: off-campus professional staff and para-professional staff, on-campus professional staff, and office workers.

According to the result from univariate analysis of variance of computer experience by merged job position, it was identified that there was a significant difference toward computer experience. The group of office workers was found having the highest number of participation in computer workshops and training courses. On the other hand, the group of on-campus professional staff was identified having the highest number of years of computer use. Off-campus professional staff and para-professional staff had lower computer experience compared to on-campus professional staff and office workers. The result from the univariate
Table 26. Analysis of variance of means of computer attitude items by job position

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>1st</th>
<th>2nd</th>
<th>3rd</th>
<th>4th</th>
<th>5th</th>
<th>6th</th>
<th>7th</th>
<th>8th</th>
<th>F Value</th>
<th>F-prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Make me feel uncomfortable (CA)</td>
<td>4.32</td>
<td>4.32</td>
<td>4.48</td>
<td>4.60</td>
<td>4.13</td>
<td>4.27</td>
<td>3.83</td>
<td>3.73</td>
<td>1.87</td>
<td>.0776</td>
</tr>
<tr>
<td>2.</td>
<td>Confident about trying new (CC)</td>
<td>3.72</td>
<td>3.76</td>
<td>4.13</td>
<td>4.30</td>
<td>3.96</td>
<td>4.00</td>
<td>3.42</td>
<td>3.91</td>
<td>1.08</td>
<td>.3794</td>
</tr>
<tr>
<td>3.</td>
<td>I find it hard to stop (CE)</td>
<td>3.20</td>
<td>3.68</td>
<td>3.57</td>
<td>4.20</td>
<td>3.81</td>
<td>3.93</td>
<td>3.42</td>
<td>3.00</td>
<td>2.41*</td>
<td>.0222</td>
</tr>
<tr>
<td>4.</td>
<td>Computer is worth while (CU)</td>
<td>4.44</td>
<td>4.50</td>
<td>4.61</td>
<td>4.60</td>
<td>4.49</td>
<td>4.67</td>
<td>4.67</td>
<td>4.64</td>
<td>0.36</td>
<td>.9231</td>
</tr>
<tr>
<td>5.</td>
<td>Do not feel threatened (CA)</td>
<td>3.68</td>
<td>3.84</td>
<td>4.17</td>
<td>4.30</td>
<td>3.83</td>
<td>3.93</td>
<td>3.33</td>
<td>4.00</td>
<td>1.39</td>
<td>.2114</td>
</tr>
<tr>
<td>6.</td>
<td>Computer is very hard for me (CC)</td>
<td>4.08</td>
<td>4.18</td>
<td>4.17</td>
<td>4.50</td>
<td>4.32</td>
<td>4.40</td>
<td>3.67</td>
<td>4.09</td>
<td>1.27</td>
<td>.2694</td>
</tr>
<tr>
<td>7.</td>
<td>Is enjoyable and stimulating (CE)</td>
<td>3.64</td>
<td>3.97</td>
<td>3.67</td>
<td>4.40</td>
<td>4.28</td>
<td>4.13</td>
<td>3.75</td>
<td>3.36</td>
<td>3.15**</td>
<td>.0037</td>
</tr>
<tr>
<td>8.</td>
<td>Need a firm mastery (CU)</td>
<td>4.28</td>
<td>4.24</td>
<td>4.04</td>
<td>4.50</td>
<td>4.06</td>
<td>4.27</td>
<td>2.92</td>
<td>3.82</td>
<td>4.25**</td>
<td>.0002</td>
</tr>
<tr>
<td>9.</td>
<td>Get a sinking feeling (CA)</td>
<td>4.36</td>
<td>4.50</td>
<td>4.61</td>
<td>4.50</td>
<td>4.40</td>
<td>4.33</td>
<td>4.17</td>
<td>4.09</td>
<td>0.98</td>
<td>.4454</td>
</tr>
<tr>
<td>10.</td>
<td>Not the type to do well (CC)</td>
<td>4.04</td>
<td>4.39</td>
<td>4.57</td>
<td>4.50</td>
<td>4.34</td>
<td>4.33</td>
<td>4.08</td>
<td>4.18</td>
<td>1.07</td>
<td>.3857</td>
</tr>
<tr>
<td>11.</td>
<td>I stick with it until (CE)</td>
<td>3.08</td>
<td>3.50</td>
<td>3.61</td>
<td>3.90</td>
<td>3.83</td>
<td>3.33</td>
<td>3.25</td>
<td>3.18</td>
<td>2.09*</td>
<td>.0474</td>
</tr>
<tr>
<td>12.</td>
<td>Expect me to be literate (CU)</td>
<td>3.64</td>
<td>3.68</td>
<td>4.22</td>
<td>4.10</td>
<td>3.74</td>
<td>3.47</td>
<td>2.83</td>
<td>3.91</td>
<td>2.58*</td>
<td>.0149</td>
</tr>
<tr>
<td>13.</td>
<td>Computer makes me nervous (CA)</td>
<td>4.16</td>
<td>4.29</td>
<td>4.52</td>
<td>4.70</td>
<td>4.13</td>
<td>4.33</td>
<td>3.75</td>
<td>3.82</td>
<td>2.00</td>
<td>.0570</td>
</tr>
<tr>
<td>14.</td>
<td>I can work with computers (CC)</td>
<td>4.40</td>
<td>4.39</td>
<td>4.70</td>
<td>4.60</td>
<td>4.32</td>
<td>4.47</td>
<td>4.08</td>
<td>2.82</td>
<td>1.89</td>
<td>.0743</td>
</tr>
<tr>
<td>15.</td>
<td>Does not appeal to me (CE)</td>
<td>2.88</td>
<td>3.47</td>
<td>3.96</td>
<td>4.10</td>
<td>3.66</td>
<td>3.33</td>
<td>3.25</td>
<td>4.36</td>
<td>3.30**</td>
<td>.0025</td>
</tr>
<tr>
<td>16.</td>
<td>Use computers in my career (CU)</td>
<td>4.64</td>
<td>4.63</td>
<td>4.61</td>
<td>4.40</td>
<td>4.53</td>
<td>4.73</td>
<td>4.50</td>
<td>4.18</td>
<td>0.31</td>
<td>.9471</td>
</tr>
<tr>
<td>17.</td>
<td>Does not bother me at all (CA)</td>
<td>3.88</td>
<td>4.18</td>
<td>4.17</td>
<td>4.30</td>
<td>4.21</td>
<td>4.27</td>
<td>4.25</td>
<td>3.82</td>
<td>0.47</td>
<td>.8571</td>
</tr>
<tr>
<td>18.</td>
<td>Not good with computers (CC)</td>
<td>3.80</td>
<td>4.16</td>
<td>4.22</td>
<td>4.60</td>
<td>4.34</td>
<td>4.00</td>
<td>3.92</td>
<td>4.55</td>
<td>1.32</td>
<td>.2455</td>
</tr>
<tr>
<td>19.</td>
<td>As little work with computers (CE)</td>
<td>4.24</td>
<td>4.61</td>
<td>4.43</td>
<td>4.50</td>
<td>4.40</td>
<td>4.27</td>
<td>4.00</td>
<td>4.27</td>
<td>1.11</td>
<td>.3601</td>
</tr>
<tr>
<td>20.</td>
<td>Increases job possibilities (CU)</td>
<td>4.44</td>
<td>4.53</td>
<td>4.35</td>
<td>4.40</td>
<td>4.64</td>
<td>4.60</td>
<td>4.33</td>
<td>4.27</td>
<td>0.79</td>
<td>.6004</td>
</tr>
<tr>
<td>21.</td>
<td>Feel aggressive and hostile (CA)</td>
<td>4.52</td>
<td>4.32</td>
<td>4.61</td>
<td>4.60</td>
<td>4.43</td>
<td>4.27</td>
<td>4.42</td>
<td>4.55</td>
<td>0.51</td>
<td>.8018</td>
</tr>
<tr>
<td>22.</td>
<td>Perform well in workshops (CC)</td>
<td>3.56</td>
<td>3.97</td>
<td>4.13</td>
<td>4.40</td>
<td>3.83</td>
<td>3.67</td>
<td>3.42</td>
<td>3.64</td>
<td>2.09*</td>
<td>.0472</td>
</tr>
<tr>
<td>23.</td>
<td>Continue to think about it (CE)</td>
<td>3.48</td>
<td>3.71</td>
<td>4.31</td>
<td>3.70</td>
<td>4.02</td>
<td>3.67</td>
<td>3.50</td>
<td>4.00</td>
<td>2.48*</td>
<td>.0188</td>
</tr>
<tr>
<td>24.</td>
<td>Supervisor expects me to be (CU)</td>
<td>4.56</td>
<td>4.34</td>
<td>4.35</td>
<td>4.00</td>
<td>4.32</td>
<td>3.80</td>
<td>3.08</td>
<td>3.73</td>
<td>4.91**</td>
<td>.0001</td>
</tr>
</tbody>
</table>

*County Extension Education Director  bField Specialist  cState Specialist  dAdministrator  eOffice Worker  fOther  gProgram Assistant  hSupport Staff

*Significant, p < .05  3. c, d > g  6. b, c, e, h > g  7. e > b
**Highly significant, p <= .01

Categories: CA = Computer anxiety; CC = Computer confidence; CE = Computer enjoyment; CU = Computer usefulness
Table 27. Analysis of variance of means of computer use items by job position

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>1&lt;sup&gt;a&lt;/sup&gt;</th>
<th>2&lt;sup&gt;b&lt;/sup&gt;</th>
<th>3&lt;sup&gt;c&lt;/sup&gt;</th>
<th>4&lt;sup&gt;d&lt;/sup&gt;</th>
<th>5&lt;sup&gt;e&lt;/sup&gt;</th>
<th>6&lt;sup&gt;f&lt;/sup&gt;</th>
<th>7&lt;sup&gt;g&lt;/sup&gt;</th>
<th>8&lt;sup&gt;h&lt;/sup&gt;</th>
<th>F Value</th>
<th>F-prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Frequency</td>
<td>4.20</td>
<td>4.39</td>
<td>4.87</td>
<td>4.80</td>
<td>4.66</td>
<td>3.93</td>
<td>3.50</td>
<td>4.36</td>
<td>3.76**</td>
<td>.0008</td>
</tr>
<tr>
<td>2</td>
<td>Length</td>
<td>3.64</td>
<td>4.00</td>
<td>4.35</td>
<td>4.40</td>
<td>4.30</td>
<td>4.26</td>
<td>3.42</td>
<td>4.40</td>
<td>2.83**</td>
<td>.0082</td>
</tr>
<tr>
<td>3</td>
<td>E-mail and EXNET</td>
<td>3.20</td>
<td>3.71</td>
<td>4.17</td>
<td>4.20</td>
<td>3.87</td>
<td>2.80</td>
<td>1.25</td>
<td>3.09</td>
<td>6.33**</td>
<td>.0001</td>
</tr>
</tbody>
</table>

*aCounty Extension Education Director  
*bField Specialist  
*cState Specialist  
*dAdministrator

**Highly significant, p < .01  
1. c > g  
3. c > g; d > g; e > g; b > g

analysis is shown in Table 28.

According to the result from univariate analysis of variance of computer knowledge by merged job position, it was identified that there was a significant difference in computer knowledge. The group of off-campus professional staff and para-professional staff was found to have the lowest computer knowledge considering all items. The result from the univariate analysis is shown in Table 29.

The results from the univariate analysis of variance of computer use by merged job position revealed that there was a significant difference toward computer use. The group of off-campus professional staff and para-professional staff was found to have the lowest computer use compared to on-campus professional staff and office workers. On the other hand, the group of office workers, in general, reported the highest computer use. The results from the univariate analysis are shown in Table 30.
Table 28. Analysis of variance of means of computer experience items by merged job position

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Off-campus staff</th>
<th>On-campus staff</th>
<th>Office workers</th>
<th>F Value</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Number of workshops and courses participated in</td>
<td>3.48&lt;sup&gt;a&lt;/sup&gt;</td>
<td>5.15&lt;sup&gt;b&lt;/sup&gt;</td>
<td>6.47&lt;sup&gt;c&lt;/sup&gt;</td>
<td>7.90**</td>
<td>.0005</td>
</tr>
<tr>
<td>2.</td>
<td>Number of years of use</td>
<td>6.25&lt;sup&gt;a&lt;/sup&gt;</td>
<td>10.60&lt;sup&gt;b&lt;/sup&gt;</td>
<td>7.56&lt;sup&gt;c&lt;/sup&gt;</td>
<td>9.61**</td>
<td>.0001</td>
</tr>
</tbody>
</table>

**Highly significant, p < .01 1. c > a 2. b > a, c

Table 29. Analysis of variance of means of computer knowledge items by merged job position

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Off-campus staff</th>
<th>On-campus staff</th>
<th>Office workers</th>
<th>F Value</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Computer systems</td>
<td>3.11</td>
<td>3.56</td>
<td>3.65</td>
<td>5.86**</td>
<td>.0034</td>
</tr>
<tr>
<td>2.</td>
<td>Wordprocessing</td>
<td>3.67</td>
<td>4.07</td>
<td>4.19</td>
<td>7.21**</td>
<td>.0010</td>
</tr>
<tr>
<td>3.</td>
<td>Spreadsheet</td>
<td>2.64</td>
<td>3.41</td>
<td>2.83</td>
<td>9.65**</td>
<td>.0001</td>
</tr>
<tr>
<td>4.</td>
<td>Graphic</td>
<td>2.24</td>
<td>3.05</td>
<td>2.45</td>
<td>8.34**</td>
<td>.0003</td>
</tr>
<tr>
<td>5.</td>
<td>Statistical</td>
<td>2.09</td>
<td>2.68</td>
<td>2.33</td>
<td>4.78**</td>
<td>.0095</td>
</tr>
<tr>
<td>6.</td>
<td>Communication</td>
<td>2.88</td>
<td>3.29</td>
<td>3.47</td>
<td>4.89**</td>
<td>.0086</td>
</tr>
<tr>
<td>7.</td>
<td>Computer language</td>
<td>2.05</td>
<td>2.39</td>
<td>2.79</td>
<td>7.28**</td>
<td>.0009</td>
</tr>
</tbody>
</table>

**Highly significant, p < .01 1. c, b > a 2. c, b > a 3. b > a, c 4. b > a, c 5. b > a 6. c > a 7. c > a
Table 30. Analysis of variance of means of computer use items by merged job position

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Off-campus staff</th>
<th>On-campus staff</th>
<th>Office workers</th>
<th>F Value</th>
<th>F Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Frequency of use</td>
<td>4.19</td>
<td>4.53</td>
<td>4.66</td>
<td>3.83*</td>
<td>.0234</td>
</tr>
<tr>
<td>2.</td>
<td>Length of use</td>
<td>3.79</td>
<td>4.34</td>
<td>4.30</td>
<td>7.51**</td>
<td>.0007</td>
</tr>
<tr>
<td>3.</td>
<td>Use of E-mail and EXNET</td>
<td>3.15</td>
<td>3.63</td>
<td>3.82</td>
<td>3.31*</td>
<td>.0388</td>
</tr>
</tbody>
</table>

*p Significant, p < .05
**Highly significant, p < .01.

Confirmatory Factor Analysis of Computer Attitudes

A structural equation, confirmatory factor analytic approach, was used to test Hypothesis 4, the factor structure of the computer attitudes proposed by others (Gressard & Loyd, 1986; Koohang, 1989). The factor structure suggested by Gressard and Loyd was a four-correlated factor model. However, they insisted that four factors could be used separately (Gressard & Loyd, 1986). As they defined four factors as subfactors underlining the attitudes, it was reasonable to adopt a second-order factor model. Therefore, a four-correlated factor model, a four-independent factor model, and a second-order factor model were tested. In addition, a null model of independence and a single factor model were also tested for the model comparison.

A correlation matrix as a data input was entered into the LISREL program to run confirmatory factor analyses. The matrix used is shown in Table 31.
Table 31. Correlation matrix of computer attitudes items

<p>| No. | 1    | 2    | 3    | 4    | 5    | 6    | 7    | 8    | 9    | 10   | 11   | 12   | 13   | 14   | 15   | 16   | 17   | 18   | 19   | 20   | 21   | 22   | 23   | 24   |
|-----|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 1   | 1.0  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 2   | .44  | 1.0  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 3   | .25  | .42  | 1.0  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 4   | .29  | .24  | .33  | 1.0  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 5   | .49  | .51  | .38  | .48  | 1.0  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 6   | .58  | .55  | .41  | .26  | .52  | 1.0  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 7   | .48  | .48  | .56  | .35  | .42  | .57  | 1.0  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 8   | .33  | .27  | .23  | .32  | .32  | .19  | .37  | 1.0  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 9   | .54  | .54  | .28  | .31  | .44  | .56  | .48  | .29  | 1.0  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 10  | .41  | .36  | .35  | .26  | .37  | .58  | .40  | .24  | .57  | 1.0  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 11  | .31  | .40  | .52  | .23  | .37  | .42  | .52  | .17  | .38  | .34  | 1.0  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 12  | .35  | .32  | .31  | .24  | .41  | .40  | .44  | .42  | .20  | .27  | .36  | 1.0  |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 13  | .61  | .56  | .29  | .28  | .53  | .68  | .50  | .29  | .67  | .57  | .46  | .38  | 1.0  |      |      |      |      |      |      |      |      |      |      |      |      |
| 14  | .55  | .46  | .39  | .36  | .51  | .49  | .50  | .41  | .50  | .45  | .43  | .41  | .56  | 1.0  |      |      |      |      |      |      |      |      |      |      |      |      |
| 15  | .33  | .40  | .42  | .26  | .40  | .43  | .47  | .23  | .37  | .39  | .56  | .41  | .37  | .46  | 1.0  |      |      |      |      |      |      |      |      |      |      |      |
| 16  | .26  | .19  | .08  | .30  | .24  | .22  | .29  | .37  | .34  | .32  | .11  | .21  | .18  | .32  | .20  | 1.0  |      |      |      |      |      |      |      |      |      |
| 17  | .35  | .39  | .37  | .33  | .26  | .36  | .46  | .25  | .37  | .36  | .41  | .30  | .38  | .37  | .31  | .27  | 1.0  |      |      |      |      |      |      |      |      |
| 18  | .45  | .32  | .32  | .22  | .39  | .52  | .45  | .24  | .44  | .55  | .37  | .28  | .50  | .48  | .43  | .31  | .36  | 1.0  |      |      |      |      |      |      |      |
| 19  | .47  | .45  | .35  | .36  | .38  | .60  | .48  | .34  | .58  | .61  | .34  | .34  | .59  | .46  | .39  | .29  | .43  | .52  | 1.0  |      |      |      |      |      |      |
| 20  | .23  | .19  | .31  | .23  | .18  | .33  | .47  | .29  | .37  | .31  | .26  | .27  | .25  | .25  | .19  | .24  | .26  | .29  | .43  | 1.0  |      |      |      |      |      |</p>
<table>
<thead>
<tr>
<th>No.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
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<th>21</th>
<th>22</th>
<th>23</th>
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</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>.47</td>
<td>.39</td>
<td>.28</td>
<td>.35</td>
<td>.42</td>
<td>.53</td>
<td>.50</td>
<td>.31</td>
<td>.57</td>
<td>.49</td>
<td>.27</td>
<td>.26</td>
<td>.56</td>
<td>.49</td>
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<td>.43</td>
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<td>.54</td>
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<td></td>
</tr>
<tr>
<td>22</td>
<td>.48</td>
<td>.43</td>
<td>.32</td>
<td>.31</td>
<td>.51</td>
<td>.57</td>
<td>.52</td>
<td>.30</td>
<td>.40</td>
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<td>.47</td>
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<td>.50</td>
<td>.50</td>
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<td>.57</td>
<td>.50</td>
<td>.26</td>
<td>.42</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>.24</td>
<td>.33</td>
<td>.32</td>
<td>.19</td>
<td>.26</td>
<td>.34</td>
<td>.44</td>
<td>.23</td>
<td>.35</td>
<td>.33</td>
<td>.59</td>
<td>.39</td>
<td>.36</td>
<td>.39</td>
<td>.41</td>
<td>.18</td>
<td>.33</td>
<td>.32</td>
<td>.35</td>
<td>.31</td>
<td>.37</td>
<td>.45</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>.30</td>
<td>.23</td>
<td>.26</td>
<td>.23</td>
<td>.23</td>
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<td>.20</td>
<td>.41</td>
<td>.31</td>
<td>.27</td>
<td>.34</td>
<td>.28</td>
<td>1.0</td>
</tr>
</tbody>
</table>

Categories: CA = Computer anxiety; CC = Computer confidence; CE = Computer enjoyment; CU = Computer usefulness

Items by number:

1) Make me feel uncomfortable (CA)
2) Confident about trying new (CC)
3) I find it hard to stop (CE)
4) Computer is worth while (CU)
5) Do not feel threatened (CA)
6) Computer is very hard for me (CC)
7) Is enjoyable and stimulating (CE)
8) Need a firm mastery (CU)
9) Get a sinking feeling (CA)
10) Not the type to do well (CC)
11) I stick with it until (CE)
12) Expect me to be literate (CU)
13) Computer makes me nervous (CA)
14) I can work with computers (CC)
15) Does not appeal to me (CE)
16) Use computers in my career (CU)
17) Does not bother me at all (CA)
18) Not good with computers (CC)
19) As little work with computers (CE)
20) Increases job possibilities (CU)
21) Feel aggressive and hostile (CA)
22) Perform well in workshops (CC)
23) Continue to think about it (CE)
24) Supervisor expects me to be (CU)
Null model of independence

A null model of independence was adopted to compare with other models. Bentler and Bonett (1980) contended that it is often useful to compare a model or set of models to a nested null model using fit coefficients. This null model implies that all 24 indicators of computer attitudes are independent of each other. Thus, it could be the same as a 24-factor model because all Psi ($\phi$s), variances of all indicators are set to 1 and no Psi is related with any Psi.

Single factor model

A single factor model used in the comparison implied that each of the 24 indicators was loaded on a single factor ($\eta_1$). Each factor loading score ($\lambda_{yi}$) was considered as a standard correlation in terms of a simple regression. In a completely standardized solution, the variance of $\eta_1$ is 1. In order to achieve model identification, the first Lambda ($\lambda_{y11}$) associated with $\eta_1$ was set to 1. In an unstandardized solution, other factor loadings are related to 1 because the first Lambda was set to 1. The single factor model of computer attitudes is diagrammed in Figure 11, and summary of the model estimation is presented in Table 32.

Four-independent factor model

A four-independent factor model implied that no correlation existed among the factors ($\eta_1, \eta_2, \eta_3, \eta_4$). Computer anxiety, computer confidence, computer enjoyment, and computer usefulness were represented by $\eta_1, \eta_2, \eta_3, \eta_4$, respectively. The model is
$\eta_i = \text{computer attitudes}$

Figure 11. Single factor model
Table 32. Summary of single factor model analysis with completely standardized solution

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Factor loading (λ)</th>
<th>Measurement error (e)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Make me feel uncomfortable (CA)</td>
<td>.698</td>
<td>.513</td>
</tr>
<tr>
<td>2.</td>
<td>Confident about trying new (CC)</td>
<td>.647</td>
<td>.581</td>
</tr>
<tr>
<td>3.</td>
<td>I find it hard to stop (CE)</td>
<td>.532</td>
<td>.716</td>
</tr>
<tr>
<td>4.</td>
<td>Computer is worth while (CU)</td>
<td>.456</td>
<td>.792</td>
</tr>
<tr>
<td>5.</td>
<td>Do not feel threatened (CA)</td>
<td>.645</td>
<td>.584</td>
</tr>
<tr>
<td>6.</td>
<td>Computer is very hard for me (CC)</td>
<td>.778</td>
<td>.395</td>
</tr>
<tr>
<td>7.</td>
<td>Is enjoyable and stimulating (CE)</td>
<td>.729</td>
<td>.469</td>
</tr>
<tr>
<td>8.</td>
<td>Need a firm mastery (CU)</td>
<td>.446</td>
<td>.802</td>
</tr>
<tr>
<td>9.</td>
<td>Get a sinking feeling (CA)</td>
<td>.719</td>
<td>.484</td>
</tr>
<tr>
<td>10.</td>
<td>Not the type to do well (CC)</td>
<td>.677</td>
<td>.541</td>
</tr>
<tr>
<td>11.</td>
<td>I stick with it until (CE)</td>
<td>.596</td>
<td>.645</td>
</tr>
<tr>
<td>12.</td>
<td>Expect me to be literate (CU)</td>
<td>.531</td>
<td>.718</td>
</tr>
<tr>
<td>13.</td>
<td>Computer makes me nervous (CA)</td>
<td>.778</td>
<td>.395</td>
</tr>
<tr>
<td>14.</td>
<td>I can work with computers (CC)</td>
<td>.711</td>
<td>.494</td>
</tr>
<tr>
<td>15.</td>
<td>Does not appeal to me (CE)</td>
<td>.585</td>
<td>.658</td>
</tr>
<tr>
<td>16.</td>
<td>Use computers in my career (CU)</td>
<td>.384</td>
<td>.853</td>
</tr>
<tr>
<td>17.</td>
<td>Does not bother me at all (CA)</td>
<td>.552</td>
<td>.695</td>
</tr>
<tr>
<td>18.</td>
<td>Not good with computers (CC)</td>
<td>.653</td>
<td>.574</td>
</tr>
<tr>
<td>19.</td>
<td>As little work with computers (CE)</td>
<td>.732</td>
<td>.464</td>
</tr>
<tr>
<td>20.</td>
<td>Increases job possibilities (CU)</td>
<td>.457</td>
<td>.791</td>
</tr>
<tr>
<td>21.</td>
<td>Feel aggressive and hostile (CA)</td>
<td>.677</td>
<td>.542</td>
</tr>
<tr>
<td>22.</td>
<td>Perform well in workshops (CC)</td>
<td>.702</td>
<td>.507</td>
</tr>
<tr>
<td>23.</td>
<td>Continue to think about it (CE)</td>
<td>.532</td>
<td>.717</td>
</tr>
<tr>
<td>24.</td>
<td>Supervisor expects me to be (CU)</td>
<td>.451</td>
<td>.797</td>
</tr>
</tbody>
</table>

Categories:  CA = Computer anxiety  CC = Computer confidence  
             CE = Computer enjoyment  CU = Computer usefulness
diagrammed in Figure 12, with the results summarized in Table 33.

**Four-correlated factor model**

A four-correlated factor model is similar to a four-independent factor model except that each factor is correlated with each of the others. This model is illustrated in Figure 13 with the estimates summarized in Table 34.

**Second-order factor model**

The second-order factor model used in this comparison implies that each of the indicators was loaded on a single first-order factor ($\eta$) and that the correlation between factors was explained by the underlying second-order factor. In the model, the second-order factor ($\text{Ksi, } \xi$) was computer attitudes and the first-order factors ($\text{Eta, } \eta$) were the four sub-factors (computer anxiety, computer confidence, computer enjoyment, and computer usefulness). Therefore, Lambdas ($\lambda_{Yi}$) were the factor loadings between observed indicators and the first-order factors. Gammas ($\gamma$) were the factor loadings between the first-order factors and second-order factor. The model is diagrammed in Figure 14, with the results summarized in Table 35.

**Model evaluation**

Three measures of goodness-of-fit were used to compare each model. Due to a dependence on sample size, the Chi-square value ($\chi^2$) has no clear threshold value to assess overall model fit. However, a large change of $\chi^2$ compared to the difference in degrees of freedom indicates that the changes made in the model represent a real improvement (Jöreskog
Figure 12. Four - independent factor model

$\eta_1 = \text{computer anxiety}$  \hspace{1cm}  $\eta_2 = \text{computer confidence}$

$\eta_3 = \text{computer enjoyment}$  \hspace{1cm}  $\eta_4 = \text{computer usefulness}$
Table 33. Summary of four-independent factor model analysis with completely standardized solution

<table>
<thead>
<tr>
<th>Item number</th>
<th>Factor loading ($\lambda$)</th>
<th>Measurement error ($\epsilon$)</th>
<th>Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer anxiety ($\eta_1$)</td>
<td>.735</td>
<td>.460</td>
<td>.84</td>
</tr>
<tr>
<td>1.</td>
<td>.618</td>
<td>.618</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>.778</td>
<td>.394</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>.844</td>
<td>.287</td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>.481</td>
<td>.769</td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>.692</td>
<td>.522</td>
<td></td>
</tr>
<tr>
<td>Computer confidence ($\eta_2$)</td>
<td>.601</td>
<td>.639</td>
<td>.85</td>
</tr>
<tr>
<td>2.</td>
<td>.793</td>
<td>.371</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>.690</td>
<td>.523</td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>.666</td>
<td>.556</td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>.706</td>
<td>.502</td>
<td></td>
</tr>
<tr>
<td>18.</td>
<td>.726</td>
<td>.473</td>
<td></td>
</tr>
<tr>
<td>Computer enjoyment ($\eta_3$)</td>
<td>.656</td>
<td>.569</td>
<td>.83</td>
</tr>
<tr>
<td>3.</td>
<td>.729</td>
<td>.468</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>.783</td>
<td>.387</td>
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</tr>
<tr>
<td>11.</td>
<td>.675</td>
<td>.545</td>
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</tr>
<tr>
<td>15.</td>
<td>.540</td>
<td>.709</td>
<td></td>
</tr>
<tr>
<td>19.</td>
<td>.640</td>
<td>.591</td>
<td></td>
</tr>
<tr>
<td>Computer usefulness ($\eta_4$)</td>
<td>.443</td>
<td>.804</td>
<td>.72</td>
</tr>
<tr>
<td>4.</td>
<td>.678</td>
<td>.540</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>.627</td>
<td>.606</td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>.461</td>
<td>.788</td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td>.460</td>
<td>.788</td>
<td></td>
</tr>
<tr>
<td>20.</td>
<td>.639</td>
<td>.591</td>
<td></td>
</tr>
</tbody>
</table>
Figure 13. Four-correlated factor model

- $\eta_1$ = computer anxiety
- $\eta_2$ = computer confidence
- $\eta_3$ = computer enjoyment
- $\eta_4$ = computer usefulness
Table 34. Summary of four-correlated factor model analysis with unstandardized solution

<table>
<thead>
<tr>
<th>Item number</th>
<th>Factor loading ($\lambda$)</th>
<th>Measurement error ($\epsilon$)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer anxiety ($\eta_1$)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>1.00</td>
<td>.453</td>
</tr>
<tr>
<td>5.</td>
<td>.887</td>
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</tr>
<tr>
<td>9.</td>
<td>1.017</td>
<td>.435</td>
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<td>13.</td>
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<tr>
<td>17.</td>
<td>.700</td>
<td>.732</td>
</tr>
<tr>
<td>21.</td>
<td>.933</td>
<td>.525</td>
</tr>
<tr>
<td>Computer confidence ($\eta_2$)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>1.00</td>
<td>.564</td>
</tr>
<tr>
<td>6.</td>
<td>1.201</td>
<td>.377</td>
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<td>1.030</td>
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<tr>
<td>14.</td>
<td>1.074</td>
<td>.501</td>
</tr>
<tr>
<td>18.</td>
<td>.995</td>
<td>.571</td>
</tr>
<tr>
<td>22.</td>
<td>1.058</td>
<td>.516</td>
</tr>
<tr>
<td>Computer enjoyment ($\eta_3$)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>1.00</td>
<td>.623</td>
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<tr>
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<td>1.263</td>
<td>.405</td>
</tr>
<tr>
<td>11.</td>
<td>1.103</td>
<td>.546</td>
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<tr>
<td>15.</td>
<td>1.062</td>
<td>.579</td>
</tr>
<tr>
<td>19.</td>
<td>1.128</td>
<td>.526</td>
</tr>
<tr>
<td>23.</td>
<td>.971</td>
<td>.648</td>
</tr>
<tr>
<td>Computer usefulness ($\eta_4$)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>1.00</td>
<td>.754</td>
</tr>
<tr>
<td>8.</td>
<td>1.228</td>
<td>.626</td>
</tr>
<tr>
<td>12.</td>
<td>1.304</td>
<td>.578</td>
</tr>
<tr>
<td>16.</td>
<td>.907</td>
<td>.796</td>
</tr>
<tr>
<td>20.</td>
<td>1.042</td>
<td>.731</td>
</tr>
<tr>
<td>24.</td>
<td>1.200</td>
<td>.643</td>
</tr>
</tbody>
</table>
Figure 14. Second-order factor model

$\xi$ = computer attitudes   $\eta_1$ = computer anxiety   $\eta_2$ = computer confidence

$\eta_3$ = computer enjoyment   $\eta_4$ = computer usefulness
Table 35. Summary of second-order factor model analysis with unstandardized solution

<table>
<thead>
<tr>
<th>Item number</th>
<th>Factor loading</th>
<th>Measurement error</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Second-order factor loading</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer anxiety ($\eta_1$)</td>
<td>.696</td>
<td></td>
</tr>
<tr>
<td>Computer confidence ($\eta_2$)</td>
<td>.671</td>
<td></td>
</tr>
<tr>
<td>Computer enjoyment ($\eta_3$)</td>
<td>.551</td>
<td></td>
</tr>
<tr>
<td>Computer usefulness ($\eta_4$)</td>
<td>.342</td>
<td></td>
</tr>
<tr>
<td><strong>First-order factor loading</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer anxiety ($\eta_1$)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>1.00</td>
<td>.447</td>
</tr>
<tr>
<td>5.</td>
<td>.874</td>
<td>.570</td>
</tr>
<tr>
<td>9.</td>
<td>1.002</td>
<td>.434</td>
</tr>
<tr>
<td>13.</td>
<td>1.104</td>
<td>.313</td>
</tr>
<tr>
<td>17.</td>
<td>.696</td>
<td>.729</td>
</tr>
<tr>
<td>21.</td>
<td>.917</td>
<td>.527</td>
</tr>
<tr>
<td>Computer confidence ($\eta_2$)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>1.00</td>
<td>.569</td>
</tr>
<tr>
<td>6.</td>
<td>1.190</td>
<td>.389</td>
</tr>
<tr>
<td>10.</td>
<td>1.026</td>
<td>.544</td>
</tr>
<tr>
<td>14.</td>
<td>1.092</td>
<td>.484</td>
</tr>
<tr>
<td>18.</td>
<td>.988</td>
<td>.577</td>
</tr>
<tr>
<td>22.</td>
<td>1.066</td>
<td>.508</td>
</tr>
<tr>
<td>Computer enjoyment ($\eta_3$)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>1.00</td>
<td>.619</td>
</tr>
<tr>
<td>7.</td>
<td>1.236</td>
<td>.413</td>
</tr>
<tr>
<td>11.</td>
<td>1.113</td>
<td>.525</td>
</tr>
<tr>
<td>15.</td>
<td>1.060</td>
<td>.569</td>
</tr>
<tr>
<td>19.</td>
<td>1.095</td>
<td>.729</td>
</tr>
<tr>
<td>23.</td>
<td>.960</td>
<td>.647</td>
</tr>
<tr>
<td>Computer usefulness ($\eta_4$)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>1.00</td>
<td>.767</td>
</tr>
<tr>
<td>8.</td>
<td>1.344</td>
<td>.617</td>
</tr>
<tr>
<td>12.</td>
<td>1.396</td>
<td>.577</td>
</tr>
<tr>
<td>16.</td>
<td>1.010</td>
<td>.782</td>
</tr>
<tr>
<td>20.</td>
<td>1.073</td>
<td>.755</td>
</tr>
<tr>
<td>24.</td>
<td>1.324</td>
<td>.622</td>
</tr>
</tbody>
</table>
& Sörbom, 1989). The goodness-of-fit index (GFI) and the adjusted goodness-of-fit index (AGFI) were compared for the model evaluation.

Each model's goodness-of-fit measure is summarized in Table 36. According to the results presented in Table 36, none of the models were good enough to explain the factor structure of computer attitudes. The collected data did not substantiate the factor structures, that is, that computer attitudes were composed of four subfactors, anxiety, confidence, enjoyment, and usefulness. Therefore, hypothesis 4 was rejected.

**Structural Model of Computer Use**

This section describes the analysis that tested a theoretically interesting model for computer use. Hypothesis 2, 3, 4, and 6 were tested by analyzing the results from the model.

**Theoretically interesting model**

A theoretically interesting model was used to test the simple bivariate relationships between the variables included in the model. Hypothesis testing was conducted within the context of the structural model. This simplified interpretation of the results because a relationship between two variables could be examined while holding constant other variables in the model.

In order to calculate the initial parameter estimates, a maximum likelihood (ML) was used, and a correlation matrix (KM) was entered into LISREL program. The correlation matrix used is shown in Table 37 and the initial parameter estimates are reported in Figure 15. Gamma and Beta estimates which were statistically significant are denoted by asterisks.
Table 36. Assessment of fit criteria for the five models

<table>
<thead>
<tr>
<th>Overall fit measure</th>
<th>Null factor model</th>
<th>Single factor model</th>
<th>Four independent factor model</th>
<th>Four correlated factor model</th>
<th>Second order factor model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi-square degrees of freedom</td>
<td>276</td>
<td>252</td>
<td>252</td>
<td>246</td>
<td>248</td>
</tr>
<tr>
<td>Chi-square value</td>
<td>2335.06</td>
<td>611.42</td>
<td>1004.23</td>
<td>523.41</td>
<td>535.77</td>
</tr>
<tr>
<td>Chi-square probability</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td>GFI</td>
<td>.220</td>
<td>.765</td>
<td>.691</td>
<td>.802</td>
<td>.800</td>
</tr>
<tr>
<td>AGFI</td>
<td>.152</td>
<td>.720</td>
<td>.632</td>
<td>.758</td>
<td>.758</td>
</tr>
</tbody>
</table>

Table 37. Correlation matrix for the structural model

<table>
<thead>
<tr>
<th>No. Item</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Experience</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Knowledge</td>
<td>.53</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Attitudes</td>
<td>.35</td>
<td>.66</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Use</td>
<td>.34</td>
<td>.64</td>
<td>.60</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Age</td>
<td>.11</td>
<td>-.08</td>
<td>-.17</td>
<td>-.05</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Gender</td>
<td>-.25</td>
<td>-.24</td>
<td>-.12</td>
<td>-.14</td>
<td>-.14</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Education</td>
<td>.21</td>
<td>.21</td>
<td>.15</td>
<td>.22</td>
<td>.03</td>
<td>-.64</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Responsibility</td>
<td>.06</td>
<td>.09</td>
<td>.04</td>
<td>.14</td>
<td>.09</td>
<td>.35</td>
<td>-.49</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Length of service</td>
<td>.13</td>
<td>-.05</td>
<td>-.05</td>
<td>.01</td>
<td>.36</td>
<td>-.18</td>
<td>.17</td>
<td>-.14</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>10. Training and</td>
<td>.04</td>
<td>.03</td>
<td>.20</td>
<td>-.05</td>
<td>.00</td>
<td>.04</td>
<td>-.13</td>
<td>.07</td>
<td>-.04</td>
<td>1.0</td>
</tr>
</tbody>
</table>
Figure 15. Parameter estimate of theoretically interesting model
A t-value was used as a criterion to test the significance of the parameters at the .05 level. A t-value was defined as the ratio between the parameter estimate and its standard error (Jöreskog and Sörbom, 1989). T-values larger than two in magnitude were judged to be significantly different from zero in this study (Lee, 1990). A t-value which was larger than three was represented by two asterisks, while one asterisk represented a t-value between two and three.

Hypotheses were examined by confirming the presence of a statistically significant relationship in the predicted direction. The following hypothesized relationships were found to be significant:

2. Hypothesis 2.2 relationship between gender and computer experience
3. Hypothesis 2.5 relationship between program area of responsibility and computer experience.
4. Hypothesis 3.1 relationship between age and computer knowledge.
5. Hypothesis 3.5 relationship between program area of responsibility and computer knowledge.
6. Hypothesis 3.7 relationship between computer experience and computer knowledge.
7. Hypothesis 4.1 relationship between age and computer attitudes.
8. Hypothesis 4.6 relationship between educational training and support and attitudes.
9. Hypothesis 4.8 relationship between computer knowledge and computer attitudes.
10. Hypothesis 6.3 relationship between educational level and computer use.
11. Hypothesis 6.5 relationship between program area of responsibility and computer use.
12. Hypothesis 6.6 relationship between educational training and support and computer use.

13. Hypothesis 6.7 relationship between computer experience and computer use.

14. Hypothesis 6.8 relationship between computer knowledge and computer use.

15. Hypothesis 6.9 relationship between computer attitudes and computer use.

No statistically significant associations were found for the following proposed hypotheses.

1. Hypothesis 2.1 relationship between age and experience.

2. Hypothesis 2.3 relationship between education and experience.

3. Hypothesis 2.4 relationship between length of service and experience.

4. Hypothesis 2.6 relationship between educational training and support, and experience.

5. Hypothesis 3.2 relationship between gender and knowledge.

6. Hypothesis 3.3 relationship between education and knowledge.

7. Hypothesis 3.4 relationship between length of service and knowledge.

8. Hypothesis 3.6 relationship between educational training and support and knowledge.


11. Hypothesis 4.4 relationship between length of service and attitudes.

12. Hypothesis 4.5 relationship between program area of responsibility and attitudes.
13. Hypothesis 4.7 relationship between experience and attitudes.
15. Hypothesis 6.2 relationship between gender and use.
16. Hypothesis 6.4 relationship between length of service and use.

Several trends were evident in the magnitude of the relationships proposed by the model. In the context of endogenous variables (computer experience, computer knowledge, computer attitudes, and computer use), all the relationships among the variables were significant except a parameter estimate of computer experience to computer attitudes. The strongest magnitude was found in a relationship between computer knowledge and computer attitudes ($\beta_{32}=.639$), followed by computer experience and computer knowledge ($\beta_{21}= .486$).

Other relationships among the endogenous variables were also found as moderately associated: between computer knowledge and computer use ($\beta_{42}=.385$) and between computer attitudes and computer use ($\beta_{43}=.354$). Therefore, computer knowledge was identified as the most important predetermined variable related to computer use, the key dependent variable of the study.

In the context of the relationships between exogenous variables (age, gender, education, length of service, program area of responsibility, and educational training and support) and endogenous variables, each exogenous variable had at least one statistically significant relationship except the variable of length of service. The variable of length of service had no significant relationship with any endogenous variables.

Some negative relationships were identified. For example, the relationship between
age and computer knowledge ($\gamma_{21} = -0.140$), age and attitudes ($\gamma_{31} = -0.127$), and educational training and support and computer use ($\gamma_{46} = -0.119$). Some positive relationships were also identified such as a relationship between education and computer use ($\gamma_{43} = 0.200$), program area of responsibility and computer experience ($\gamma_{14} = 0.226$), program area of responsibility and computer knowledge ($\gamma_{24} = 0.169$), and educational training and support and attitude ($\gamma_{31} = 0.189$). However, all relationships among exogenous and endogenous variables were weak. In relation to computer use, the key dependent variable in the model, education, program area of responsibility, and educational training and support were determined as having a positive relationship.
CHAPTER V: DISCUSSION

The objectives of this study were to:

1. Identify and quantify computer educational training and support needs of Extension personnel.
2. Determine the attitudes of Extension personnel towards computer technology.
3. Determine current computer technology use by Extension personnel including amount of time spent, frequency, and programs in use.
4. Identify selected characteristics of Extension personnel regarding computer technology such as experience, knowledge, learning style, and job position.
5. Develop and analyze a linear model to reveal causal relationships between computer technology use of Extension personnel and selected factors such as training and support, attitudes towards computers, knowledge, experience, educational level, age, gender, length of service, and program area of responsibility.

During the process of accomplishing these objectives, information surfaced that could be beneficial to Iowa State University Extension Service in planning for better computerization, especially for educational training and support.

Objective One

In identifying and quantifying computer training and support, little was discovered that was unexpected. The most needed assistance from educational training and support was for specific software program, followed by assistance with upgrading software. The least needed
assistance from educational training and support was for basic introduction to computers. This was consistent with results found in similar studies (Richardson, 1984; Goode, 1990).

One possible explanation could be Extension personnel's limited experience with various new versions of software. McClelland (1986) supported this reasoning arguing that a lack of experience with new software discourages Extension personnel's computer use. Since a variety of new software with more powerful functions compared to existing software shows up in the market day by day, it is natural that the Extension personnel need to learn about and want to use new software.

Results of this study concerning the forms and types of computer training and support Extension personnel preferred to receive were inconsistent with results found in similar studies (Cantrell, 1982; Richardson, 1984). In former studies, in-service workshops held primarily on-campus were the most popular form of training and support. However, in this study an in-service workshop held on-campus was ranked fourth out of 11 items. The most preferred way to receive training and support was 'personalized at local level.'

One possible explanation could be Extension personnel's lack of time. This finding concurred with Quintana's study (1992) wherein a lack of time was identified as the most limiting barrier to Extension personnel's computer use.

The second most preferred item was for a 'user-friendly manual.' This implied that development and/or distribution of user-friendly manuals are necessary. Compared to other methods such as video tapes, via EXNET, tutorial computer disks, satellite, a user-friendly manual was considered the most useful tool. One possible cause of the problem is that
company-produced manuals are provided with the purchase of computer software. In general, this type of manual is neither user-friendly nor comprehensive.

**Objective Two**

The attitudes of Iowa State University Extension Service (ISUES) personnel toward computers were very positive as indicated in the data summarized in Table 9. This was consistent with a previous Iowa study (Richardson, 1984), a Mississippi study (Cantrell, 1982), and a Louisiana study (Smith & Kotrlik, 1990).

The highest positive sub-attitude was computer usefulness, while the lowest was computer enjoyment. Therefore, it could be reasoned that the Extension personnel regard computers as useful tools for their work. In summary, computer attitudes overall were not a matter of concern for Iowa State University Extension Service (ISUES).

**Objective Three**

Use of E-mail and EXNET was not very extensive as summarized by data presented in Table 10. However, approximately 66% of the respondents, indicated that they had used computers daily, with 43% reporting they had used computers for over two hours. This was a remarkable improvement over a previous Iowa study of 9 years ago (Richardson, 1984) wherein 90% of Extension personnel reported they had used a computer at least once during 1983.

This result may be due to the continuous supportive efforts of ISUES through several action plans to continue supporting personnel’s computer use (Information Technology
Training Support Service Infrastructure Report, 1993). Several steps have been taken by ISUES to help meet the challenge by removing some barriers and accelerating the development and capacity to utilize computer technology in communication and use of information.

**Objective Four**

Information concerning ISUES personnel's computer experience, knowledge, learning styles, and job position was collected. Current Extension personnel in Iowa indicated that they had considerably more training and computer experience than did respondents in a previous study (Nieuwsma, 1984). In the 1984 study approximately 72% of the Extension personnel in Iowa had not received any training in computers as compared to 5% in this study.

A more recent study of 13 North Central Region States including Iowa could also be compared with this study. Quintana (1992) reported that approximately 40% of the respondents had attended one or two in-service programs on educational technologies during the last 2 years, while more than three-fourths of the respondents had participated in an in-service program during the past 3 to 5 years. These findings were consistent with the results of this study. Therefore, it may be said that ISUES personnel's computer is comparable to that of other states.

In terms of years of computer use, 64% of the respondents indicated they had used computers for more than 5 years. This led the researcher to judge that ISUES personnel had extensive experience in computer use. One possible explanation for this may be justified by systems theory. According to systems theory, organizational support, including providing in-
service education, can be considered as a system's input, and Extension personnel's computer experience is considered as an output of the transformation process.

Behaviorism theory offers another possible explanation for justifying adequate computer experience. According to behaviorism theory, all behavior produces observable outcomes and reward from the outcomes is important. Extension personnel indicated that they had highly positive computer attitudes, especially computer usefulness. Consequently, they believed reward would occur. Therefore, those who had used computers little or not at all increased their usage.

In terms of computer knowledge by ISUES personnel, a concern surfaced because the mean of their computer knowledge was less than a mid-point of 3 on a scale of 1 to 5. Even though ISUES personnel indicated that they had enough experience, their knowledge level seemed low when compared to their attitude and experience. One possible cause for this low score can be explained by focusing on the quality of experience rather than quantity or amount of experience. What if teaching methods used in in-service education were not effective and congruent with participants' learning styles? Did in-service education meet Extension personnel's needs in the use of computers? Cognitive theory may provide some basis to answer these questions. This theory focuses on a conceptualization of the student's learning processes or the way the student receives, organizes, retains, and uses information.

Extension personnel's learning styles were identified by the use of the Learning Style Inventory. Four different learning styles were identified: converger, diverger, assimilator, and accommodator. The converger learning style emphasizes abstract conceptualization and active
experimentation. A learner with this style is interested in finding practical uses for ideas and theories to solve specific problems and to make decisions based on finding solutions to problems. The diverger learning style combines the learning steps of concrete experience and reflective observation. A learner with this style observes concrete situations from many different points of view, rather than taking action. The assimilator learning style combines abstract conceptualization and reflective observation. Assimilators are best at understanding a broad range of information and summarizing it into logical form. Finally, the accommodator learning style reflects concrete experience and active experimentation. A learner with this style has the ability to learn primarily from hands-on experience yet may rely more heavily on feelings rather than on logical analysis while solving problems.

Most of the respondents exhibited a converger learning style (almost 29%). Overall, the distribution of learning styles was fairly well balanced (see Figure 10). It was also found that learning styles had an overall effect on Extension personnel's preference to receive educational training and support. Therefore, it was suggested that future educational training and support be designed according to personnel's learning style as well as their need for specific topics.

In terms of job position, the participants were categorized into 8 groups: county extension education director; field specialist; state specialist, administrator, office workers, program assistant, support staff, and other. The largest group was office workers (N = 47 or 26.0%), followed by field specialist (N = 38 or 20.9%).

Furthermore, the participants were merged by position, into three groups: off-campus
professional staff, on-campus professional staff, and office workers. From the results of MANOVA, it was determined that all selected variables including educational computer training and support, computer experience, computer knowledge, computer attitudes, and computer use were related to Extension personnel's job positions.

Specifically, in relation to preference of ways to receive educational computer training and support, an interesting result appeared in item number 3, 'on-campus computer workshops', which was significant when grouped by job position. This implied that off-campus professional staff had a low preference to receive on-campus workshops as compared to on-campus staff. This argument was supported by reviewing the mean of each group (see Table 22). One possible explanation is their lack of time and the inconvenience to commute from their work to the campus. McClelland (1986) insisted that county Extension agents lacked the time to learn about and use computers and this lack of time played a role in discouraging use of computers.

In order to simplify relationships between job position and selected variables, several univariate analyses were administered according to merged job position. From the results of univariate analysis of variance, it was found that off-campus professional staff had the lowest means for all items (computer experience, computer knowledge, and computer use) compared to on-campus staff and office workers. One possible explanation is a lack of hardware and software. In general, computer facilities of county offices are inferior to those of on-campus offices. McClelland (1986) stated that the factors inhibiting county agent's instructional applications were hardware and software. Since county Extension personnel are out in front
dealing directly with clientele, more attention should be given to selecting computer equipment and software to meet their needs.

**Objective Five**

The last objective in this study was to develop and analyze a linear model to reveal causal relationships between computer technology use and a set of selected variables. First, a theoretically interesting model was developed and each bivariate relationship between the variables was tested.

According to the results from the analysis of the model, it was found that Extension personnel's computer experience, knowledge, attitudes, educational level, program area of responsibility, educational training and support were related to Extension personnel's computer use. Computer knowledge was identified as the most important variable to predict Extension personnel's computer use. However, as computer knowledge of ISUES personnel was not relatively high, some educational support needing to be made to increase computer knowledge.
CHAPTER VI. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The purpose of this study was to analyze the relationship of computer use with selected factors such as computer attitudes, computer experience, computer knowledge, learning styles, and job position, and to develop a linear structural model of computer technology use by Iowa State University Extension personnel that would provide implications for training and support needs for Extension personnel. In addition to these primary purposes, some descriptive characteristics of current educational computer technology use were to be determined.

The population for this study consisted of professionals and staff formally engaged in providing and supporting Extension education. They included field specialists, state specialists, county Extension education directors, area directors, administrative staff, support staff, and office workers. All branches of University Extension, including Extension to Business and Industry and Continuing Education, were included in this study. The total population consisted of 974 Iowa State University Extension Service personnel. A simple random sampling method was used to select a sample population of 200 subjects. After the first mailing and second follow-up mailing, 184 subjects were used in the study with a total return rate of 95 percent.

The completed instrument consisted of five parts: Part I - Computer Attitudes; Part II - Training and Support for Computer Use; Part III - Computer Experience, Knowledge and Use, Part IV - Learning Style; and Part V - Demographic Information. Computer attitudes
consisted of 24 items measured on a 5-point Likert-type scale that varied from strongly disagree to strongly agree. The scale was adapted from one developed by Gressard and Loyd (1986).

The questions for Part II were developed by the researcher. This part was divided into two sub-parts. The first dealt with Extension personnel's preference of ways to receive computer training and support. The other concerned Extension personnel's needs related to computer training and support. Both used 5-point Likert-type scales. The preference part consisted of 11 items while the needs part consisted of six items.

Part III was composed of three sub-parts: computer experience, computer knowledge, and computer use. Two items were employed to identify Extension personnel's computer experience and both were open-ended questions: number of times of participation in computer training course and years of computer use. Computer knowledge was measured in terms of self-reported ability to use specific computer systems and programs on a 5-point Likert-type scale that ranged from very poor to excellent. In the computer use sub-part, three items were administered in terms of frequency, time length, and use of E-mail and EXNET.

Part IV was designed to identify and quantify Extension personnel's learning style. This part contained 12 items, each consisting of a statement with four possible endings to be ranked. Kolb's learning style inventory (LSI) was adopted in the study. Finally, Part V consisted of six items requesting demographic information: age, sex, educational level, years of service in Extension, position, and responsibility.
Data from the research instrument were analyzed using the Statistical Package for Social Sciences (SPSS®), Statistical Analysis System (SAS), and LISREL at the computer facilities of Iowa State University. The following statistical procedures were used to analyze the data:

1. FREQ (frequency) and MEANS were performed to obtain descriptive statistics. TABLES statement with the CHISQ option was employed to achieve the chi-square test for independence in relation to learning style.

2. CORR (correlation) was used to detect pre-relationships among the variables and to produce the correlation matrices to be used in LISREL.

3. GLM (general linear model) with the MANOVA option was employed to test Hypothesis 1. After the MANOVA, several individual one-way ANOVAs were used to find significant differences and the SCHEFFÉ was used to identify specific relationships.

4. RELIABILITY was performed to assess the internal consistency of each part of the instrument. Finally, for hypotheses 2, 3, 4, 5, and 6, the LISREL program was employed.

After several statistical analyses, the major findings were identified. The findings were then divided into eight subsections for presentation. The subsections were as follows:

1. Demographic information
2. Computer experience
3. Computer knowledge
4. Computer attitudes
5. Computer use
6. Educational training and support for computer use
7. Learning styles
8. Job position

The following results were obtained by analyzing the data regarding each of the following eight subsets:

Demographic information

1. The age of the Iowa State University Extension Service personnel were nearly evenly distributed on the categorized scale.
2. The sample was approximately two-thirds female and one-third male.
3. Approximately 46% of the respondents had a M.S. or Ph.D. degree.
4. The years of service in Extension were divided into five groups. The highest group was 5 to 10 years of service. Approximately 40% of the participants had served more than 10 years.
5. The largest group was comprised of office workers with 37 (20.3%), followed by agriculture with 33 (18.1%).

Computer experience

1. Almost 95% of the respondents participated at least once in computer workshops and training courses. The mean of the number of times of participation in computer workshops and training courses was about five.
2. A majority (64%) of the respondents had used computers for more than six years.
Computer knowledge

1. The participants rated their abilities at word processing as the highest and computer system as the second highest.

2. The participants were least confident of their abilities in the use of statistical programs and computer language.

Computer attitudes

1. The attitudes of Iowa State University Extension Service personnel toward computers were very positive.

2. The most positive sub-attitude was that of computer usefulness, while the least positive sub-attitude was that of computer enjoyment.

3. Factor structures of computer attitudes were not composed of four sub-attitude factors.

Computer use

1. Approximately 66% of the participants used computers daily.

2. Approximately 43% of the participants used computers for more than two consecutive hours.

3. Use of E-mail and EXNET was low.

4. The most widely used program by the respondents was word processing.

5. Extension personnel's computer experience, knowledge, attitudes, educational level, program area of responsibility, and educational training and support were related to their computer use according to the initial theoretically interesting model.

6. Computer knowledge was identified as the most important variable to predict Iowa
State University Extension Service personnel's computer use.

**Educational training and support**

1. The most needed assistance for training and support indicated by participants was for specific software program and help with upgrading software.
2. The least needed assistance was for a basic introduction to computers.
3. The most preferred way to receive training and support was personalized at local level.
4. The participants indicated that they would like to receive training and support via user-friendly manuals.
5. An on-campus workshop was ranked as the fourth out of 11 types of training and support.

**Learning styles**

1. Extension personnel were divided into four different learning styles by means of the Learning Style Inventory (Kolb, 1985). The four different learning styles were: converger, diverger, assimilator, and accomodator. The distribution of learning styles was fairly well balanced.
2. The largest group used the converger learning style.
3. It was found that learning styles were related to the Extension personnel's preference to receive training and support.

**Job position**

1. In terms of job position, 25 county Extension education directors (13.8%), 38 field specialists (20.9%), 23 state specialists (12.7%), 10 administrators (3.9%), 47 office
workers (26.0%), 12 program assistants (6.6%), 11 support staff (6.1%), and 15 others (8.3%) were included in the study.

2. Job position was related to learning style.

3. Overall, job position was related to the selected variables such as preference of ways to receive educational computer training and support, needed assistance from educational computer training and support, computer experience, computer knowledge, computer attitudes, and computer use.

4. Off-campus professional staff composed of county Extension education directors, field specialists, and program assistants were found to have less computer experience, computer knowledge, and computer use compared to on-campus professional staff and office workers.

Conclusions

The following conclusions were made based on the findings and discussions of this study.

1. The majority (95%) of the participants had participated in computer workshops and training courses and 64% had used computers more than six years. Therefore, Iowa State University Extension Service personnel had a relatively high amount of computer experience.

2. Since Iowa State University Extension Service had made several efforts to bring about improved computer use, and since there had been a remarkable improvement over a decade as compared to a similar Iowa study done by Richardson in 1984, continuous
training and support played a role in encouraging computer use.

3. Most of the participants expressed confidence in using word processing. However, total mean computer knowledge was 2.94 which is less than the mid-point on a scale from 1 to 5. Therefore, Iowa State University Extension Service personnel's computer knowledge is not as good as their experience.

4. Iowa State University Extension Service personnel indicated that they regarded computers as useful and valuable. Therefore, they have the potential to increase computer knowledge and use because computer attitudes have an effect on both computer knowledge and computer use.

5. Computer knowledge was the most important variable in explaining Iowa State University Extension Service personnel's computer use.

6. Since computer knowledge of Iowa State University Extension Service personnel was not high when compared to other findings such as computer experience and attitudes, Extension service personnel need more intensive educational training that focuses on specific applications and includes hands-on operation.

7. Since the most preferred way to receive educational training and support was 'personalized at local level,' Iowa State University Extension Service personnel, especially off-campus professional staff, are not comfortable with on-campus computer workshops. Possible reasons are the lack of time and inconvenience of commuting. The Extension administration needs to provide educational training and support at the local level rather than on-campus education, if possible.
8. Since the second-most preferred way to receive training and support was a 'user-friendly manual,' development and/or distribution of user-friendly manuals is urgent. This might take place through recommending and distributing commercial manuals that are well-written and user-friendly.

9. The individual learning style of Iowa State University Extension Service personnel was related to their preference to receive educational training and support. Therefore, it is necessary to take learning style into account when designing training programs.

10. Job position was found to have a significant relationship with learning style, preference of ways to receive training and support, needed assistance, computer experience, computer knowledge, computer attitudes, and computer use. Thus, job position is the most important variable to consider when designing and implementing educational computer training and support.

Recommendations

Based on the findings and conclusions drawn, the following recommendations are made:

1. A standardized computer literacy questionnaire should be developed for Extension personnel.

2. After developing a standardized computer literacy questionnaire, a study should be conducted to determine Extension personnel's computer knowledge and competencies.

3. A study should be undertaken to determine specific use of E-mail and EXNET and to verify some of the barriers that inhibit these communication networks.

4. The computer area is rapidly changing in relation to hardware and software. Therefore,
Extension administration should provide continuous educational support to help
Extension personnel acquire new knowledge and better facilities to accommodate the
new changes.

5. Because Iowa State University Extension personnel are confident about their use of
word processing it is necessary that training and support focus on the other aspects of
educational software.

6. Since E-mail and EXNET use was low, promoting E-mail and information exchange
through the computer network is needed.

7. Extension administration should consider participants' needs and their learning styles in
designing future training programs.

8. Extension administration should hire more computer support staff or reallocate
resources to develop and distribute user-friendly manuals.

9. When Extension administration designs and implements educational computer
workshops, participants should be selected by their job position.

10. More studies should be conducted to determine how teaching methods match with
learning styles and affect participants' computer learning achievement.
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Felter M. (1983). *Computer literacy of California high school seniors.* (ERIC ED 237 068)

Francis, S. (1988). *The impact of educational level, gender, age and computer experience on computer attitudes of adults enrolled in ABE and GED programs in the state of Arkansas.* Doctoral dissertation, University of Arkansas, Fayetteville, AR.


ACKNOWLEDGMENTS

It has been my fortune to have been able to work under the direction of Dr. Julia A. Gamon and Dr. Robert A. Martin, my co-major professors. I could not have completed this research without their guidance. Special thanks go to Dr. Gamon who provided a research assistantship and sage counsel during my graduate studies. She was always supportive and kind.

I would like to express my appreciation to the members of my graduate committee: Dr. Eric A. Abbott, a representative from my minor program of studies in Technology and Social Change and who also provided me with an assistantship and a chance to conduct research studies in a related area of value to my work in Korea; Dr. Frederick O. Lorenz who taught LISREL Analysis and expanded my mind in statistics; and Dr. Larry D. Trede who gave me valuable critical reviews and comments about my work.

I am greatly indebted to my previous professors in Korea: Tae-Young You, Sung Sam Oh, and Soo Wook Kim. They all have been exceptional mentors and have given me continual encouragement during my study in the United States of America.

I am deeply grateful to my parents: my father, Kyoung Bok Park and my mother, Nang Ja Ahn. I dedicate this dissertation especially to them for their many years of boundless love and steadfast support in all areas of my life. I have especially appreciated their close contact with me while I have been away in Iowa.

Finally, with much love and devotion, I thank my lovely wife, Hwang Gi Young, for her endurance through many long days and late night hours of study.
APPENDIX A: HUMAN SUBJECTS COMMITTEE APPROVAL FORM
Information for Review of Research Involving Human Subjects
Iowa State University
(Please type and use the attached instructions for completing this form)

1. Title of Project
   Computer technology use by Iowa State University Extension personnel

2. I agree to provide the proper surveillance of this project to insure that the rights and welfare of the human subjects are protected. I will report any adverse reactions to the committee. Additions to or changes in research procedures after the project has been approved will be submitted to the committee for review. I agree to request renewal of approval for any project continuing more than one year.

   Sung-Youl Park April 14
   Typed Name of Principal Investigator
   Ag. Ed & Studies
   Department

   Curtiss 223
   Campus Address
   294-0901
   Campus Telephone

3. Signatures of other investigators
   Date Relationship to Principal Investigator
   April 14 Major Professor

4. Principal Investigator(s) (check all that apply)
   □ Faculty □ Staff □ Graduate Student □ Undergraduate Student

5. Project (check all that apply)
   □ Research □ Thesis or dissertation □ Class project □ Independent Study (490, 590, Honors project)

6. Number of subjects (check all that apply)
   □ 300 # Adults, non-students □ 1 ISU student □ # minors under 14 □ # minors 14 - 17
   □ other (explain)

7. Brief description of proposed research involving human subjects: (See instructions, Item 7. Use an additional page if needed.)
   The purpose of this study is to develop a linear structure model of computer technology use by Iowa State Extension personnel that will provide direction for administrative support and educational training needs for Extension personnel. Target sampling subjects are Iowa State Extension staff members. Addresses and information about the subjects will be gained with the aid of Dept. of Ag. Ed & Studies and Iowa State Extension Service. A questionnaire will be mailed to the 50% of population and simple random sampling technique will be used to select sample.

(Please do not send research, thesis, or dissertation proposals.)

8. Informed Consent:
   □ Signed informed consent will be obtained. (Attach a copy of your form.)
   □ Modified informed consent will be obtained. (See instructions, Item 8.)
   □ Not applicable to this project.
9. **Confidentiality of Data:** Describe below the methods to be used to ensure the confidentiality of data obtained. (See instructions, item 9.)

   The information that the subjects will provide will be only created by the researcher in strict confidence. As soon as the researcher analyzes the data, it will be destroyed by the researcher. The expected date for deletion will be late fall of 1993. The researcher will not provide any personal information to any body. Information from the study will be reported only in group form. The number on the questionnaire will be used only the purpose of follow-up in the case of non-respondents.

10. What risks or discomfort will be part of the study? Will subjects in the research be placed at risk or incur discomfort? Describe any risks to the subjects and precautions that will be taken to minimize them. (The concept of risk goes beyond physical risk and includes risks to subjects' dignity and self-respect as well as psychological or emotional risk. See instructions, item 10.)

   None.

11. **CHECK ALL** of the following that apply to your research:

   - A. Medical clearance necessary before subjects can participate
   - B. Samples (blood, tissue, etc.) from subjects
   - C. Administration of substances (foods, drugs, etc.) to subjects
   - D. Physical exercise or conditioning for subjects
   - E. Deception of subjects
   - F. Subjects under 14 years of age and/or Subjects 14-17 years of age
   - G. Subjects in institutions (nursing homes, prisons, etc.)
   - H. Research must be approved by another institution or agency (Attach letters of approval)

   If you checked any of the items in 11, please complete the following in the space below (include any attachments):

   - **Items A - D** Describe the procedures and note the safety precautions being taken.

   - **Item E** Describe how subjects will be deceived; justify the deception; indicate the debriefing procedure, including the timing and information to be presented to subjects.

   - **Item F** For subjects under the age of 14, indicate how informed consent from parents or legally authorized representatives as well as from subjects will be obtained.

   - **Items G & H** Specify the agency or institution that must approve the project. If subjects in any outside agency or institution are involved, approval must be obtained prior to beginning the research, and the letter of approval should be filed.
Checklist for Attachments and Time Schedule

The following are attached (please check):

12. ☒ Letter or written statement to subjects indicating clearly:
   a) purpose of the research
   b) the use of any identifier codes (names, #s), how they will be used, and when they will be removed (see Item 17)
   c) an estimate of time needed for participation in the research and the place
   d) if applicable, location of the research activity
   e) how you will ensure confidentiality
   f) in a longitudinal study, note when and how you will contact subjects later
   g) participation is voluntary; non-participation will not affect evaluations of the subject

13. ☐ Consent form (if applicable)

14. ☐ Letter of approval for research from cooperating organizations or institutions (if applicable)

15. ☒ Data-gathering instruments

16. Anticipated dates for contact with subjects:

<table>
<thead>
<tr>
<th>First Contact</th>
<th>Last Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>April 30, 1993</td>
<td>May 20, 1993</td>
</tr>
</tbody>
</table>

   Month / Day / Year

17. If applicable: anticipated date that identifiers will be removed from completed survey instruments and/or audio or visual tapes will be erased:

   November 30, 1993

   Month / Day / Year

18. Signature of Departmental Executive Officer Date Department or Administrative Unit

   [Signature]

   4/14/93

   Dept. of Ag.Ed & Studies

19. Decision of the University Human Subjects Review Committee:

   ☒ Project Approved  ☐ Project Not Approved  ☐ No Action Required

   [Signature]

   Patricia M. Keith

   Name of Committee Chairperson  Date  Signature of Committee Chairperson

   4/14/93  PMK

GC: 1/90
APPENDIX B: INSTRUMENT
EXTENSION COMPUTER USE

Part I: Computer Attitudes

For the set of statements below, please circle the number between 1 and 5 which most closely reflects your level of agreement with the question posed. When responding to the items below, please use the following scale:

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly disagree</td>
<td>Disagree</td>
<td>Undecided</td>
<td>Agree</td>
<td>Strongly agree</td>
</tr>
</tbody>
</table>

1. Computers make me feel uncomfortable.
   - 1 2 3 4 5
2. Generally, I feel confident about trying new computer usages.
   - 1 2 3 4 5
3. Once I start to work with the computer, I find it hard to stop.
   - 1 2 3 4 5
4. Learning about computers is worth while.
   - 1 2 3 4 5
5. I do not feel threatened when others talk about computers.
   - 1 2 3 4 5
6. I think using a computer is very hard for me.
   - 1 2 3 4 5
7. I think working with computers is enjoyable and stimulating.
   - 1 2 3 4 5
8. I need a firm mastery of computers for my future work.
   - 1 2 3 4 5
9. I get a sinking feeling when I think of trying to use a computer.
   - 1 2 3 4 5
10. I am not the type to do well with computers.
    - 1 2 3 4 5
11. When there is a problem with a computer that I can't immediately solve, I stick with it until I have the answer.
    - 1 2 3 4 5
12. My clientele expect me to be computer literate.
    - 1 2 3 4 5
13. Working with a computer makes me nervous.
    - 1 2 3 4 5
14. I am sure I can work with computers.
    - 1 2 3 4 5
15. Figuring out computer problems does not appeal to me.
    - 1 2 3 4 5
16. I can't think of any way that I will use computers in my career.
    - 1 2 3 4 5
17. It does not bother me at all to take a computer training.
    - 1 2 3 4 5
18. I feel comfortable working with a computer.
    - 1 2 3 4 5
19. I do as little work with computers as possible.
    - 1 2 3 4 5
20. Knowing how to work with computers increases my job possibilities.
    - 1 2 3 4 5
21. I feel aggressive and hostile towards computers.
    - 1 2 3 4 5
22. I can perform well in computer workshops.
    - 1 2 3 4 5
23. If a computer problem is left unsolved, I continue to think about it afterward.
    - 1 2 3 4 5
24. My immediate supervisor expects me to be able to use computers.
    - 1 2 3 4 5

(Continue on the next Page)
Part II: Training and support for computer use

For the set of statements below, please circle the number between 1 and 5 which most closely reflects your level of agreement with the question posed. When responding to the items below, please use the following scale:

<table>
<thead>
<tr>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Undecided</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

I like to receive computer training and support in the following way:

25. personalized at local level  
26. telephone hot-line  
27. on-campus work shop  
28. periodical newsletters  
29. tutorial computer disks  
30. video tapes  
31. via EXNET  
32. program documentation  
33. satellite  
34. user friendly manual  
35. combination of manual, video, and computer disk

I need assistance with the following:

36. basic introduction to computers  
37. specific software programs  
38. computer programming  
39. information retrieval and exchange (EXNET)  
40. purchasing new equipment  
41. upgrading software

(Continue on the next page)
Part III : Computer Experience, Knowledge and Use

Please indicate your responses to the statements below by circling only one number and for the open-ended questions, write down your responses.

42. Approximately how many computer workshops and training courses have you participated in? __________

43. Approximately how many years have you used computers? __________

<table>
<thead>
<tr>
<th>How would you rate your ability to use</th>
<th>Very poor</th>
<th>Poor</th>
<th>Average</th>
<th>Good</th>
<th>Excellent</th>
</tr>
</thead>
<tbody>
<tr>
<td>44. computer systems</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>45. word processing</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>46. spreadsheet program</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>47. graphic program</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>48. statistical program</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>49. communication system</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>50. computer language</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

51. During the past four years, how often have you typically used computers?
   1. Never
   2. About one to three times a month
   3. About once a week
   4. About two to four times a week
   5. Daily

52. When you are working on the computer, about how long do you usually work?
   1. Never
   2. Less than thirty minutes
   3. Thirty minutes to one hour
   4. One hour to two hours
   5. Over two hours

53. How often do you use E-mail and EXNET?
   1. Never
   2. One time to three times per month
   3. About one time per week
   4. About two times to four times per week
   5. Daily

54. Which of the following application programs is your most frequent use?
   1. Word Processing
   2. Desktop Publishing
   3. Data Base
   4. Spreadsheet
   5. Graphics
   6. Statistical Programs
   7. Communication
   8. Computer language
   9. Other __________

55. Which of the following application programs do you most need to learn about
   1. Word Processing
   2. Desktop Publishing
   3. Data Base
   4. Spreadsheet
   5. Graphics
   6. Statistical Programs
   7. Communication
   8. Computer language
   9. Other __________

(Continue on the next page)
Part IV: Learning Style

For this part, you will be asked to complete 12 sentences. Each has four endings. Please rank the endings for each sentence according to how well you think each one fits with how you would go about learning something. Try to recall some recent situations where you had to learn something new, perhaps in your job. Then, using the spaces provided, rank a "4" for the sentence ending that describes how you learn best, down to a "1" for the sentence ending that seems least like the way you would learn. (Learning Style Inventory, McBer and Company. Copyright permission applied for)

<table>
<thead>
<tr>
<th>Most like you</th>
<th>Second like you</th>
<th>Third like you</th>
<th>Least like you</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

Example:

When I learn: 4. I am happy. 1. I am fast. 2. I am logical. 3. I am careful.

66. When I learn: ___ I like to deal ___ I like to think ___ I like to be
with my feelings. and listen. about ideas. doing things.
67. I learn best when: ___ I trust my hunches and ___ I listen and watch carefully. ___ I rely on logical thinking. ___ I work hard to get things feelings. and reactions.
68. When I am learning: ___ I have strong feelings and ___ I am quiet and ___ I tend to reason things out. ___ I am responsible reserved. about things.
69. I learn by: ___ feeling. ___ watching ___ thinking. ___ doing.
70. When I learn: ___ I am open to ___ I look at all ___ I like to analyze ___ I like to try new experiences. sides of issues. things, break them down into their parts.
71. When I am learning: ___ I am an intuitive person. ___ I am an observing person. ___ I am a logical person. ___ I am an active person.
72. I learn best from: ___ personal relationships. ___ observation ___ rational theories. ___ a chance to try out and practice.
73. When I learn: ___ I feel personally involved in things. ___ I take my time before acting. ___ I like ideas and theories. ___ I like to see results from my work.
74. I learn best when: ___ I rely on my feelings. ___ I rely on my observations. ___ I rely on my ideas. ___ I can try things out for myself.
75. When I am learning: ___ I am an accepting person. ___ I am a reserved person. ___ I am a rational person. ___ I am a responsible person.
76. When I learn: ___ I get involved. ___ I like to observe. ___ I evaluate things. ___ I like to be active.
77. I learn best when: ___ I am receptive and open-minded. ___ I am careful. ___ I analyze ideas. ___ I am practical.

(Continue on the next page)
Part V: Demographic information
Please indicate your answer to questions below by circling the appropriate number.

68. What is your age?
   1 Less than 20
   2 20 to 30
   3 31 to 40
   4 41 to 50
   5 Over 50

69. What is your sex?
   1 Male
   2 Female

70. What is your last degree?
   1 High school
   2 B.A. or B.S.
   3 M.S.
   4 Ph.D.

71. How long have you been in Extension?
   1 Less than 5 years
   2 5 years to 10 years
   3 11 years to 20 years
   4 21 years to 30 years
   5 Over 30 years

72. What is your position?
   1 County Extension Education Director
   2 Field Specialist
   3 State Specialist
   4 Administrator
   5 Office Assistant
   6 Other

73. What is your main area of responsibility?
   1 Agriculture
   2 Home Economics
   3 Youth
   4 Community Development
   5 Engineering
   6 Education
   7 Administration
   8 Office Assistant
   9 Other

Thank you for your cooperation

If you have any additional comments that would help us better understand your view on Extension workers' computer use or Extension's computerization, please use the space below to share your thoughts with us.
To: Sung-Youl Park  
Dept. of Ag. Ed & Studies  
Room 223, Curtiss Hall  
Iowa State University  
Ames, Iowa 50010

Please staple or tape
DATE: September 1, 1993
TO: Extension Area Directors
    Cabinet Members
FROM: Julia Gamon
      Agricultural Education & Studies
      217 Curtiss Hall
      515-294-0897

I have a graduate student (Sung-Youl Park) who will be mailing, this
month, a questionnaire on Extension computer use to a 30 percent random
sample of all Iowa State University Extension personnel, including office
assistants. He has permission from Bob Anderson to do this study and has
been working with Barb Woods on the content of the questionnaire. This
should be a study that will benefit all of Extension with specific implications
for the design of computer support and training. This note is simply to
make you aware of the mailing and to ask for your support if you receive
questions.

kmv
APPENDIX D: COVER LETTER TO PARTICIPANTS
Dear Extension Staff Member:

The importance of educational technology, especially computers, has been increasing in the educational environment. Extension is no exception. While microcomputers and computer networks have been in use in Extension for a decade or more, some questions about computer use still remain unanswered, questions on software use, needs for staff support and training, and preferred learning style. As an Extension staff member, your responses about your attitude toward computers will provide valuable information to answer these and similar questions bearing on computer use by Extension.

You have been randomly selected as a participant in this study entitled "Computer technology use by Iowa State University Extension personnel." This is a Ph.D. research study being conducted in the Dept. of Agricultural Education and Studies. Your participation is entirely voluntary. The information you provide will be treated in strict confidence. In addition, information from the study will be pooled and reported only in group form. The number on the questionnaire will be used only for the purpose of follow-up only in the case of non-respondents.

This questionnaire will take you approximately ten minutes to complete. When you have completed the questionnaire, please fold, tape and return to us by November 19.

We thank you very much in advance for your response. Once again, the information you provide will be valuable to our Extension system. If you have any questions concerning the research project, feel free to contact us at 515/294-0897.

Sincerely,

Sung-Youl Park
Graduate student

Julia A. Gamon
Associate Professor
Agricultural Education and Studies

Enclosure
APPENDIX E: FOLLOW-UP LETTER
November 19, 1993

Dear Extension Staff Member:

Recently you received a questionnaire titled "Extension Computer Use". We know that you are busy in your working or educating, especially at the end of this year. Perhaps that is why we have not received your completed questionnaire for the study of computer technology use by Iowa State University Extension personnel, which was mailed to you. We are also enclosing another copy of the questionnaire for you in case you did not receive it.

It is very important that we have your input in order to make the study worthwhile. This questionnaire requires only a few minutes to complete. We would appreciate it if you would complete the questionnaire at your earliest convenience and return it as soon as possible.

If you have already sent us the questionnaire please disregard this notice. Thank you very much for your cooperation.

Sincerely,

Sung-Youl Park
Graduate student

Julia A. Gamon
Associate Professor
Agricultural Education and Studies

Enclosure