Instructional technology used by the teaching and extension faculty in the College of Agriculture at Iowa State University

Saban-Shah Bukhari Sayed
Iowa State University

Follow this and additional works at: https://lib.dr.iastate.edu/rtd

Part of the Agricultural Education Commons, and the Other Education Commons

Recommended Citation
Sayed, Saban-Shah Bukhari, "Instructional technology used by the teaching and extension faculty in the College of Agriculture at Iowa State University " (1989). Retrospective Theses and Dissertations. 9081.
https://lib.dr.iastate.edu/rtd/9081

This Dissertation is brought to you for free and open access by the Iowa State University Capstones, Theses and Dissertations at Iowa State University Digital Repository. It has been accepted for inclusion in Retrospective Theses and Dissertations by an authorized administrator of Iowa State University Digital Repository. For more information, please contact digirep@iastate.edu.
INFORMATION TO USERS

The most advanced technology has been used to photograph and reproduce this manuscript from the microfilm master. UMI films the text directly from the original or copy submitted. Thus, some thesis and dissertation copies are in typewriter face, while others may be from any type of computer printer.

The quality of this reproduction is dependent upon the quality of the copy submitted. Broken or indistinct print, colored or poor quality illustrations and photographs, print bleedthrough, substandard margins, and improper alignment can adversely affect reproduction.

In the unlikely event that the author did not send UMI a complete manuscript and there are missing pages, these will be noted. Also, if unauthorized copyright material had to be removed, a note will indicate the deletion.

Oversize materials (e.g., maps, drawings, charts) are reproduced by sectioning the original, beginning at the upper left-hand corner and continuing from left to right in equal sections with small overlaps. Each original is also photographed in one exposure and is included in reduced form at the back of the book. These are also available as one exposure on a standard 35mm slide or as a 17" x 23" black and white photographic print for an additional charge.

Photographs included in the original manuscript have been reproduced xerographically in this copy. Higher quality 6" x 9" black and white photographic prints are available for any photographs or illustrations appearing in this copy for an additional charge. Contact UMI directly to order.
Instructional technology used by the teaching and extension faculty in the College of Agriculture at Iowa State University

Sayed, Saban-Shah Bukhari, Ph.D.

Iowa State University, 1989
Instructional technology used by the teaching and extension faculty in the College of Agriculture at Iowa State University

by

Saban-Shah Bukhari Sayed

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

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

Approved: Members of the Committee:
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
1989

Copyright © Saban-Shah Bukhari Sayed, 1989. All rights reserved.
# TABLE OF CONTENTS

1 INTRODUCTION ............................................................... 1
   1.1 Statement of the Problem ........................................... 4
   1.2 Significance of the Problem ..................................... 5
   1.3 Purpose of the Study .............................................. 6
   1.4 Hypotheses .......................................................... 6
   1.5 Basic Assumptions of the Study ................................. 8
   1.6 Limitations of the Study ......................................... 8
   1.7 Definition of Terms .............................................. 9

2 REVIEW OF LITERATURE ................................................... 12
   2.1 Technology and Its Importance ................................... 12
   2.2 Technology and Audio-visuals .................................... 14
   2.3 Technology and Teaching ......................................... 17
   2.4 Summary of Literature Review ................................. 22

3 METHODS AND PROCEDURES .............................................. 24
   3.1 Method of the Study .............................................. 25
      3.1.1 Research Design ........................................... 25
      3.1.2 Population and Sample Size ............................... 25
| 3.1.3  | Instrumentation ........................................ 26 |
| 3.1.4  | Data Collection ........................................ 27 |
| 3.1.5  | Data Analysis .......................................... 29 |
| 4     | RESULTS AND DISCUSSION .................................. 33 |
| 4.1   | Reliability of Instrument .............................. 33 |
| 4.2   | Demographic Information ................................ 34 |
| 4.2.1 | Characteristics by Type of Assignment(s) .............. 35 |
| 4.2.2 | Characteristics of Respondents by Rank ................ 36 |
| 4.3   | Use of Instructional Technology ........................ 39 |
| 4.3.1 | Use of Library and University Facilities ............... 42 |
| 4.3.2 | Factors Affecting Selection of Technology .............. 43 |
| 4.3.3 | Changes in Strategy to Use Instructional Technology ... 46 |
| 4.3.4 | Future Use of Instructional Technology ................. 46 |
| 5     | SUMMARY, CONCLUSIONS AND RECOMMENDATIONS ............... 74 |
| 5.1   | Summary .................................................. 74 |
| 5.2   | Conclusions ............................................. 81 |
| 5.3   | Recommendations ........................................ 85 |
| 5.4   | Recommendations for Further Study ...................... 86 |
| 6     | BIBLIOGRAPHY ............................................. 88 |
| 7     | ACKNOWLEDGMENTS ........................................ 93 |
| 8     | APPENDIX A: Cover Letter ................................ 95 |
LIST OF TABLES

Table 3.1: Mean, standard deviation (SD), t-value, and t-probability for the respondents and non-respondents of the teaching and extension faculty in the College of Agriculture at Iowa State University .......................... 32

Table 4.1: Reliability of instrument for use of instructional technology by the teaching and extension faculty in the College of Agriculture at ISU .......................... 51

Table 4.2: Mean, standard deviation (SD), F-ratio, and F-probability for use of instructional technology during a typical semester by the teaching and extension faculty when grouped by their rank in the College of Agriculture at Iowa State University .......... 61

Table 4.3: Mean, standard deviation (SD), F-ratio, and F-probability for use of instructional technology during a typical semester by the teaching and extension faculty when grouped by type of assignment(s) in the College of Agriculture at Iowa State University .......................... 62
Table 4.4: Mean, standard deviation (SD), F-ratio, and F-probability for use of library and university facilities by the teaching and extension faculty when grouped by type of assignment(s) in the College of Agriculture at Iowa State University 63

Table 4.5: Mean, standard deviation (SD), F-ratio, and F-probability for use of library and university facilities by the teaching and extension faculty when grouped by their rank in the College of Agriculture at Iowa State University 64

Table 4.6: Mean, standard deviation (SD), F-ratio, and F-probability pertaining to the factors influencing selection of instructional technology by the teaching and extension faculty when divided by their rank in the College of Agriculture at Iowa State University 65

Table 4.7: Mean, standard deviation (SD), F-ratio, and F-probability pertaining to the factors influencing selection of instructional technology by the teaching and extension faculty when divided by type of assignment(s) in the College of Agriculture at Iowa State University 66

Table 4.8: Mean, standard deviation (SD), t-value, and t-probability for use of instructional technology by the teaching and extension faculty in the College of Agriculture at Iowa State University 67
Table 4.9: Mean, standard deviation (SD), F-ratio, and F-probability for perceptions of the teaching and extension faculty regarding the future use of instructional technology when grouped by rank at ISU .................................................. 68

Table 4.10: Mean, standard deviation (SD), F-ratio, and F-probability for perceptions of teaching and extension faculty regarding the future use of instructional technology when grouped by their assignment(s) ................................................................. 69

Table 4.11: Mean, standard deviation (SD), F-ratio, and F-probability regarding the perceptions about instructional technology by the teaching and extension faculty when they are grouped by type of assignment(s) in the College of Agriculture at Iowa State University ................................................................. 70

Table 4.12: Mean, standard deviation (SD), F-ratio, and F-probability regarding the perceptions about instructional technology by the teaching and extension faculty when they are grouped by rank in the College of Agriculture at Iowa State University ................................................................. 71

Table 4.13: Mean, standard deviation (SD), F-ratio, and F-probability for use of instructional technology in class/presentation(s) by the teaching and extension faculty in the College of Agriculture at Iowa State University when grouped by age ................................................................. 72
Table 4.14: Mean, standard deviation (SD), t-value, and t-probability for use of instructional technology in class/presentation by the faculty in the College of Agriculture at Iowa State University when they were grouped according to teaching certification.
LIST OF FIGURES

Figure 3.1: Distribution of responses of the teaching and extension faculty over time (N=182) .................................................. 31

Figure 4.1: Distribution of respondents by type of assignment(s) and gender (N=192) .................................................. 52

Figure 4.2: Distribution of respondents by type of assignment(s) and whether they have taught via television and/or video (N=182) ....... 53

Figure 4.3: Distribution of respondents by type of assignment(s) and whether they possessed teaching certification (N=181) ............... 54

Figure 4.4: Distribution of respondents by rank and gender (N=171) ... 55

Figure 4.5: Distribution of respondents by rank and age group (N=170) ... 56

Figure 4.6: Distribution of respondents by rank and level of teaching (N=156) 57

Figure 4.7: Distribution of respondents by rank and where they teach (N=165) ................................................................. 58

Figure 4.8: Distribution of respondents by rank and whether they had taken teaching methods course(s) (N=169) ............................ 59

Figure 4.9: Distribution of respondents by rank and whether they had modified their teaching strategy (N=169) .............................. 60
1 INTRODUCTION

One common definition of instructional technology is a systematic approach to improve learning through media management, educational program development, and learning resources. Tickton (1971) defined instructional technology as a systematic way of designing, carrying out, and evaluating the total process of teaching and learning in terms of specific objectives; based upon research in human learning and communication, and employing a combination of human and non-human resources to bring about more effective instruction.

He also set forth six benefits which are as follows:

1. Technology can make education more productive.
2. Technology can make education more individualized.
3. Technology can give instruction a more scientific basis.
4. Technology can make instruction more powerful.
5. Technology can make learning more immediate.
6. Technology can make access to education more equal.

In addition to the advantages Tickton sees, there are others; for example, technology can make the student more involved in a subject, technology can store information until the student is ready to use it, and technology can relay information over long distances. Media can also give the student the opportunity to interact and respond
in many ways.

The definition of instructional technology used to judge the programs considered here is synthesized from two definitions, one developed by the Association for Educational Communications and Technology and the other by Tickton. Accordingly, instructional technology is a systematic approach to improve teaching/learning through media management, educational program development, and learning resources; and is based upon research in human learning and communication. The important components of the definition as identified by Hortin (1981) are:

1. Improvement of learning
2. Systematic approach
3. Media management
4. Educational program development
5. Learning resources.

Instructional technology, when properly designed and used, can help students retain more of what they learn by requiring them to use more of their senses in the teaching/learning process. For example, a microcomputer can be an effective teaching aid. It can assist teachers by performing routine tasks (grading and recordkeeping), and serve as an audio-visual device. Instructional technology is becoming increasingly important because it enables instructors to be in communication with all other components of the teaching/learning process. Key applications of instructional technology are to give teachers sufficient time to learn the use of instructional technology, utilize the available resources around them, and keep them up to date.

Another application of the instructional technology as a teacher's aid uses the
computer as an audio-visual device. If a classroom is equipped with television monitors, the teacher may use the microcomputer as a slide or overhead projector. Title slides that take several days to prepare using a conventional 35mm camera, can be prepared and used in minutes. Computer images can replace overhead projector transparencies. Microcomputer graphics can be generated to illustrate various principles. Microcomputer graphics can even include animations (which are not possible with 35mm slides or overhead transparencies). Applications of microcomputers as audio-visual devices, although frequently overlooked by teachers, can do much to enhance the delivery of instruction.

Thorndike, an eminent educational psychologist, expressed the need for a new educational technology as pointed out by Nasman (1987). He mentioned that instructional technology offers the real possibility of a revolution in the organization, content, methods and achievements of an educational system. Instructional technology goes beyond any particular medium or device. In this sense, instructional technology is more than the sum of its parts. It is a systematic approach employing a combination of human and non-human resources to bring about more effective instruction.

Nasman (1987, p. 2), while talking about learning principles, stated:

Research has shown that individuals retain about 10% of what they read, 20% of what they hear, 30% of what they see, and 50% of what they see and hear. Furthermore, when the learner is required to immediately complete an action that demonstrates what the learner has seen and heard, there is a dramatic increase in retention.

To be effective in increasing long-term retention, an instructional delivery system
should allow teachers to address as many of the learners' senses as possible. The system should allow for the learner to be actively, rather than passively, involved. New instructional technology makes it possible for students to be involved in the teaching/learning process.

1.1 Statement of the Problem

A number of innovations have come and gone over the years. Many of these have been promoted as something that will revolutionize the way education is conducted, however, most have had little long-term impact on the way education is delivered. Several forms of instructional technology have been available for a number of years, but several factors have prevented their widespread application in education. Among these factors are:

- Lack of information about the technology;

- Relative cost of hardware, software development costs;

- Difficulty of interfacing, especially in cases of videodisc players and microcomputers; and

- Lack of availability of materials which have been specifically designed for instruction (Nasman 1987, p. 2).

It is possible that instructional technology can resolve many of the problems related to delivering high quality instruction to students. The hardware has been developed and is readily available. The cost of hardware is at a point where it is no
longer a major obstacle. Perhaps the biggest problem to be solved is the development of related educational materials that can be incorporated into quality instruction. As more and more educators discover the potential of instructional technology, the demand for quality educational materials will grow, and there may be corresponding growth in the supply. Hopefully, it will not be too much longer before every student will experience the benefits of the most advanced instructional technology.

1.2 Significance of the Problem

According to Paoni (1983), the average instructor spends approximately 80–90% of his/her classroom time involved in the use of teaching strategies. The other 10–20% is used for roll taking, giving assignments, homework, instructions, etc. There is a multitude of strategies that can be used in the instructional process. Experts have identified and defined a number of strategies but none of them is said to be the best. However, each of them is appropriate under certain conditions as pointed out by Hyman (1974) in Ways of Teaching.

The critical factors in the use of instructional technology are the methods being used and for what purposes. Several experts in the field have indicated that each strategy, or types of strategies, require(s) different forms of learning or skills from the students. All strategies/methods do not produce the same cognitive or affective results, but should result in a general pattern of student outcomes. This concept emphasizes the individualized and self-pacing instruction and is possible with use of instructional technology for quality teaching.
1.3 Purpose of the Study

The main purpose of the study was to assess instructional technology used by the teaching and extension faculty in the College of Agriculture at Iowa State University. A secondary purpose was to determine the perceptions of the teaching and extension faculty regarding the future use of instructional technology in teaching and disseminating information.

The specific objectives were as follows:

1. To collect demographic data on the teaching and extension faculty relevant to the study.

2. To assess and compare instructional technology used by the teaching and extension faculty during a typical semester.

3. To identify and compare the factors that influence the selection of instructional technology.

4. To identify any changes in the use of instructional technology from initial employment.

5. To assess and compare the teaching and extension faculty perceptions regarding the future use of instructional technology.

1.4 Hypotheses

Keeping in view the objectives of this study, the following null hypotheses were formulated:
• There is no significant difference in the use of instructional technology during a typical semester among the teaching and extension faculty in the College of Agriculture at Iowa State University when they are grouped by rank.

• There is no significant difference in the use of instructional technology during a typical semester among the teaching and extension faculty in the College of Agriculture at Iowa State University when they are grouped by type of assignment(s).

• There is no significant difference pertaining to the factors affecting selection of instructional technology when the teaching and extension faculty in the College of Agriculture at Iowa State University are grouped by rank.

• There is no significant difference pertaining to the factors affecting selection of instructional technology when the teaching and extension faculty in the College of Agriculture at Iowa State University are grouped by type of assignment(s).

• There is no significant difference in the use of instructional technology by the teaching and extension faculty in the College of Agriculture at Iowa State University who modified their teaching strategy to use instructional technology and who did not.

• There is no significant difference in the future use of instructional technology as perceived by the teaching and extension faculty in the College of Agriculture at Iowa State University when they are grouped by rank.
• There is no significant difference in the future use of instructional technology as perceived by the teaching and extension faculty in the College of Agriculture at Iowa State University when they are grouped by type of assignment(s).

1.5 Basic Assumptions of the Study

The researcher made certain assumptions that served as the basis for the study. The following were assumed to be true:

1. The data collected reflected the actual experiences of the teaching and extension faculty in the College of Agriculture at Iowa State University with respect to their use of instructional technology.

2. The respondents clearly understood the statements and questions as presented in the instrument.

3. The individuals selected to participate in the study were knowledgeable about the uses of instructional technology.

1.6 Limitations of the Study

1. This study was limited to the teaching and extension faculty in the College of Agriculture at Iowa State University.

2. The study was limited to those teaching and extension faculty members who were willing to participate in the study.

3. The study was limited to use of instructional technology and not to technical skills of instructional technology.
4. The study was limited to those instructional technology uses as outlined in the instrument.

5. The questionnaire represented a selected list of questions based on a literature search and a panel of experts. It may not have represented all possible uses of instructional technology.

6. Mailed questionnaires have limitations, e.g., respondents cannot express themselves other than categories in the questionnaire, therefore, this study may be subject to the weaknesses inherent to this method.

1.7 Definition of Terms

For the purpose of the study, the terms used in the study are defined as follows:

**Attitude:** A set of beliefs that the object is either good or bad (Culbertson 1968). Attitudes are states of readiness that influence the action of an individual toward objectives and events (Broudy, Smith and Burnett 1964). Attitude is a general tendency of a person to act in a certain way under certain conditions (Mager 1968).

**CES:** See Cooperative Extension Service.

**Clientele:** Refers to individuals or special interest groups who participate and potentially derive benefit from the program(s).

**Cooperative Extension Service:** An organization created by the Smith-Lever Act in 1914 and is a cooperative function among the United States Department of
Agriculture (USDA), the land-grant institutions, and local county governments. Its purpose is to provide informal education to the people of the United States.

**Extension:** See Cooperative Extension Service.

**Faculty:** Members of the faculty in the College of Agriculture at Iowa State University.

**Instructional technology:** A systematic approach to improve teaching/learning through media management, educational program development, and learning resources. It is based upon research in human learning and communication.

**Instructor:** See teacher.

**Method:** See teaching method.

**Planning:** A series of planned events or activities with specific objectives taking advantage of all available facilities which facilitate the process of learning (Gross 1977).

**Perception:** An immediate judgement or a process of knowing objectives, facts, etc., either by sense(s), or by thought. The ability to link what is sensed with past events in order to give meaning to situations as well as an awareness, feeling, and understanding of situations (Van Dalen 1979).

**Personnel:** See professional.

**Professional:** Title given to an individual who has been appointed to carry out the programs. The role of professional is very similar to that of a teacher.
Program: The result of planned activities in which professional educators and learners are involved. The sequential activities consist of needs analysis, planning, instruction, promotion, evaluation, and reporting (Boyle 1981).

Research: A formal, intensive and systematic investigation which employs the scientific or problem solving method and is directed toward the identification, clarification and/or resolution of a problem.

Strategy: See method.

Teacher: Denotes any Extension worker – agent, specialist, supervisor, administrator – whose responsibilities include attempting to change the knowledge, skills, understanding, or behavior of others (staff members, clientele or students).

Teaching: Refers to any type of effort to diffuse information, to encourage its adoption, or to assist people in coping with any type of problem.

Teaching method: A planned procedure, sequence of experiences, activities or events designed to bring about a desired change. The technique(s) used to present knowledge to the students (Gross 1977).
2 REVIEW OF LITERATURE

The literature review is divided into three sections: 1) technology and its importance; 2) technology and audio-visuals; and 3) technology and teaching.

2.1 Technology and Its Importance

Ofiesh (1984) points out that "as the cost of high technology drops, and its reliability increases, the effect on education will be revolutionary". By the year 1990, 25% of all the nation's households will own a computer. Pressure will be on educators to keep pace with what is commonplace in the home and business (Steinman 1984).

Not only has technology development and application progressed rapidly, but there has also been an important institutional change. George E. Brown, Jr., a congressman, emphasized the "Information Revolution" by saying:

Half of the work force is engaged in information-related occupations. In 1990 and 2000, information technologies will have uses ranging from routine services such as electronic mail and banking to sophisticated industrial applications of computer aided design and robotics. I see great educational potential in imaginative uses of telecommunications networks to "wire" together schools, libraries, and governmental and industrial centers and to
make distant data bases, as well as distant new and important environments, accessible to home users. With the construction of sophisticated "knowledge bases", computers will be able to query a student—perhaps in natural language—to ascertain his level of knowledge and to guide his explorations, complete with advanced graphics, at an appropriate level (Brown 1981, p. viii).

Media technology is assumed necessary in a modern society because of its ability to transmit bits of information in a multitude of different forms. David Sarnoff said in 1965:

Not only television and the telephone, but books, magazines and newspapers, will be converted into identical bits of energy for transmission over any distance. At the receiving end, these electronic signals will be converted into any form we choose—either visual display or recorded sound or printed page (as cited in Friendly 1967, p. 226).

Media is a generic term referring to a class of instructional resources and representing all aspects of the mediation of instruction through the agency of reproducible events. It includes the materials themselves, the instruments used to deliver the materials to learners, and the techniques or methods employed (Allen 1970).

Instructional technology includes a wide array of instruments, devices, and techniques (Tickton 1971). In the Commission report on instructional technology, cost was summed up by stating:

But a true technology of instruction that integrates human and nonhuman
resources into a comprehensive system to improve learning is unlikely to save money. Quality comes high (Tickton 1971, p. 24).

2.2 Technology and Audio-visuals

According to Chu and Schramm (as cited in Kinzel 1973), instructional television can be used efficiently to teach any subject matter where one-way communication will contribute to learning. The chances of broadcast opportunities improve and expand when quality color videotapes can be produced within an institution. The same videotape produced for one utilization can be used by several commercial television stations.

Videocassettes can become electronic books when media libraries provide playback equipment for individual viewing. Videocassettes, being mailable, can support an extended campus program. Videotape whether in a cassette or reel to reel format can be delivered mostly anywhere (Neidt and Baldwin 1970).

Gropper (1967) indicated that conventional television lessons, involving no active responding on the part of the students, “may be adequate with lesser goals in mind”. Active, overt responding, however, is necessary when the student is required to acquire, retain and transfer large amount of information. It is important, when considering the effectiveness of instructional television or film, not to forget the contribution made by the verbal commentary.

In an incisive review of the research that has been carried out on learning from films; Hoban (1960) arrived at three broad conclusions: 1) People do learn from films; 2) The amount learned varies with individual differences such as age and formal edu-
cation; and 3) Learning can be directly increased by repetition, student participation, and the use of attention directing devices as the inclusion of arrows etc.

Instructional radio must be examined as it relates to the practices of a tradition bound educational system and a science of learning that has not yet discovered “wheels”. College and university systems, in general, have used their educational radio facilities for cultural enrichment, student training, and some student teaching (Forsythe 1971).

At MIT an “Interactive Lecture System” utilized a stereo audiocassette tape recorder and an electrowriter for visual reproduction. One track carries the audio lecture, the other signals the electrowriter to reproduce on paper the chalkboard information. Both sound and display occur as originally presented, but are now transmitted for a single individual (Schmelzer 1972).

Instructional telephone has been an important link in radio feedback system. Thornton and Brown (1968) cite a number of examples of “telelectures” in schools, colleges, and universities. Telelecture brings the specialist or expert to the classroom by two-way telephone. Both the students and the expert have a chance to communicate. If an electrowriter is added to the telelecture-telephone system, line drawings can be transmitted from one point and projected at another serving as an electronic chalkboard. Electrowriters have been used to improve the instructional environment, especially in courses like mathematics, physics, or chemistry.

If the instructional time period is short or has conflicting schedule, the presentation can be recorded on audiotape for playback on telephone line, or the tape mailed to the distant point for utilization at an appropriate time (Kinzel 1973).
Audiotape utilization for instruction is a medium with many uses. Thornton and Brown (1968, p. 49) have identified the common uses of audiotape utilization for instruction. They are summarized as:

- Criticizing and commenting about student assignments on audiotape for student playback.
- Recordings prepared by students and faculty for the blind students.
- Variations in freshman performance due to background can be compensated for by supplementary audiotape listening and workbook.
- Foreign language instruction for groups or individuals.
- Listening centers for music, and speech and hearing testing.
- Instructional listening to prerecorded material for information and direct response.
- Major lectures recorded and made available to students (may be used in place of class attendance, conflict, and sickness).

Students with composition problems could benefit from a bank of prerecorded audiotapes designed to explain common composition problems as determined by repeated student errors (Briand 1970).

Audiotutorial instruction began in 1961 as an attempt to assist Purdue University students with poor backgrounds in introductory botany (Postlethwait 1970, p. 79). The model has guidelines as:
Learning requires active involvement on the part of the learner, and opportunities should be provided for repetition, concentration, multi-sensory learning, use of medium appropriate to the subject, sequencing of activities, and interaction with fellow students and instructors. Emphasis is on directed independent study.

According to Black (1962), simple line drawings are most effective for teaching than pictures. Dwyer (1969) compared presentation by means of simple line drawings, detailed shaded drawings, and realistic photographs, with presentations containing no illustrations. He found that simple line drawings were more successful at prompting total student understanding of the concepts presented in the instruction; that the more detailed shaded drawings were better at prompting learning of location, structure and position, but that oral presentations, with an absence of any kind of illustration, were more effective in prompting the learning of information about terms and the development of new views and reorganizations.

2.3 Technology and Teaching

Generally, educators do essentially the same things no matter the level at which they teach. According to Allen (1970, p. 4) educators:

- Plan course, present the material and make outside work assignments.
- Stimulate and motivate the students.
- Assess how much the students have learned.
- Report the information to a central record keeper and to the student.

Most of the teacher’s time for a given course is devoted to planning and preparing
the course and presenting material to students to meet their needs. According to Bukhari (1987, p. 5), needs can be assessed through a process which determines the gap between current outputs/outcomes and required or target outputs/outcomes. The great promise of instructional technology is that it offers an opportunity to develop models of education far different from the current dominant one, and in so doing, make major improvements in the quality and effectiveness of education in order to meet the needs of clientele. A number of changes in institutional policies and procedures can encourage faculty to become involved in the development and use of instructional technology. Hershfield (1981) feels that if educators do not reorient themselves quickly to take advantage of technology, private industry and new types of non-profit educational organizations will do so.

Dede (1981, p. 308) identified a new mode of teaching/learning. This paradigm includes:

- Centralization of curriculum development and financing approaches.
- Decentralization of learning environment into homes, communities and industries.
- New types of government regulations to allow educators to interface with public utilities as communications channels.
- Privatization of educational enterprise, as information technology vendors become involved.
- New types of diagnostic, assessment, and evaluation strategies in response to larger grading pools and altered definitions of learner effectiveness.
• New "machine-coupled" teaching strategies such as computers and interactive video.

• New administrative networks, with the erosion of many middle management positions as increased information transfer becomes possible without intermediary functionaries.

• New types of people attracted to the various educational professions, with different skills and salary requirements; and

• Evolution in the process and content of teacher training/certification.

According to Anandam and Kelly (1981, p. 126), technology, used in education, is divided into five major categories:

1. Print technology is most widely used technology though it is not always thought of as one.

2. Telecommunications include telephones, radios, and two-way communication systems which are just barely beginning to make their mark in various instructional applications.

3. Motion picture and video technology represents a combination of visual, motion, animation, and audio components.

4. Computer technology is exploding with unbelievable dimensions into every phase of our lives.
5. *Biological manipulation*, perhaps the most frightening of all, links all the other technologies to modify human behavior.

Benjamin Bloom discusses two roles of evaluation – formative and summative. Most evaluations with respect to technological innovations failed to include formative evaluation. Anandam and Kelly (1981) introduced the concept of three Es – Extensiveness, Effectiveness, and Endurance, as related to technology. Extensiveness refers to how widespread is the use of technology in education; effectiveness refers to improvement in human (faculty and student) satisfaction, student motivation, retention, and learning; and endurance refers to the long lasting continuation of an innovation.

According to Thornton and Brown (1968), uses of self-instructional multi-media systems are as varied as the variety of equipment and materials available for independent study, individual and individualized instruction. A distinction between individual and individualized instruction may be useful. Individual instruction is for any individual who is directed or chooses to learn independently with little or no instruction. Individualized instruction is tailored to the individual’s needs (Coulson 1970). One of the most frequent uses in higher education has been the preparation of teachers in the utilization of audiovisual equipment.

According to Lipson (1981), computers, telecommunications networks, and image devices such as the videodisc offer a wide range of instructional options. Even on a straight economic basis, the continuing reduction in the cost of computing combined with the increasing cost of printed materials suggests that electronic publishing will compete directly with printing within the decade of the '80s (Evans 1979). Dolce (1981) asked the question: Can we reorganize our educational system – at all levels
to make effective use of these new information technologies? The question still remains unanswered.

Computing has profoundly influenced our society, science, government, business, our household appliances, and even children’s toys have been affected. Indeed, computing is one of those rare commodities within our society for which the cost has continued to decline (Deringer 1981). The National Science Foundation has concentrated on computing because to be able to do science and engineering in the '80s and beyond one has to know something about computing. According to Deringer (1981), there are different approaches to the computer in science education:

1. The computer as a tool of science.
2. The computer as an object of study, and
3. The computer as a deliverer of instruction. For the last approach — the deliverer of instruction — there is still reluctance on the part of many institutions but can be encouraged as pointed out by Dr. Joseph Lipson of the National Science Foundation (Deringer 1981).

Dr. Andrew Molnar of NSF stated that change cannot be mandated, but leaders can persuade. Many leaders point to the need for better science training, which means training in the use of computers. Lidtke (1981, p. 86) suggested the development of an action plan which should:

- Provide teachers with an opportunity to learn about appropriate uses of computers in the classroom.
- Provide pre-service and in-service training for teachers.
- Provide adequate, not token, equipment for the classroom.
• Provide software packages for use in classrooms.

• Provide auxiliary teaching resources – films, texts, lesson plans, and curriculum guides.

• Provide a specialist to consult with classroom teachers concerning hardware, software, and classroom usage of the computer.

• Reward good teaching with computers.

• Provide examples of teachers doing superior teaching with computers.

In a recent report, Technology in Science Education: The next 10 years, J. C. R. Licklider of MIT says “the world is rapidly moving into the Information Age” and information technology is flourishing everywhere but in the field of education. He concludes that “education is not only missing a great opportunity, but it is also failing to discharge a responsibility” (Deringer 1981).

2.4 Summary of Literature Review

The review of literature was organized around three sections: 1) technology and its importance; 2) technology and audio-visuals; and 3) technology and teaching.

From the literature reviewed, it is evident that instructional technology is an integrated process involving people, procedures, ideas, devices, and organization, for analyzing problems; and devising, implementing, evaluating and managing solutions to the problems, in situations in which learning is puposive and controlled.

There’s an old Chinese proverb that says, “When I listen, I forget; when I see, I remember; and when I do, I learn”. With use of instructional technology the learner
is not only given a chance to listen and see but also can take active part which is not possible otherwise. Moreover, instructional technology provides an opportunity for hands-on experience and involvement in the process of teaching/learning.

No one will argue with the premise that education is the plaster that holds a society together (Sturdivant 1985). Technology soon will be flourishing everywhere and pressure will be on educators to keep pace with it. Educators should develop strategies to meet the changing needs of the society in order to cope with future problems when everything will be dependent, one way or the other, on technology. The use of technology needs planning as is evident from an old Chinese proverb that says, “If you want to plan for the year, plant a seed. If you want to plan for ten years, plant a tree. But, if you want to plan for hundred years, educate the people”.
3 METHODS AND PROCEDURES

The main purpose of the study was to assess instructional technology used by the teaching and extension faculty in the College of Agriculture at Iowa State University. A secondary purpose was to determine the perceptions of the teaching and extension faculty regarding the future use of instructional technology in teaching and disseminating information.

The specific objectives were as follows:

1. To collect demographic data on the teaching and extension faculty relevant to the study.

2. To assess and compare instructional technology used by the teaching and extension faculty during a typical semester.

3. To identify and compare the factors that influence the selection of instructional technology.

4. To identify any changes in the use of instructional technology from initial employment.

5. To assess and compare the teaching and extension faculty perceptions regarding the future use of instructional technology.
3.1 Method of the Study

The method of investigation consisted of research design; population and sample size; instrumentation; data collection procedures; and data analysis.

3.1.1 Research Design

The study was conducted using the descriptive survey method. Mason and Bramble (1978) defined "descriptive research" as a broad range of activities that have a common purpose of describing situations or phenomena. These descriptions may be necessary for decision-making or to support broader research objectives. According to Moore (1983), descriptive research attempts to describe their inter-relationship in the hope of obtaining useful information in order to plan subsequent experimental studies.

3.1.2 Population and Sample Size

Population for the study consisted of the faculty in the College of Agriculture at Iowa State University who had teaching and/or extension responsibilities. Some faculty also had other responsibilities such as research, administration, advising, and/or curriculum development. The faculty represented all departments in the College of Agriculture at Iowa State University.

According to Van Dalen (1979), a sample of 10 to 20 percent of a population is often used in descriptive research depending upon the nature of the population. A list showing faculty and staff was obtained from the College of Agriculture at Iowa State University in Ames. A total of 250 faculty members were identified from the
1988-89 master list with responsibilities of teaching and extension. A new list was generated with a four-digit code number for mailing purposes.

3.1.3 Instrumentation

According to Slavin (1984), descriptive research employs surveys in order to describe particular phenomena as they exist, rather than trying to manipulate variables. He further reported that questionnaires and interviews are commonly used to determine the ideas or perceptions of interest to the research. Mason and Bramble (1978) indicated that by using questionnaire, a large sample can be reached economically, thus increasing the generalizability of the obtained data. In addition, greater anonymity can be provided to the respondents which may result in more open and honest responses to the questions. The data were collected through structured questionnaire. The instrument was developed on the bases of experience, literature available on instructional technology, and its uses in teaching and disseminating information (see Appendix B). The researcher's program of study committee served as a panel of experts and their comments were incorporated to improve content validity of the instrument.

The survey instrument developed for this study consisted of 125 items. The following areas were covered:

- Demographic information and other characteristics relevant to the study.
- Use of instructional technology in class and/or presentation(s).
- Use of library facilities
- Use of university facilities
Use of instructional technology during a typical semester.

Factors influencing selection of instructional technology.

Perceptions about future use of instructional technology.

Perceptions about instructional technology.

Likert-type scales were used for all the above areas except for demographic information and other characteristics relevant to the study. For the areas 1) use of instructional technology in class; 2) use of library facilities; 3) use of university facilities; and 4) use of instructional technology during a typical semester, the scales used were as: 1=Never; 2=Seldom; 3=Sometimes; 4=Often; and 5=Always.

The scales for the area of factors influencing selection of instructional technology were as: 1=Not Important; 2=Somewhat Important; 3=Important; 4=Very Important; and 5=Extremely Important. The scales for perceptions pertaining to future use of instructional technology were as: 1=No Change; 2=Little Change; 3=Significant Change; 4=Complete Change; and 5=Do not know. The scales for perceptions about instructional technology were as: 1=Strongly Disagree; 2=Disagree; 3=Undecided; 4=Agree; and 5=Strongly Agree.

3.1.4 Data Collection

In order to gather data for the study, necessary permission was obtained from the University Committee on the Use of Human Subjects in Research (see Appendix D). The instrument was numerically coded for confidentiality and for follow-up procedures. A cover letter was developed to explain the importance and objectives of the study and assure anonymity. The letter was approved by the Assistant Dean for
Academic Programs (see Appendix A). On March 1, 1989, the cover letter along with survey was mailed with a request to respond by March 10, 1989. A reminder (see Appendix C) along with a copy of survey was mailed to non-respondents on March 15, 1989, so that they could fill out survey and return by March 24, 1989. A codebook was developed to record the data for analysis.

The returned responses are presented in Figure 3.1 on page 31. The response rate began with four or 2.1% of the total returned on the same day. The next day it expanded to the number of fifty-one or 26.6% of the total which was recorded as the highest. On March 7, 1989, it dropped to forty-five or 23.4% of the total. From March 8-15, 1989, the response ranged between eleven to nine, roughly 5% of the total return per day. The return rate for follow-up ranged from seven to one or 3.6% to 0.5%. Eleven faculty members decided not to participate in the study.

On March 31, 1989, ten or about 20% of non-respondents were contacted by telephone for validating the data. Six questions from the instrument were randomly selected for follow-up. The questions asked were: 1) How many years have you taught/worked at ISU? 2) How many years experience do you have in using computer(s)? 3) On a five-point scale where 1=never, 2=seldom, 3=sometimes, 4=often, and 5=always; how often do you use television and/or video cassette recorder in your class/presentation(s)? 4) On a five-point scale where 1=never, 2=seldom, 3=sometimes, 4=often, and 5=always; how will you describe use of transparencies during a typical semester? 5) On a five-point scale where 1=not important, 2=somewhat important, 3=important, 4=very important, and 5=extremely important; how will you rate the importance of software cost in selection of instructional technology?
and 6) On a five-point scale where 1=strongly disagree, 2=disagree, 3=undecided, 4=agree, and 5=strongly agree; how do you describe your feelings; can technology make education cost effective?

The final response rate was seventy-six percent. The data in Table 3.1 on page 32 show the comparison between respondents and non-respondents. It is evident that no significant differences were observed between the respondents and non-respondents. Therefore, this study can be generalized for the teaching and extension faculty in the College of Agriculture at Iowa State University.

3.1.5 Data Analysis

The returned questionnaires were reviewed for missing data by the researcher and were appropriately keypunched into IBM compatible microcomputer using Wordstar word processing software. The file was printed in ASCII onto a disk. The printed file was uploaded via modem on mainframe computer (WYLBUR) of Iowa State University Computation Center. The Statistical Package for Social Sciences (SPSSx Release 3) was used to analyze the data (Jendrek 1985; Norusis 1986; SPSS Inc. 1988). SPSS/PC+ modules such as base, advanced statistics, and tables were also used for some procedures (Norusis 1988). Keeping in view the specific objectives of the study, appropriate descriptive and inferential statistical procedures were employed to test the hypotheses.

The subprograms used were as follows:

- The subprogram FREQUENCIES was used for means, standard deviations, frequencies, and percentages.
- The subprogram RELIABILITY was used to test the reliability of the items within the categories.

- The subprogram T-TEST was used to determine the differences between the groups. The significance was set at 0.05 alpha level.

- The subprogram ONEWAY was used for testing differences among the groups. The Scheffé and the Duncan tests were used to find out differences among the groups when significance was observed at 0.05 alpha level.
Figure 3.1: Distribution of responses of the teaching and extension faculty over time (N=182)
Table 3.1: Mean, standard deviation (SD), t-value, and t-probability for the respondents and non-respondents of the teaching and extension faculty in the College of Agriculture at Iowa State University

<table>
<thead>
<tr>
<th>Category</th>
<th>Group 1</th>
<th></th>
<th></th>
<th>Group 2</th>
<th></th>
<th></th>
<th>t-value</th>
<th>t-prob</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
<td>SD</td>
<td>N</td>
<td>Mean</td>
<td>SD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Taught or worked at Iowa State University</td>
<td>181</td>
<td>16.18</td>
<td>8.70</td>
<td>10</td>
<td>17.50</td>
<td>12.83</td>
<td>-0.46</td>
<td>0.65</td>
</tr>
<tr>
<td>Experience in using computer(s)</td>
<td>175</td>
<td>8.70</td>
<td>7.81</td>
<td>10</td>
<td>11.30</td>
<td>8.43</td>
<td>-1.02</td>
<td>0.31</td>
</tr>
<tr>
<td>Use of television or VCR in class/presentation$^c$</td>
<td>175</td>
<td>2.39</td>
<td>1.00</td>
<td>10</td>
<td>2.90</td>
<td>1.20</td>
<td>-1.54</td>
<td>0.13</td>
</tr>
<tr>
<td>Use of transparencies in class/presentation$^d$</td>
<td>179</td>
<td>3.89</td>
<td>1.10</td>
<td>10</td>
<td>3.50</td>
<td>0.97</td>
<td>1.09</td>
<td>0.28</td>
</tr>
<tr>
<td>Influence of cost of software$^e$</td>
<td>169</td>
<td>2.95</td>
<td>1.23</td>
<td>10</td>
<td>3.10</td>
<td>1.29</td>
<td>-0.37</td>
<td>0.71</td>
</tr>
<tr>
<td>Technology can make education cost effective$^f$</td>
<td>177</td>
<td>3.69</td>
<td>1.02</td>
<td>10</td>
<td>3.90</td>
<td>0.57</td>
<td>-0.63</td>
<td>0.53</td>
</tr>
</tbody>
</table>

$^a$Respondents.
$^b$Non-respondents.
$^c$Scale: 1=Never 2=Seldom 3=Sometimes 4=Often 5=Always.
$^d$Scale: 1=Never 2=Seldom 3=Sometimes 4=Often 5=Always.
$^e$Scale: 1=Not Important 2=Somewhat Important 3=Important 4=Very Important 5=Extremely Important.
$^f$Scale: 1=Strongly Disagree 2=Disagree 3=Undecided 4=Agree 5=Strongly Agree.
4 RESULTS AND DISCUSSION

The main purpose of the study was to assess instructional technology used by the teaching and extension faculty in the College of Agriculture at Iowa State University. A secondary purpose was to determine the perceptions of the teaching and extension faculty regarding the future use of instructional technology in teaching and disseminating information. The chapter is divided into seven sections: 1) reliability of instrument; 2) demographic information; 3) use of instructional technology; 4) use of library and university facilities; 5) factors affecting selection of technology; 6) changes in strategy to use instructional technology; and 7) future use of instructional technology.

4.1 Reliability of Instrument

The instrument used to collect data regarding the use of instructional technology by the teaching and extension faculty in the College of Agriculture at ISU was tested for reliability under seven categories: 1) use of instructional technology in class; 2) use of library facilities; 3) use of university facilities; 4) use of instructional technology per semester, 5) factors influencing selection of instructional technology; 6) future use of instructional technology; and 7) perceptions about instructional technology.

The Cronbach alpha coefficients ranged from 0.71 to 0.93 except for the use of
library facilities with 0.57. The standardized alpha ranged from 0.72 to 0.94 except for the use of library facilities with 0.57 as presented in Table 4.1 on page 51. The reliability test was conducted to see how group as a whole reacted to items in the seven categories. The alpha scores were quite high indicating that respondents reacted similarly to the items except for the use of library facilities.

The highest alpha (0.93) was recorded for the future use of instructional technology; and second highest (0.82) for perceptions about instructional technology. The use of university facilities and the factors influencing selection of instructional technology were almost in the same level (with alpha 0.79 and 0.78 respectively); and use of instructional technology per semester was the next (0.75). The lowest alpha (0.57) was recorded for use of library facilities, and second lowest alpha was observed for the use of instructional technology in class (0.71). As a result, it was concluded that appropriate statistical tests could be made using the categories. However, the reader should interpret the data keeping in view the lower alpha for the category of the use of library facilities.

### 4.2 Demographic Information

This section describes the demographic characteristics of the teaching and extension faculty in the College of Agriculture at Iowa State University. The section is divided into two subsections: 1) characteristics by type of assignment(s); and 2) characteristics of respondents by rank.
4.2.1 Characteristics by Type of Assignment(s)

The distribution of respondents by type of assignment(s) and gender is presented in Figure 4.1 on page 52. Of the one hundred ninety-two respondents, thirty-eight (19.8% of the total respondents) had teaching assignments, fifty-one (26.6% of the total respondents) were engaged in extension activities and/or other related responsibilities, the remaining one hundred three (53.6% of the total) were teaching and conducting research. Of the thirty-eight in teaching category, thirty-two (16.7% of the total respondents) were male and six (3.1% of the total respondents) were female. Of the extension and other related assignment(s) category, forty-seven (24.5% of the total respondents) were male whereas the remaining four (2.1% of the total respondents) were female. One hundred three respondents were in the category of teaching and research. Ninety-six (50% of the total respondents) were male and seven (3.6% of the total respondents) were female.

The data in Figure 4.2 on page 53 show the distribution of respondents by type of assignment(s) and whether they have taught via television and/or video. Of the total one hundred eighty-two, about three-quarters (73.6% of the total) had no experience of teaching via television and/or video, the remaining quarter (26.4% of the total) had used television and/or video for teaching and/or presentation(s). One interesting result was found in teaching category where only four (2.2% of the total respondents) had used television and/or video.

About eighty-two percent (148 respondents) possessed no teaching certification whereas the remaining eighteen percent (33 respondents) had teaching certificates. Eleven (6.1% of the total respondents), five (2.8% of the total respondents), and
seventeen (9.4% of the total respondents) were in the categories of teaching; extension and other related responsibilities; and teaching and research respectively. The results are shown in Figure 4.3 on page 54.

4.2.2 Characteristics of Respondents by Rank

The distribution of respondents by rank and gender is presented in Figure 4.4 on page 55. Twenty-one (12.3% of the total respondents) were assistant professors; thirty-eight (22.2% of the total respondents) were associate professors; and the remaining one hundred twelve (65.5% of the total respondents) were professors. About 91% (one hundred fifty-six of the total respondents) were male and the remaining 9% (fifteen of the total respondents) were female. Of the one hundred fifty-six in male category, sixteen (9.4% of the total) were assistant professors, thirty-two (18.7% of the total) were associate professors, and one hundred eight (63.2% of the total) were professors. Of the fifteen in female category; four, six, and five held the rank of assistant professor, associate professor, and professor respectively.

The distribution of respondents by rank and age group is shown in Figure 4.5 on page 56. The data indicated that forty-one (24.1% of the total) were under 40 years of age, fifty-six (32.9% of the total) were in the range of 40–50 years of age, and seventy-three (42.9% of the total) were found to be above 50 years of age. Of the forty-one under 40 years of age, twelve (7.1% of the total) were assistant professors; twenty (11.8% of the total) were associate professors; and nine (5.3% of the total) were professors. Of the fifty-six in the age group of 40–50 years, two (1.2% of the total) were assistant professors; fourteen (8.2% of the total) were associate professors;
and forty (23.5% of the total) were professors. Out of seventy-three who were above 50 years of age, seven (4.1% of the total) were assistant professors; four (2.4% of the total) were associate professors; and sixty-two (36.5% of the total) were professors.

The distribution of respondents by rank and level of teaching is presented in Figure 4.6 on page 57. The data indicated that thirty-six (23.1% of the total) were teaching graduate students, thirty-four (21.8% of the total) were teaching undergraduate students, and eighty-six (55.1% of the total) were teaching at both levels, i.e., graduate and undergraduate. Of the thirty-six who were teaching graduate students, three (1.9% of the total) were assistant professors; five (3.2% of the total) were associate professors; and twenty-eight (17.9% of the total) were professors. Of the thirty-four who were teaching undergraduate students, nine (5.8% of the total) were assistant professors; seven (4.5% of the total) were associate professors; and eighteen (11.5% of the total) were professors. Out of eighty-six who were teaching at both levels, i.e., graduate and undergraduate, seven (4.5% of the total) were assistant professors; twenty-two (14.1% of the total) were associate professors; and fifty-seven (36.5% of the total) were professors.

The rank of the faculty and the location where they teach is reported in Figure 4.7 on page 58. One hundred (60.6% of the total) were teaching on-campus; eleven (6.7% of the total) were teaching off-campus; and fifty-four (32.7% of the total) were teaching and/or giving presentation(s) on-campus and off-campus as well. Of the one hundred who were teaching on-campus, twelve or 7.3% of the total were assistant professors; twenty or 12.1% of the total were associate professors; and sixty-eight or 41.2% of the total were professors. Of the total eleven who were teaching off-campus, only one
(0.6% of the total) was assistant professor; equal number of associate professors and professors, i.e., five (3.0% of the total in each category), were teaching off-campus. Of the fifty-four who were teaching on-campus and off-campus, seven or 4.2% of the total were assistant professors; thirteen or 7.9% of the total were associate professors; and the remaining thirty-four or 20.6% of the total were professors.

The data in Figure 4.8 on page 59 indicated that one hundred eighteen or 69.8% of the total did not have any formal teaching method course to prepare them for teaching, whereas only fifty-one or 30.2% of the total had at least one or more course(s) in teaching methods. Of the fifty-one who had formal education in teaching, seven or 4.2% of the total were assistant professors, ten or 6% of the total were associate professors, and thirty-four or 20.1% of the total were professors.

The teaching and extension faculty were asked to indicate if they had modified their teaching strategy during last five years to use instructional technology. The responses are presented in Figure 4.9 on page 60. It appears that most (one hundred seventeen or 70.5% of the total) did change their teaching strategy, however, about one-third (forty-nine or 29.5% of the total) did not change their teaching strategy for some reason. Of the one hundred seventeen who modified their teaching strategy, fifteen or 9% of the total were assistant professors; twenty-seven or 16.3% of the total were associate professors; and the remaining seventy-five or 45.2% of the total were professors.
4.3 Use of Instructional Technology

The teaching and extension faculty were asked to describe their use of instructional technology during a typical semester. On a scale of 1–5, their responses were recorded for comparison. The scales used were as: 1=Never; 2=Seldom; 3=Sometimes; 4=Often; and 5=Always.

There is no significant difference in the use of instructional technology during a typical semester among the teaching and extension faculty in the College of Agriculture at Iowa State University when they are grouped by rank.

\( H_0 \):

There is no significant difference in the use of instructional technology during a typical semester among the teaching and extension faculty in the College of Agriculture at Iowa State University when they are grouped by rank.

Mean, standard deviation (SD), F-ratio, and F-probability for use of instructional technology during a typical semester by the teaching and extension faculty when grouped by rank are presented in Table 4.2 on page 61. No significant difference was observed in the overall mean for use of instructional technology during a typical semester. The same results were observed for all twelve items under the category of use of instructional technology during a typical semester. Therefore, there was not enough evidence to reject the null hypothesis. However, on a five-point scale, use of transparencies was rated with highest mean of 3.90 and standard deviation of 1.04 by assistant professors. The second highest item used by assistant professors was photocopy machine with mean of 3.76 followed by slides (mean of 3.00). The computers and models (mean of 2.55 and 2.19 respectively) were seldom used during a typical semester. The video cassette recorder (mean of 1.90), television (mean of
1.80), audio cassette recorder (mean of 1.68), camera (mean of 1.57), flannel board (mean of 1.35), and data projection panel (mean of 1.35) were almost seldom used.

Among associate professors, the photocopy machine was rated high (mean of 3.92). The transparencies, slides and projector(s) were second, with mean above 3.00. The computers, video cassette recorders, and models were seldom used during a typical semester (mean ranged from 2.00 to 2.49). The remaining five items were mostly never used by associate professors. The transparencies, slides, projector(s), and photocopy machines (all with mean above 3 and below 4) were frequently used by professors. The overall pattern was almost the same among all three groups, i.e., assistant professors, associate professors, and professors.

\text{H}_0^2:

There is no significant difference in the use of instructional technology during a typical semester among the teaching and extension faculty in the College of Agriculture at Iowa State University when they are grouped by type of assignment(s).

Mean, standard deviation (SD), F-ratio, and F-probability for use of instructional technology during a typical semester by the teaching and extension faculty when grouped by type of assignment(s) are presented in Table 4.3 on page 62. The use of instructional technology during a typical semester was found significantly different at 0.05 level as is evident from analysis of variance table. The Scheffé (at 0.05 level) could not locate the differences between the groups, however, the difference was found by the Duncan test between the groups of teaching and teaching with research.
Therefore, the null hypothesis was rejected. It is concluded that the use of instructional technology by the teaching faculty in the College of Agriculture is dependent on the type of assignment(s).

No significant differences were observed among the use of transparencies, slides, models, flannel board, projector(s), and photocopy machine. Although higher means were observed for each of them. The pattern among all three groups was almost the same. The means were slightly over 3 except for models (mean ranged from 1.84 to 2.15) and flannel board (mean 1.18 to 1.28).

The use of television was found to be significant at 0.05 level. The differences were recorded between the faculty who had teaching responsibilities, and the faculty who were teaching and conducting research. The differences were observed by the Duncan test. The use of video cassette recorder was significantly different at 0.01 level. The Scheffé test indicated the differences between group 1 and 3, i.e., the faculty with teaching assignment(s) and the faculty with teaching and research responsibilities. However, the Duncan test showed differences among groups; teaching and teaching with research; and teaching and extension with/without other related responsibilities. The use of computer was also found significantly different at 0.05 level. The differences were located between the faculty who were teaching and the faculty who were teaching and conducting research. A highly significant difference, i.e., at 0.01 level, was found in the use of data projection panel. The Scheffé test located differences between the faculty with teaching and research responsibilities and the faculty with extension and/or other related responsibilities.
A highly significant difference, i.e., at 0.01 level, was observed in the use of camera. The faculty with teaching responsibilities and the faculty with teaching and research responsibilities were significantly different at 0.01 level. Significance at 0.01 level was also observed between the faculty with teaching and research responsibilities and the faculty with extension and/or other related assignment(s) as indicated by the Scheffé test. Significant differences at 0.01 level were also observed for the use of audio cassette recorder. The Scheffé test found differences between the groups of teaching and teaching with research. However, the Duncan test located differences between the faculty with teaching assignment(s) and the extension faculty with/without other related responsibilities.

4.3.1 Use of Library and University Facilities

The teaching and extension faculty were asked to respond on a scale of one to five; how often they used the library and university facilities. The descriptors were: 1=Never; 2=Seldom; 3=Sometimes; 4=Often; and 5=Always. The results were analyzed and are presented in Table 4.4 on page 63. A significant difference was observed in the use of facilities, i.e., library and university, when the faculty were grouped by the type of assignment(s). The Reserve Desk and the Media Center facilities were equally rated by all groups with mean slightly above 2 except for the faculty with teaching and research responsibilities who used the Reserve Desk quite often (mean of 3.13) as compared to other groups. The Computer Lab was quite often used by the faculty with teaching activities (mean 2.03); whereas the faculty with teaching and research responsibilities; and the extension faculty seldom used
the Computer Lab facility in the library (mean under 2). The Microforms facility was seldom used by all groups (mean ranged between 1 and 2). The use of university facilities was significantly different at 0.05 level. The Duncan test indicated difference between the faculty with teaching assignment(s) and the faculty with teaching and research responsibilities. For the use of library facilities, all three groups were different from one another at 0.05 level. The Photo Service was rated high with 3.28 by the extension faculty while all other items were equally rated (mean varied between 2 and 3) by all three groups.

When the faculty were grouped by their rank, the results observed were different see Table 4.5 on page 64. The use of library facilities and the use of university facilities were found to be non-significant. All the items in respective categories were also recorded to be non-significant. For library facilities, the Reserve Desk and the Media Center were rated high with mean above 2; whereas the Microforms, and the Computer Lab were with low scores (mean below 2). Similar pattern was observed for all three groups. The use of the Photo Service was rated high with mean above 3 for all three groups, followed by the Media Resource Center and the Media Graphics (mean above 2 for both of them) as far as university facilities were concerned.

4.3.2 Factors Affecting Selection of Technology

The teaching and extension faculty were asked to rate the importance of factors affecting selection of instructional technology. A five-point scale was used with descriptors as: 1=Not Important; 2=Somewhat Important; 3=Important; 4=Very Important; and 5=Extremely Important.
There is no significant difference pertaining to the factors affecting selection of instructional technology when the teaching and extension faculty in the College of Agriculture at Iowa State University are grouped by rank.

Mean, standard deviation (SD), F-ratio, and F-probability for factors influencing selection of instructional technology by the teaching and extension faculty when divided by rank are presented in Table 4.6 on page 65. The data indicated no significant differences among the teaching and extension faculty when selecting instructional technology. Hence, there was not enough evidence to reject the null hypothesis. Similar results were observed among the teaching and extension faculty pertaining to individual eight factors affecting selection of instructional technology. The time available for preparation was rated as most important factor by assistant professors with mean of 4.45. The availability of materials was second most important factor (mean of 3.68) for assistant professors. The cost for software, hardware, and development of materials was indicated to be important with mean between 3 and 4. The security of existing system with mean of 2.32 was somewhat important to assistant professors.

The factors affecting selection of instructional technology were equally important to associate professors and professors. A similar pattern was observed for all the factors except for the cost of software which was less important to professors as compared to associate professors. All factors were rated between mean of 3 and 4.
H_{04}:

There is no significant difference pertaining to the factors affecting selection of instructional technology when the teaching and extension faculty in the College of Agriculture at Iowa State University are grouped by type of assignment(s).

Mean, standard deviation (SD), F-ratio, and F-probability for factors influencing selection of instructional technology by the teaching and extension faculty when divided by type of assignment(s) are presented in Table 4.7 on page 66. It is evident from the results that no significant difference was found in overall mean of all eight factors within three groups, i.e., teaching, teaching and research, and extension with other related responsibilities. Hence, the null hypothesis was not rejected. Similar results were observed among the teaching and extension faculty pertaining to individual items of the category. An interesting point is that almost same pattern was found among the teaching and extension faculty when they were grouped by their rank. The time for preparation was rated (approximate mean of 4) as very important factor for the selection of instructional technology. The cost of software (mean of 3.06) was an important factor for the faculty who were teaching. The faculty with teaching and research responsibilities; and the faculty with extension and other related activities rated the cost of software as somewhat important factor (mean ranged from 2.85 to 2.98). The security of existing system ranged between important to somewhat important (mean was above 2 for the faculty with teaching assignment and for the extension faculty, and below 2 for the faculty with teaching and research responsibilities). The training to operate (mean above 3), information about technology (mean of 3.3) and
cost of hardware (mean of 3.1) were rated important factors influencing selection of instructional technology.

4.3.3 Changes in Strategy to Use Instructional Technology

\( H_{0,5} \):

There is no significant difference in the use of instructional technology by the teaching and extension faculty in the College of Agriculture at Iowa State University who modified their teaching strategy to use instructional technology and who did not.

Mean, standard deviation (SD), t-ratio, and t-probability for the teaching and extension faculty who modified their teaching strategy to use instructional technology and who did not are presented in Table 4.8 on page 67. The data show that significant difference was found in the use of instructional technology in class; use of library facilities; use of instructional technology per semester; and the factors affecting selection of instructional technology at 0.01 level. In other words, the groups who modified their teaching strategy to use instructional technology and who did not were different. The use of university facilities and the perceptions about the future use of instructional technology were significantly different at 0.05 level. Therefore, the null hypothesis was rejected.

4.3.4 Future Use of Instructional Technology

The teaching and extension faculty were asked about their perceptions pertaining to use of instructional technology in the year 2001 on a scale of 1 to 4. The description
of the scale was: 1=No Change; 2=Little Change; 3=Significant Change; 4=Complete Change.

\[ H_{06}: \]

There is no significant difference in the perceived future use of instructional technology when the teaching and extension faculty in the College of Agriculture at Iowa State University are grouped by rank.

Mean, standard deviation (SD), F-ratio, and F-probability for the future use of instructional technology as perceived by the teaching and extension faculty when they are grouped by rank are presented in Table 4.9 on page 68. The data indicated that no differences were found in the perceptions of the teaching and extension faculty in the College of Agriculture regarding the future use of instructional technology when they were grouped by rank. Moreover, almost same pattern was observed among all three groups, i.e., assistant professors, associate professors, and professors. The higher means were observed among the computer; uplink; graphics; simulation; camcorder; interactive video; video cassette recorder; color photocopy machine; television and data projection panel with ratings from 3 to 4. In other words, there may be much changes in use of instructional technology in the year 2001. The flannel board and audio cassette recorder were rated almost low in all the groups indicating no change in future use. There was not enough evidence to reject the null hypothesis.
There is no significant difference in the future use of instructional technology as perceived by the teaching and extension faculty in the College of Agriculture at Iowa State University when they are grouped by type of assignment(s).

Mean, standard deviation (SD), F-ratio, and F-probability for the future use of instructional technology as perceived by the teaching and extension faculty when they are grouped by type of assignment(s) are presented in Table 4.10 on page 69. No significant differences were found in the future use of instructional technology among the teaching and extension faculty when they were grouped by type of assignment(s). Moreover, the pattern was not different from those when they were grouped by rank. All nineteen items under the category of future use of instructional technology were found to be non-significant. Therefore, null hypothesis was not rejected.

Mean, standard deviation (SD), F-ratio, and F-probability regarding perceptions about instructional technology by the teaching and extension faculty when they are grouped by type of assignment(s) are presented in Table 4.11 on page 70. The overall perceptions of the teaching and extension faculty regarding instructional technology were found to be non-significant when they were categorized by type of assignment(s). The highest mean score (3.53) was recorded in the teaching group followed by the group with extension and other related responsibilities (mean of 3.34) and the lowest mean score (3.25) was observed for the teaching and research group. No significant difference was observed when the faculty were asked if technology can make education more cost effective; more individualized; and more interesting and motivating. The
mean responses ranged from 3.02 to 3.45 among the groups.

Significant differences at 0.05 level were observed when the faculty were asked if technology can make education more understandable. The Scheffé test could not locate differences among the groups, however, the Duncan test indicated differences between the groups of teaching and the teaching with research responsibilities; and also between the groups of teaching and the extension with/without other activities. The mean responses ranged from 3.12 to 3.46. Significant differences at 0.05 level were also found when the faculty were asked if technology can make education more effective. The faculty with teaching assignments were different from the faculty with teaching and research responsibilities as indicated by the Scheffé test, whereas, the Duncan test showed differences between the faculty with teaching assignments and the faculty with extension and/or other related activities.

Mean, standard deviation (SD), F-ratio, and F-probability regarding perceptions about instructional technology by the teaching and extension faculty when they were divided by rank are presented in Table 4.12 on page 71. The overall responses from the teaching and extension faculty were found to be non-significant when they were grouped by rank. A similar pattern was found when the faculty were grouped by their type of assignment(s). The highest mean scores were recorded for the rank of assistant professor (mean of 3.44) followed by associate professor (mean of 3.37) and professors' ratings were the lowest (mean of 3.28). All ranks of the faculty were undecided (means ranged from 3.04 to 3.54) regarding the perceptions about instructional technology except that assistant professors disagreed (mean of 2.88) when they were asked if instructional technology can make education more cost effective.
Mean, standard deviation (SD), F-ratio, and F-probability for the use of instructional technology in class/presentation(s) by the teaching and extension faculty when grouped by age are presented in Table 4.13 on page 72. The overall use of instructional technology was found to be non-significant. However, the uses for computers and photocopy machine were found significantly different at 0.01 level. The faculty below 40 years of age were using computers and photocopy machines differently from the faculty who were above 50 years of age. The faculty between 40 and 50 years of age were also using instructional technology differently from the faculty above 50 years of age. Transparencies, slides, overhead projector, and the photocopy machine were rated higher (mean ranged between 3 and 4) by all age groups, i.e., faculty below 40 years of age, between 40 and 50 years, and above 50 years of age, except for the faculty below 40 years of age who rated photocopy machine with little over 4. The faculty below 50 years of age were using video cassette recorder and computer more as compared to the faculty who were above 50 years of age as indicated by their responses. Otherwise, the pattern was similar in all groups as far as the use of instructional technology in class was concerned. The mean responses were between 1 and 2.

Mean, standard deviation (SD), t-ratio, and t-probability for the use of instructional technology in class by the faculty in the College of Agriculture at ISU when they were grouped according to teaching certification are shown in Table 4.14 on page 73. The results indicated that the overall use of instructional technology in class by the faculty with teaching certification was significantly different at 0.01 level. The faculty with teaching certification were using tape recorder/player, television/video cassette
recorder, and movie projector(s) significantly different at 0.01 level from the faculty who did not have teaching certification. The use of other items was found to be non-significant. The faculty with teaching certification rated the use of individual items higher than the faculty without teaching certification.

Table 4.1: Reliability of instrument for use of instructional technology by the teaching and extension faculty in the College of Agriculture at ISU

<table>
<thead>
<tr>
<th>Description</th>
<th>N</th>
<th>Items</th>
<th>$\alpha^a$</th>
<th>$\alpha^b$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of instructional technology in class</td>
<td>160</td>
<td>9</td>
<td>0.71</td>
<td>0.72</td>
</tr>
<tr>
<td>Use of library facilities</td>
<td>174</td>
<td>4</td>
<td>0.57</td>
<td>0.57</td>
</tr>
<tr>
<td>Use of university facilities</td>
<td>178</td>
<td>3</td>
<td>0.79</td>
<td>0.79</td>
</tr>
<tr>
<td>Use of instructional technology per semester</td>
<td>162</td>
<td>12</td>
<td>0.75</td>
<td>0.76</td>
</tr>
<tr>
<td>Factors in selecting instructional technology</td>
<td>156</td>
<td>8</td>
<td>0.78</td>
<td>0.78</td>
</tr>
<tr>
<td>Future use of instructional technology</td>
<td>22</td>
<td>19</td>
<td>0.93</td>
<td>0.94</td>
</tr>
<tr>
<td>Perceptions about instructional technology</td>
<td>176</td>
<td>5</td>
<td>0.82</td>
<td>0.83</td>
</tr>
</tbody>
</table>

$^a$Cronbach alpha.

$^b$Standardized alpha.
Figure 4.1: Distribution of respondents by type of assignment(s) and gender (N=192)
Figure 4.2: Distribution of respondents by type of assignment(s) and whether they have taught via television and/or video (N=182)
Figure 4.3: Distribution of respondents by type of assignment(s) and whether they possessed teaching certification (N=181)
Figure 4.4: Distribution of respondents by rank and gender (N=171)
Figure 4.5: Distribution of respondents by rank and age group (N=170)
Figure 4.6: Distribution of respondents by rank and level of teaching (N=156)
Figure 4.7: Distribution of respondents by rank and where they teach (N=165)
Figure 4.8: Distribution of respondents by rank and whether they had taken teaching method courses(s) (N=169)
Figure 4.9: Distribution of respondents by rank and whether they had modified their teaching strategy (N=169)
Table 4.2: Mean, standard deviation (SD), F-ratio, and F-probability for use of instructional technology during a typical semester by the teaching and extension faculty when grouped by their rank in the College of Agriculture at Iowa State University

<table>
<thead>
<tr>
<th>Category</th>
<th>Assistant Professor</th>
<th>Associate Professor</th>
<th>Professor</th>
<th>F-ratio</th>
<th>F-prob</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
<td>SD</td>
<td>N</td>
<td>Mean</td>
</tr>
<tr>
<td>Use of instructional technology</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>19</td>
<td>2.38</td>
<td>0.46</td>
<td>33</td>
<td>2.39</td>
</tr>
<tr>
<td>Transparencies</td>
<td>21</td>
<td>3.90</td>
<td>1.04</td>
<td>37</td>
<td>3.60</td>
</tr>
<tr>
<td>Slides</td>
<td>21</td>
<td>3.00</td>
<td>1.10</td>
<td>37</td>
<td>3.35</td>
</tr>
<tr>
<td>Models</td>
<td>21</td>
<td>2.19</td>
<td>1.25</td>
<td>34</td>
<td>2.21</td>
</tr>
<tr>
<td>Flannel board</td>
<td>20</td>
<td>1.35</td>
<td>0.99</td>
<td>37</td>
<td>1.19</td>
</tr>
<tr>
<td>Overhead projector</td>
<td>21</td>
<td>3.62</td>
<td>1.32</td>
<td>36</td>
<td>3.81</td>
</tr>
<tr>
<td>Television</td>
<td>20</td>
<td>1.80</td>
<td>0.83</td>
<td>37</td>
<td>1.84</td>
</tr>
<tr>
<td>Video cassette recorder</td>
<td>21</td>
<td>1.90</td>
<td>0.83</td>
<td>37</td>
<td>2.00</td>
</tr>
<tr>
<td>Camera</td>
<td>21</td>
<td>1.57</td>
<td>0.93</td>
<td>36</td>
<td>1.72</td>
</tr>
<tr>
<td>Audio cassette recorder</td>
<td>19</td>
<td>1.68</td>
<td>0.89</td>
<td>37</td>
<td>1.65</td>
</tr>
<tr>
<td>Computer</td>
<td>20</td>
<td>2.55</td>
<td>1.32</td>
<td>37</td>
<td>2.49</td>
</tr>
<tr>
<td>Photocopy machine</td>
<td>21</td>
<td>3.76</td>
<td>1.26</td>
<td>36</td>
<td>3.92</td>
</tr>
<tr>
<td>Data projection panel</td>
<td>20</td>
<td>1.35</td>
<td>0.59</td>
<td>35</td>
<td>1.43</td>
</tr>
</tbody>
</table>

\(^a\)Scale: 1=Never 2=Seldom 3=Sometimes 4=Often 5=Always.
Table 4.3: Mean, standard deviation (SD), F-ratio, and F-probability for use of instructional technology during a typical semester by the teaching and extension faculty when grouped by type of assignment(s) in the College of Agriculture at Iowa State University

<table>
<thead>
<tr>
<th>Description</th>
<th>Teaching</th>
<th>Extension/ etc.</th>
<th>Teaching/ Research</th>
<th>F-ratio</th>
<th>F-prob</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N  Mean  SD</td>
<td>N  Mean  SD</td>
<td>N  Mean  SD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use of instructional technology&lt;sup&gt;a&lt;/sup&gt;</td>
<td>34 2.54 0.55</td>
<td>42 2.48 0.46</td>
<td>86 2.29 0.55</td>
<td>3.37</td>
<td>0.04</td>
</tr>
<tr>
<td>Transparencies</td>
<td>37 3.84 0.99</td>
<td>49 3.94 0.83</td>
<td>103 3.84 1.25</td>
<td>0.14</td>
<td>0.87</td>
</tr>
<tr>
<td>Slides</td>
<td>36 3.00 1.24</td>
<td>46 3.54 1.07</td>
<td>97  3.21 1.22</td>
<td>2.26</td>
<td>0.11</td>
</tr>
<tr>
<td>Models</td>
<td>35 2.14 1.14</td>
<td>43 1.84 1.00</td>
<td>94  2.15 0.12</td>
<td>1.27</td>
<td>0.28</td>
</tr>
<tr>
<td>Flannel board</td>
<td>36 1.28 0.88</td>
<td>45 1.18 0.58</td>
<td>93  1.20 0.73</td>
<td>0.20</td>
<td>0.82</td>
</tr>
<tr>
<td>Overhead projector</td>
<td>36 3.67 1.22</td>
<td>46 3.91 0.89</td>
<td>95  3.94 1.09</td>
<td>0.87</td>
<td>0.42</td>
</tr>
<tr>
<td>Television</td>
<td>36 2.19 1.21</td>
<td>45 2.02 0.84</td>
<td>93  1.74 0.95</td>
<td>3.14</td>
<td>0.05</td>
</tr>
<tr>
<td>Video cassette recorder</td>
<td>36 2.44 1.18</td>
<td>46 2.00 0.70</td>
<td>94  1.86 0.96</td>
<td>4.91</td>
<td>0.01</td>
</tr>
<tr>
<td>Camera</td>
<td>35 2.00 1.19</td>
<td>46 1.91 1.09</td>
<td>94  1.47 0.86</td>
<td>5.17</td>
<td>0.01</td>
</tr>
<tr>
<td>Audio cassette recorder</td>
<td>36 2.06 0.89</td>
<td>44 1.66 0.83</td>
<td>91  1.42 0.80</td>
<td>7.70</td>
<td>0.01</td>
</tr>
<tr>
<td>Computer</td>
<td>36 2.83 1.30</td>
<td>46 2.37 1.25</td>
<td>94  2.16 1.24</td>
<td>3.76</td>
<td>0.03</td>
</tr>
<tr>
<td>Photocopy machine</td>
<td>35 3.77 1.26</td>
<td>46 3.59 1.15</td>
<td>96  3.68 1.33</td>
<td>0.21</td>
<td>0.81</td>
</tr>
<tr>
<td>Data projection panel</td>
<td>34 1.35 0.65</td>
<td>45 1.60 0.86</td>
<td>90  1.21 0.55</td>
<td>5.12</td>
<td>0.01</td>
</tr>
</tbody>
</table>

<sup>a</sup>Scale: 1=Never  2=Seldom  3=Sometimes  4=Often  5=Always.
Table 4.4: Mean, standard deviation (SD), F-ratio, and F-probability for use of library and university facilities by the teaching and extension faculty when grouped by type of assignment(s) in the College of Agriculture at Iowa State University

<table>
<thead>
<tr>
<th>Description</th>
<th>Teaching</th>
<th>Extension/ etc.</th>
<th>Teaching/ Research</th>
<th>F-ratio</th>
<th>F-prob</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
<td>SD</td>
<td>N</td>
<td>Mean</td>
</tr>
<tr>
<td>Use of library facilities(^a)</td>
<td>36</td>
<td>2.10</td>
<td>0.82</td>
<td>45</td>
<td>1.76</td>
</tr>
<tr>
<td>Reserve Desk</td>
<td>37</td>
<td>2.70</td>
<td>1.45</td>
<td>45</td>
<td>2.11</td>
</tr>
<tr>
<td>Media Center</td>
<td>36</td>
<td>2.22</td>
<td>1.07</td>
<td>46</td>
<td>2.00</td>
</tr>
<tr>
<td>Microforms</td>
<td>36</td>
<td>1.44</td>
<td>0.73</td>
<td>45</td>
<td>1.40</td>
</tr>
<tr>
<td>Computer Lab</td>
<td>36</td>
<td>2.03</td>
<td>1.32</td>
<td>45</td>
<td>1.56</td>
</tr>
<tr>
<td>Use of university facilities(^b)</td>
<td>37</td>
<td>2.58</td>
<td>0.94</td>
<td>47</td>
<td>2.84</td>
</tr>
<tr>
<td>Media Graphics</td>
<td>37</td>
<td>2.22</td>
<td>1.06</td>
<td>47</td>
<td>2.43</td>
</tr>
<tr>
<td>Media Resource Center</td>
<td>37</td>
<td>2.68</td>
<td>1.11</td>
<td>47</td>
<td>2.83</td>
</tr>
<tr>
<td>Photo Service</td>
<td>37</td>
<td>2.81</td>
<td>1.13</td>
<td>47</td>
<td>3.28</td>
</tr>
</tbody>
</table>

\(^a\)Scale: 1=Never 2=Seldom 3=Sometimes 4=Often 5=Always.
\(^b\)Scale: 1=Never 2=Seldom 3=Sometimes 4=Often 5=Always.
Table 4.5: Mean, standard deviation (SD), F-ratio, and F-probability for use of library and university facilities by the teaching and extension faculty when grouped by their rank in the College of Agriculture at Iowa State University

<table>
<thead>
<tr>
<th>Category</th>
<th>Assistant Professor</th>
<th>Associate Professor</th>
<th>Professor</th>
<th>F-ratio</th>
<th>F-prob</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
<td>SD</td>
<td>N</td>
<td>Mean</td>
</tr>
<tr>
<td><strong>Use of library facilities</strong>a</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use of library facilities</td>
<td>20</td>
<td>1.98</td>
<td>0.58</td>
<td>37</td>
<td>1.95</td>
</tr>
<tr>
<td>Reserve Desk</td>
<td>21</td>
<td>2.76</td>
<td>1.04</td>
<td>38</td>
<td>2.66</td>
</tr>
<tr>
<td>Media Center</td>
<td>20</td>
<td>2.40</td>
<td>1.14</td>
<td>38</td>
<td>2.13</td>
</tr>
<tr>
<td>Microforms</td>
<td>20</td>
<td>1.30</td>
<td>0.66</td>
<td>37</td>
<td>1.49</td>
</tr>
<tr>
<td>Computer Lab</td>
<td>20</td>
<td>1.45</td>
<td>0.69</td>
<td>38</td>
<td>1.63</td>
</tr>
<tr>
<td><strong>Use of university facilities</strong>b</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Media Graphics</td>
<td>21</td>
<td>2.57</td>
<td>1.12</td>
<td>38</td>
<td>2.55</td>
</tr>
<tr>
<td>Media Resource Center</td>
<td>21</td>
<td>2.76</td>
<td>1.04</td>
<td>38</td>
<td>2.74</td>
</tr>
<tr>
<td>Photo Service</td>
<td>21</td>
<td>3.10</td>
<td>1.18</td>
<td>38</td>
<td>3.47</td>
</tr>
</tbody>
</table>

\(^a\)Scale: 1=Never 2=Seldom 3=Sometimes 4=Often 5=Always.

\(^b\)Scale: 1=Never 2=Seldom 3=Sometimes 4=Often 5=Always.
Table 4.6: Mean, standard deviation (SD), F-ratio, and F-probability pertaining to the factors influencing selection of instructional technology by the teaching and extension faculty when divided by their rank in the College of Agriculture at Iowa State University

<table>
<thead>
<tr>
<th>Category</th>
<th>Assistant Professor</th>
<th>Associate Professor</th>
<th>Professor</th>
<th>F-ratio</th>
<th>F-prob</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
<td>SD</td>
<td>N</td>
<td>Mean</td>
</tr>
<tr>
<td>Factors influencing selection$^a$</td>
<td>18</td>
<td>3.37</td>
<td>0.61</td>
<td>34</td>
<td>3.13</td>
</tr>
<tr>
<td>Cost of hardware to use</td>
<td>20</td>
<td>3.30</td>
<td>1.13</td>
<td>37</td>
<td>3.24</td>
</tr>
<tr>
<td>Cost of software to use</td>
<td>20</td>
<td>3.15</td>
<td>1.27</td>
<td>37</td>
<td>3.19</td>
</tr>
<tr>
<td>Development cost of materials</td>
<td>20</td>
<td>3.20</td>
<td>1.01</td>
<td>36</td>
<td>3.06</td>
</tr>
<tr>
<td>Information about technology</td>
<td>18</td>
<td>3.44</td>
<td>0.92</td>
<td>35</td>
<td>3.09</td>
</tr>
<tr>
<td>Availability of materials</td>
<td>19</td>
<td>3.68</td>
<td>1.11</td>
<td>35</td>
<td>3.63</td>
</tr>
<tr>
<td>Security of existing system</td>
<td>19</td>
<td>2.32</td>
<td>1.00</td>
<td>35</td>
<td>1.77</td>
</tr>
<tr>
<td>Training to operate and use</td>
<td>20</td>
<td>3.40</td>
<td>1.14</td>
<td>35</td>
<td>3.14</td>
</tr>
<tr>
<td>Time available for preparation</td>
<td>20</td>
<td>4.45</td>
<td>1.05</td>
<td>36</td>
<td>4.03</td>
</tr>
</tbody>
</table>

$^a$Scale: 1=Not Important 2=Somewhat Important 3=Important 4=Very Important 5=Extremely Important.
Table 4.7: Mean, standard deviation (SD), F-ratio, and F-probability pertaining to the factors influencing selection of instructional technology by the teaching and extension faculty when divided by type of assignment(s) in the College of Agriculture at Iowa State University

<table>
<thead>
<tr>
<th>Category</th>
<th>Teaching</th>
<th>Extension/ etc.</th>
<th>Teaching/ Research</th>
<th>F-ratio</th>
<th>F-prob</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>Mean</td>
<td>SD</td>
<td>N</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Factors influencing selectiona</td>
<td>31</td>
<td>3.31</td>
<td>0.53</td>
<td>42</td>
<td>3.18</td>
</tr>
<tr>
<td>Cost of hardware to use</td>
<td>32</td>
<td>3.28</td>
<td>1.14</td>
<td>45</td>
<td>3.11</td>
</tr>
<tr>
<td>Cost of software to use</td>
<td>33</td>
<td>3.06</td>
<td>1.09</td>
<td>48</td>
<td>2.85</td>
</tr>
<tr>
<td>Development cost of materials</td>
<td>32</td>
<td>3.06</td>
<td>0.95</td>
<td>44</td>
<td>3.09</td>
</tr>
<tr>
<td>Information about technology</td>
<td>31</td>
<td>3.32</td>
<td>1.08</td>
<td>44</td>
<td>3.30</td>
</tr>
<tr>
<td>Availability of materials</td>
<td>32</td>
<td>3.72</td>
<td>0.96</td>
<td>44</td>
<td>3.73</td>
</tr>
<tr>
<td>Security of existing system</td>
<td>32</td>
<td>2.34</td>
<td>0.94</td>
<td>45</td>
<td>2.18</td>
</tr>
<tr>
<td>Training to operate and use</td>
<td>32</td>
<td>3.50</td>
<td>1.08</td>
<td>44</td>
<td>3.41</td>
</tr>
<tr>
<td>Time available for preparation</td>
<td>32</td>
<td>4.16</td>
<td>0.99</td>
<td>4</td>
<td>4.02</td>
</tr>
</tbody>
</table>

aScale: 1=Not Important 2=Somewhat Important 3=Important 4=Very Important 5=Extremely Important.
Table 4.8: Mean, standard deviation (SD), t-value, and t-probability for use of instructional technology by the teaching and extension faculty in the College of Agriculture at Iowa State University

<table>
<thead>
<tr>
<th>Category</th>
<th>Group 1</th>
<th></th>
<th></th>
<th>Group 2</th>
<th></th>
<th></th>
<th>t-value</th>
<th>t-prob</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
<td>SD</td>
<td>N</td>
<td>Mean</td>
<td>SD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use of instructional technology in class(^c)</td>
<td>110</td>
<td>2.09</td>
<td>0.42</td>
<td>47</td>
<td>1.59</td>
<td>0.32</td>
<td>8.45</td>
<td>0.01</td>
</tr>
<tr>
<td>Use of library facilities(^d)</td>
<td>120</td>
<td>2.15</td>
<td>0.73</td>
<td>49</td>
<td>1.70</td>
<td>0.62</td>
<td>3.84</td>
<td>0.01</td>
</tr>
<tr>
<td>Use of university facilities(^e)</td>
<td>124</td>
<td>2.96</td>
<td>0.86</td>
<td>49</td>
<td>2.63</td>
<td>0.81</td>
<td>2.31</td>
<td>0.02</td>
</tr>
<tr>
<td>Use of instructional technology per semester(^f)</td>
<td>111</td>
<td>2.56</td>
<td>0.50</td>
<td>47</td>
<td>2.01</td>
<td>0.45</td>
<td>6.44</td>
<td>0.01</td>
</tr>
<tr>
<td>Factors affecting selection of technology(^g)</td>
<td>113</td>
<td>3.37</td>
<td>0.59</td>
<td>41</td>
<td>2.82</td>
<td>0.82</td>
<td>3.95</td>
<td>0.01</td>
</tr>
<tr>
<td>Future use of instructional technology(^h)</td>
<td>112</td>
<td>3.28</td>
<td>0.54</td>
<td>43</td>
<td>3.07</td>
<td>0.47</td>
<td>2.23</td>
<td>0.03</td>
</tr>
<tr>
<td>Perceptions about instructional technology(^i)</td>
<td>63</td>
<td>3.38</td>
<td>0.52</td>
<td>16</td>
<td>3.15</td>
<td>0.53</td>
<td>1.61</td>
<td>0.11</td>
</tr>
</tbody>
</table>

\(^a\) Faculty who modified their teaching strategy to use instructional technology.
\(^b\) Faculty who did not modify their teaching strategy since their initial employment.
\(^c\) Scale: 1=Never 2=Seldom 3=Sometimes 4=Often 5=Always.
\(^d\) Scale: 1=Never 2=Seldom 3=Sometimes 4=Often 5=Always.
\(^e\) Scale: 1=Never 2=Seldom 3=Sometimes 4=Often 5=Always.
\(^f\) Scale: 1=Never 2=Seldom 3=Sometimes 4=Often 5=Always.
\(^g\) Scale: 1=Not Important 2=Somewhat Important 3=Important 4=Very Important 5=Extremely Important.
\(^h\) Scale: 1=No Change 2=Little Change 3=Significant Change 4=Complete Change (5 recoded as missing).
\(^i\) Scale: 1=Strongly Disagree 2=Disagree 3=Undecided 4=Agree 5=Strongly Agree.
Table 4.9: Mean, standard deviation (SD), F-ratio, and F-probability for perceptions of the teaching and extension faculty regarding the future use of instructional technology when grouped by rank at ISU

<table>
<thead>
<tr>
<th>Category</th>
<th>Assistant Professor</th>
<th>Associate Professor</th>
<th>Professor</th>
<th>F-ratio</th>
<th>F-prob</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
<td>SD</td>
<td>N</td>
<td>Mean</td>
</tr>
<tr>
<td>Future use of technology*</td>
<td>18</td>
<td>3.18</td>
<td>0.64</td>
<td>33</td>
<td>3.20</td>
</tr>
<tr>
<td>Transparencies</td>
<td>20</td>
<td>2.80</td>
<td>1.06</td>
<td>35</td>
<td>2.60</td>
</tr>
<tr>
<td>Slides</td>
<td>20</td>
<td>2.80</td>
<td>0.95</td>
<td>35</td>
<td>2.60</td>
</tr>
<tr>
<td>Models</td>
<td>20</td>
<td>2.60</td>
<td>0.88</td>
<td>35</td>
<td>2.71</td>
</tr>
<tr>
<td>Flannel board</td>
<td>19</td>
<td>2.21</td>
<td>0.98</td>
<td>35</td>
<td>2.60</td>
</tr>
<tr>
<td>Projector(s)</td>
<td>20</td>
<td>2.65</td>
<td>0.81</td>
<td>35</td>
<td>2.71</td>
</tr>
<tr>
<td>Television</td>
<td>20</td>
<td>3.45</td>
<td>0.94</td>
<td>35</td>
<td>3.34</td>
</tr>
<tr>
<td>Video cassette recorder</td>
<td>20</td>
<td>3.55</td>
<td>1.05</td>
<td>35</td>
<td>3.29</td>
</tr>
<tr>
<td>Camera</td>
<td>18</td>
<td>2.89</td>
<td>1.18</td>
<td>35</td>
<td>2.86</td>
</tr>
<tr>
<td>Audio cassette recorder</td>
<td>19</td>
<td>2.53</td>
<td>0.96</td>
<td>35</td>
<td>2.63</td>
</tr>
<tr>
<td>Computer</td>
<td>20</td>
<td>3.98</td>
<td>0.97</td>
<td>34</td>
<td>3.97</td>
</tr>
<tr>
<td>Color photocopy machine</td>
<td>20</td>
<td>3.45</td>
<td>1.15</td>
<td>34</td>
<td>3.73</td>
</tr>
<tr>
<td>Interactive video</td>
<td>20</td>
<td>3.60</td>
<td>1.14</td>
<td>35</td>
<td>3.80</td>
</tr>
<tr>
<td>CamCorder</td>
<td>20</td>
<td>3.55</td>
<td>1.05</td>
<td>34</td>
<td>3.59</td>
</tr>
<tr>
<td>Graphics</td>
<td>20</td>
<td>3.65</td>
<td>0.99</td>
<td>35</td>
<td>3.83</td>
</tr>
<tr>
<td>Uplink</td>
<td>20</td>
<td>3.65</td>
<td>1.18</td>
<td>34</td>
<td>3.65</td>
</tr>
<tr>
<td>Simulation</td>
<td>20</td>
<td>3.70</td>
<td>0.98</td>
<td>34</td>
<td>3.79</td>
</tr>
<tr>
<td>Fascimile (Fax machine)</td>
<td>19</td>
<td>3.16</td>
<td>1.30</td>
<td>34</td>
<td>3.44</td>
</tr>
<tr>
<td>Printed materials</td>
<td>20</td>
<td>2.75</td>
<td>1.12</td>
<td>35</td>
<td>2.57</td>
</tr>
<tr>
<td>Data projection panel</td>
<td>20</td>
<td>3.30</td>
<td>1.30</td>
<td>35</td>
<td>3.17</td>
</tr>
</tbody>
</table>

*a1=No Change  2=Little Change  3=Significant Change  4=Complete Change  (5 recoded as missing).
Table 4.10: Mean, standard deviation (SD), F-ratio, and F-probability for perceptions of teaching and extension faculty regarding the future use of instructional technology when grouped by their assignment(s)

<table>
<thead>
<tr>
<th>Category</th>
<th>Teaching</th>
<th>Extension/ etc.</th>
<th>Teaching/ Research</th>
<th>F-ratio</th>
<th>F-prob</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
<td>SD</td>
<td>N</td>
<td>Mean</td>
</tr>
<tr>
<td>Future use of technology&lt;sup&gt;a&lt;/sup&gt;</td>
<td>33</td>
<td>3.25</td>
<td>0.60</td>
<td>43</td>
<td>3.24</td>
</tr>
<tr>
<td>Transparencies</td>
<td>35</td>
<td>2.74</td>
<td>1.04</td>
<td>45</td>
<td>2.64</td>
</tr>
<tr>
<td>Slides</td>
<td>35</td>
<td>2.71</td>
<td>0.95</td>
<td>45</td>
<td>2.58</td>
</tr>
<tr>
<td>Models</td>
<td>35</td>
<td>2.83</td>
<td>0.98</td>
<td>45</td>
<td>2.53</td>
</tr>
<tr>
<td>Flannel board</td>
<td>34</td>
<td>2.29</td>
<td>1.06</td>
<td>44</td>
<td>2.34</td>
</tr>
<tr>
<td>Projector(s)</td>
<td>35</td>
<td>2.66</td>
<td>1.06</td>
<td>45</td>
<td>2.78</td>
</tr>
<tr>
<td>Television</td>
<td>35</td>
<td>3.40</td>
<td>0.95</td>
<td>45</td>
<td>3.47</td>
</tr>
<tr>
<td>Video cassette recorder</td>
<td>35</td>
<td>3.69</td>
<td>0.93</td>
<td>45</td>
<td>3.51</td>
</tr>
<tr>
<td>Camera</td>
<td>35</td>
<td>2.91</td>
<td>1.16</td>
<td>45</td>
<td>2.93</td>
</tr>
<tr>
<td>Audio cassette recorder</td>
<td>35</td>
<td>2.56</td>
<td>0.96</td>
<td>45</td>
<td>2.56</td>
</tr>
<tr>
<td>Computer</td>
<td>35</td>
<td>3.99</td>
<td>0.76</td>
<td>45</td>
<td>3.98</td>
</tr>
<tr>
<td>Color photocopy machine</td>
<td>35</td>
<td>3.74</td>
<td>0.92</td>
<td>44</td>
<td>3.82</td>
</tr>
<tr>
<td>Interactive video</td>
<td>35</td>
<td>3.67</td>
<td>1.05</td>
<td>45</td>
<td>3.82</td>
</tr>
<tr>
<td>CamCorder</td>
<td>35</td>
<td>3.57</td>
<td>0.92</td>
<td>45</td>
<td>3.73</td>
</tr>
<tr>
<td>Graphics</td>
<td>35</td>
<td>3.94</td>
<td>0.84</td>
<td>45</td>
<td>3.76</td>
</tr>
<tr>
<td>Uplink</td>
<td>35</td>
<td>3.77</td>
<td>0.97</td>
<td>45</td>
<td>3.71</td>
</tr>
<tr>
<td>Simulation</td>
<td>35</td>
<td>3.60</td>
<td>0.81</td>
<td>45</td>
<td>3.67</td>
</tr>
<tr>
<td>Fascimile (Fax machine)</td>
<td>34</td>
<td>3.41</td>
<td>1.16</td>
<td>44</td>
<td>3.68</td>
</tr>
<tr>
<td>Printed materials</td>
<td>35</td>
<td>2.66</td>
<td>1.03</td>
<td>45</td>
<td>2.84</td>
</tr>
<tr>
<td>Data projection panel</td>
<td>35</td>
<td>3.26</td>
<td>0.90</td>
<td>45</td>
<td>3.33</td>
</tr>
</tbody>
</table>

<sup>a</sup>1=No Change  2=Little Change  3=Significant Change  4=Complete Change  (5 recoded as missing).
Table 4.11: Mean, standard deviation (SD), F-ratio, and F-probability regarding the perceptions about instructional technology by the teaching and extension faculty when they are grouped by type of assignment(s) in the College of Agriculture at Iowa State University

| Description | Teaching | | | | | Teaching/ | | | F- | | |
| | | | | | | etc. | | | | prob | |
| | N | Mean | SD | N | Mean | SD | N | Mean | SD | ratio | prob |
| Perceptions about technology<sup>a</sup> | 21 | 3.51 | 0.43 | 25 | 3.34 | 0.55 | 36 | 3.25 | 0.55 | 1.72 | 0.19 |
| Technology can make education: | | | | | | | | | | |
| more cost effective | 27 | 3.33 | 0.55 | 42 | 3.02 | 0.78 | 74 | 3.03 | 0.76 | 1.93 | 0.15 |
| more individualized | 29 | 3.38 | 0.62 | 41 | 3.20 | 0.64 | 71 | 3.06 | 0.79 | 2.14 | 0.12 |
| more interesting & motivating | 33 | 3.45 | 0.56 | 37 | 3.32 | 0.53 | 75 | 3.25 | 0.55 | 1.55 | 0.21 |
| more understandable | 28 | 3.46 | 0.51 | 35 | 3.14 | 0.69 | 73 | 3.12 | 0.62 | 3.25 | 0.04 |
| more effective | 31 | 3.52 | 0.51 | 38 | 3.21 | 0.66 | 72 | 3.15 | 0.64 | 3.79 | 0.02 |

<sup>a</sup>Scale: 1=Strongly Disagree  2=Disagree  3=Undecided  4=Agree  5=Strongly Agree.
Table 4.12: Mean, standard deviation (SD), F-ratio, and F-probability regarding the perceptions about instructional technology by the teaching and extension faculty when they are grouped by rank in the College of Agriculture at Iowa State University

<table>
<thead>
<tr>
<th>Category</th>
<th>Assistant Professor</th>
<th>Associate Professor</th>
<th>Professor</th>
<th>F-ratio</th>
<th>F-prob</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
<td>SD</td>
<td>N</td>
<td>Mean</td>
</tr>
<tr>
<td>Perceptions about technology&lt;sup&gt;a&lt;/sup&gt;</td>
<td>9</td>
<td>3.44</td>
<td>0.46</td>
<td>13</td>
<td>3.37</td>
</tr>
<tr>
<td>Technology can make education:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>more cost effective</td>
<td>17</td>
<td>2.88</td>
<td>0.86</td>
<td>24</td>
<td>3.13</td>
</tr>
<tr>
<td>more individualized</td>
<td>14</td>
<td>3.14</td>
<td>0.77</td>
<td>28</td>
<td>3.11</td>
</tr>
<tr>
<td>more interesting &amp; motivating</td>
<td>17</td>
<td>3.47</td>
<td>0.51</td>
<td>29</td>
<td>3.28</td>
</tr>
<tr>
<td>more understandable</td>
<td>13</td>
<td>3.31</td>
<td>0.85</td>
<td>23</td>
<td>3.04</td>
</tr>
<tr>
<td>more effective</td>
<td>13</td>
<td>3.54</td>
<td>0.52</td>
<td>28</td>
<td>3.07</td>
</tr>
</tbody>
</table>

<sup>a</sup>Scale: 1=Strongly Disagree  2=Disagree  3=Undecided  4=Agree  5=Strongly Agree.
Table 4.13: Mean, standard deviation (SD), F-ratio, and F-probability for use of instructional technology in class/presentation(s) by the teaching and extension faculty in the College of Agriculture at Iowa State University when grouped by age

<table>
<thead>
<tr>
<th>Description</th>
<th>Below 40 years</th>
<th>40-50 years</th>
<th>Above 50 years</th>
<th>F-ratio</th>
<th>F-prob</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>Mean</td>
<td>SD</td>
<td>N</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-------------</td>
<td>-----</td>
<td>-------------</td>
<td>---------</td>
<td>--------</td>
</tr>
<tr>
<td>Use of instructional technology&lt;sup&gt;a&lt;/sup&gt;</td>
<td>49</td>
<td>2.49</td>
<td>0.51</td>
<td>49</td>
<td>2.41</td>
</tr>
<tr>
<td>Transparencies</td>
<td>52</td>
<td>3.94</td>
<td>1.02</td>
<td>55</td>
<td>3.87</td>
</tr>
<tr>
<td>Slides</td>
<td>52</td>
<td>3.15</td>
<td>1.18</td>
<td>55</td>
<td>3.27</td>
</tr>
<tr>
<td>Models</td>
<td>50</td>
<td>2.16</td>
<td>1.15</td>
<td>53</td>
<td>1.98</td>
</tr>
<tr>
<td>Flannel board</td>
<td>52</td>
<td>1.23</td>
<td>0.83</td>
<td>53</td>
<td>1.04</td>
</tr>
<tr>
<td>Overhead projector</td>
<td>51</td>
<td>3.96</td>
<td>1.02</td>
<td>55</td>
<td>3.91</td>
</tr>
<tr>
<td>Television</td>
<td>52</td>
<td>1.90</td>
<td>1.03</td>
<td>53</td>
<td>1.81</td>
</tr>
<tr>
<td>Video cassette recorder</td>
<td>52</td>
<td>2.08</td>
<td>1.05</td>
<td>54</td>
<td>2.06</td>
</tr>
<tr>
<td>Camera</td>
<td>52</td>
<td>1.67</td>
<td>0.98</td>
<td>53</td>
<td>1.75</td>
</tr>
<tr>
<td>Audio cassette recorder</td>
<td>52</td>
<td>1.63</td>
<td>0.84</td>
<td>52</td>
<td>1.56</td>
</tr>
<tr>
<td>Computer</td>
<td>52</td>
<td>2.77</td>
<td>1.29</td>
<td>54</td>
<td>2.54</td>
</tr>
<tr>
<td>Photocopy machine</td>
<td>52</td>
<td>4.02</td>
<td>1.03</td>
<td>54</td>
<td>3.89</td>
</tr>
<tr>
<td>Data projection panel</td>
<td>51</td>
<td>1.39</td>
<td>0.72</td>
<td>50</td>
<td>1.46</td>
</tr>
</tbody>
</table>

<sup>a</sup>Scale: 1=Never 2=Seldom 3=Sometimes 4=Often 5=Always.
Table 4.14: Mean, standard deviation (SD), t-value, and t-probability for the use of instructional technology in class/presentation by the faculty in the College of Agriculture at Iowa State University when they were grouped according to teaching certification.

<table>
<thead>
<tr>
<th>Category</th>
<th>Group 1 (^a)</th>
<th>Group 2 (^b)</th>
<th>t-value</th>
<th>t-prob</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
<td>SD</td>
<td>N</td>
</tr>
<tr>
<td>Use of instructional technology(^c)</td>
<td>28</td>
<td>2.25</td>
<td>0.47</td>
<td>131</td>
</tr>
<tr>
<td>Tape recorder/player</td>
<td>33</td>
<td>2.33</td>
<td>1.16</td>
<td>140</td>
</tr>
<tr>
<td>Audio teleconference</td>
<td>32</td>
<td>1.63</td>
<td>0.87</td>
<td>140</td>
</tr>
<tr>
<td>Television/VCR</td>
<td>32</td>
<td>3.03</td>
<td>0.90</td>
<td>142</td>
</tr>
<tr>
<td>Overhead projector</td>
<td>33</td>
<td>4.18</td>
<td>0.95</td>
<td>143</td>
</tr>
<tr>
<td>Computer</td>
<td>33</td>
<td>2.36</td>
<td>1.11</td>
<td>139</td>
</tr>
<tr>
<td>Interactive video</td>
<td>33</td>
<td>1.27</td>
<td>0.76</td>
<td>140</td>
</tr>
<tr>
<td>Movie projector(s)</td>
<td>33</td>
<td>2.39</td>
<td>1.03</td>
<td>142</td>
</tr>
<tr>
<td>Telephone conference</td>
<td>32</td>
<td>1.56</td>
<td>0.67</td>
<td>138</td>
</tr>
<tr>
<td>Data projection panel</td>
<td>31</td>
<td>1.45</td>
<td>0.72</td>
<td>136</td>
</tr>
</tbody>
</table>

\(^a\) Faculty who had teaching certification.  
\(^b\) Faculty who did not have teaching certification.  
\(^c\) Scale: 1=Never  2=Seldom  3=Sometimes  4=Often  5=Always.
5 SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary

Instructional technology is a systematic approach to educational process. It is a way of designing, carrying out, and evaluating the process of teaching and learning in terms of specific objectives. The definition of instructional technology used to judge the programs considered here was synthesized from two definitions, one developed by the Association for Educational Communications and Technology and the other by Tickton (1971). Accordingly, instructional technology is a systematic approach to improve teaching/learning through media management, educational program development and learning resources; and is based upon research in human learning and communication.

Instructional technology, when properly designed and used, can help students retain more of what they learn by requiring them to use more of their senses in the teaching/learning process. For example, a microcomputer can be an effective teaching aid. It can assist teachers by performing routine tasks (grading and recordkeeping), and serving as an audio-visual device. Instructional technology is becoming increasingly important because it enables instructors to be in communication with all other components of the teaching/learning process. The key applications of instructional
technology are to give teachers sufficient time to learn the use of instructional technology, utilize the available resources around them, and keep them up to date.

According to Nasman (1987), research has shown that individuals retain about 10% of what they read, 20% of what they hear, 30% of what they see, and 50% of what they see and hear. Furthermore, when the learner is required to immediately complete an action that demonstrates what the learner has seen and heard, there is a dramatic increase in retention. To be effective in increasing long-term retention, an instructional delivery system should allow teachers to address as many of the learners' senses as possible. The system should allow for the learner to be actively, rather than passively, involved. New instructional technology makes it possible for students to be involved in the teaching/learning process.

Instructional technology can resolve many of the problems related to delivering high quality instruction to students. The hardware has been developed and is readily available. The cost of hardware is at a point where it is no longer a obstacle. Perhaps the biggest problem to be solved is the development of related materials. As more and more educators learn about the potential of instructional technology, the demand for quality materials will grow, and there will be corresponding growth in the supply. It will not be too much longer before every student will experience the benefits of the most advanced instructional technology.

According to Paoni (1983), the average instructor spends approximately 80–90% of his/her classroom time involved in the use of teaching strategies. The other 10–20% is used for roll taking, giving assignments, homework, instructions, etc. There is a multitude of strategies that can be used in the instructional process. Experts
have identified and defined a number of strategies but none of them is said to be the best. However, each of them is appropriate under certain conditions as pointed out by Hyman (1974). The critical factors in the use of instructional technology are the methods being used and for what purposes. Several experts in the field have indicated that each strategy, or types of strategies, require(s) different forms of learning or skills from the students. All strategies/methods do not produce the same cognitive or affective results, but should result in a general pattern of student outcomes.

The main purpose of the study was to assess instructional technology used by the teaching and extension faculty in the College of Agriculture at Iowa State University. A secondary purpose was to determine the perceptions of the teaching and extension faculty regarding the future use of instructional technology in teaching and disseminating information.

The specific objectives were as follows:

1. To collect demographic data on the teaching and extension faculty relevant to the study.

2. To assess and compare instructional technology used by the teaching and extension faculty during a typical semester.

3. To identify and compare the factors that influence the selection of instructional technology.

4. To identify any changes in the use of instructional technology from initial employment.
5. To assess and compare the teaching and extension faculty perceptions regarding the future use of instructional technology.

The population for the study consisted of faculty in the College of Agriculture at Iowa State University who had teaching and/or extension responsibilities. Some faculty also had other responsibilities such as research, administration, advising, and/or curriculum development assignment(s). The faculty represented all departments in the College of Agriculture at Iowa State University. A list showing faculty and staff was obtained from the College of Agriculture at Iowa State University in Ames. A total of 250 faculty members were identified from the 1988-89 master list with responsibilities of teaching and/or extension. A new list was generated with a four-digit code number for mailing purposes.

The survey instrument developed for this study consisted of 125 items. The instrument covered the areas: 1) demographic information and other characteristics relevant to the study; 2) use of instructional technology in class and/or presentation(s); 3) use of library facilities; 4) use of university facilities; 5) use of instructional technology during a typical semester; 6) factors influencing selection of instructional technology; 7) perceptions about future use of instructional technology; and 8) perceptions about instructional technology. Likert-type scales were used for all the above areas except for demographic information and other characteristics relevant to the study. Appropriate statistical procedures including frequencies, reliability, t-test, and oneway analysis of variance were employed for analysis of data.

A profile of the characteristics of the investigation is summarized as:

1. One-fifth of the faculty had only teaching responsibilities.
2. Twenty-seven percent were engaged in extension and other related activities.

3. Above half of the faculty were teaching and conducting research as well.

4. Almost three-quarters of the faculty had no experience of teaching via television and/or video.

5. Only four percent of the teaching faculty had used television/video.

6. One-fifth of the faculty possessed teaching certificate.

7. Sixty-five percent of the faculty consisted of professors.

8. About one-fourth of the faculty were under 40 years of age.

9. One-third of the faculty were between 40–50 years of age.

10. About one-fourth of the faculty were teaching at graduate level.

11. Fifty-five percent of the faculty were teaching at both graduate and undergrad­uate levels.

12. Only nine percent of the faculty were female.

13. About seven percent of the faculty were teaching off-campus.

14. A majority (about seventy percent) of the faculty changed their teaching strat­egy to use instructional technology and forty percent of them were professors.

15. The overall use of instructional technology by the teaching and extension faculty was found to be non-significant when they were grouped by rank.
16. The results for individual items for the category of use of instructional technology in class were observed to be non-significant.

17. The use of transparencies and slides were rated high (mean above 3); computers and models (mean above 2) were seldom used; and video cassette recorder, television, audio cassette recorder, camera, flannel board, and data projection panel (mean below 2) were almost never used.

18. A significant difference was observed in the use of instructional technology at 0.05 level between the groups of teaching and teaching with research when the teaching and extension faculty were grouped by their type of assignment(s).

19. Under the category of use of instructional technology, the individual items, i.e., transparencies, slides, models, flannel board, projector(s), and photocopy machine were found to be non-significant.

20. A significant difference was recorded in the use of television and computer at 0.05 level, and the use of video cassette recorder was observed significantly different at 0.01 level. The differences were between the groups of teaching and the teaching with research.

21. The use of camera was also significantly different between the groups of teaching and the extension with related responsibilities.

22. The data for the factors affecting selection of instructional technology indicated no significant differences among the teaching and extension faculty when they were divided by their type of assignment(s).
23. The time available for preparation was rated as very important factor (mean above 4) by the faculty, followed by cost of software, hardware, and development of materials (mean above 3).

24. The factors affecting selection of instructional technology were equally important for all three groups, i.e., teaching; teaching and research; and extension with other related responsibilities.

25. Almost similar responses were found for all the factors affecting selection of instructional technology when the teaching and extension faculty were grouped by their rank and type of assignment(s).

26. A comparison between the faculty who modified their teaching strategy to use instructional technology and who did not was made. The t-test indicated difference at 0.01 level for the use of instructional technology in class; use of library facilities; use of instructional technology per semester; and the factors affecting selection of instructional technology.

27. The use of university facilities and the future use of instructional technology were significantly different at 0.05 level as revealed by t-test between the faculty who modified their teaching strategy and who did not.

28. Perceptions about instructional technology were found to be non-significant among the teaching and extension faculty in the College of Agriculture.

29. Overall, the teaching and extension faculty who modified their teaching strategy were significantly different from the faculty who did not.
30. No significant differences were found in the future use of instructional technology as perceived by the teaching and extension faculty when they were categorized by rank and type of assignment(s).

31. The individual items under the umbrella of the future use of instructional technology revealed the similar pattern when the faculty were divided by rank and type of assignment(s).

5.2 Conclusions

Keeping in view the objectives of the study, the following null hypotheses were formulated for testing:

There is no significant difference in the use of instructional technology during a typical semester among the teaching and extension faculty in the College of Agriculture at Iowa State University when they are grouped by rank.

It was concluded that the teaching and extension faculty in the College of Agriculture at Iowa State University were not using instructional technology differently during a typical semester when they were grouped by rank. Transparencies, slides, projectors, and the photocopy machine were often used by the assistant professors, associate professors, and professors. Models and computers were seldom used by the faculty. The remaining items were almost never used by the faculty except for the video cassette recorder that was seldom used by associate professors and professors.
There is no significant difference in the use of instructional technology during a typical semester among the teaching and extension faculty in the College of Agriculture at Iowa State University when they are grouped by type of assignment(s).

It was concluded that the teaching and extension faculty in the College of Agriculture at Iowa State University were not using instructional technology differently during a typical semester when they were grouped by their type of assignment(s). All three groups of the faculty used transparencies, slides, projectors, and the photocopy machine quite often. Models and computers were seldom used by the faculty. The television and video cassette recorder were seldom used by the faculty with teaching assignments and the faculty with extension with/without other related responsibilities. The remaining items were never used by the faculty.

There is no significant difference pertaining to the factors affecting selection of instructional technology when the teaching and extension faculty in the College of Agriculture at Iowa State University are grouped by rank.

It was concluded that the factors affecting selection of instructional technology did not have significant effect on the teaching and extension faculty in the College of Agriculture at Iowa State University when they were categorized by rank. The cost of software, hardware, development cost of materials, availability of materials, training to operate and use, and information about technology were important to the faculty when selecting instructional technology. The time available for preparation was very important to assistant professors, associate professors, and professors as
well. The security of existing system was not an important factor for the faculty with teaching and research responsibilities.

There is no significant difference pertaining to the factors affecting selection of instructional technology when the teaching and extension faculty in the College of Agriculture at Iowa State University are grouped by type of assignment(s).

It was concluded that the factors affecting selection of instructional technology did not have significant effect on the teaching and extension faculty in the College of Agriculture at Iowa State University when they were categorized by their type of assignment(s). The cost of software, hardware, development cost of materials, availability of materials, training to operate and use, and information about technology were important to the faculty when selecting instructional technology. The time available for preparation was very important to the teaching and extension faculty. The security of existing system was somewhat important to all groups.

There is no significant difference in the use of instructional technology by the teaching and extension faculty in the College of Agriculture at Iowa State University who modified their teaching strategy to use instructional technology and who did not.

It was concluded that the teaching and extension faculty in the College of Agriculture at Iowa State University used instructional technology differently when they were grouped according to teaching strategy, i.e., those who modified their teaching strategy and those who did not. The teaching and extension faculty who modified
their teaching strategy to use: 1) instructional technology in class, 2) library facilities, 3) university facilities, and 4) instructional technology per semester differently than those who did not modify their teaching strategy. The factors affecting selection of instructional technology also influenced the faculty differently according to their teaching strategy. The teaching and extension faculty who modified their teaching strategy perceived future use of instructional technology differently than those who did not change their teaching strategy.

There is no significant difference in the future use of instructional technology as perceived by the teaching and extension faculty in the College of Agriculture at Iowa State University when they are grouped by rank.

It was concluded that the teaching and extension faculty in the College of Agriculture at Iowa State University did not perceive the future use of instructional technology differently when they were grouped by rank. Overall, they perceived that there will be much change in the future use of instructional technology. Transparencies, slides, models, flannel board, camera, and the printed materials will undergo little change, while there will be much change in the future use of the data projection panel, fascimile (fax machine), simulation, uplinks, graphics, camcorder, video cassette recorder, computer, and television.

There is no significant difference in future use of instructional technology as perceived by the teaching and extension faculty in the College of Agriculture at Iowa State University when grouped by type of assignment(s).

It was concluded that the perceptions of the teaching and extension faculty in the College of Agriculture at Iowa State University were not significantly different regard-
ing the future use of instructional technology when they were grouped by their type of assignment(s). The overall perceptions of all groups were that there will be much change in the future use of instructional technology. All the three groups perceived that almost complete change will occur in the use of computers. The perceptions of the faculty regarding the data projection panel, fascimile (fax machine), simulation, uplinks, graphics, camcorder, video cassette recorder, computer, and television was that there will be much change in future use. The remaining items were rated with little change.

5.3 Recommendations

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

1. The data in Figure 4.2 on page 53 indicated that the teaching faculty had very little experience in teaching via television and/or video, therefore, the faculty should be provided with opportunities for training so that they can teach via television and/or video.

2. Classroom and laboratory facilities should be equipped so that instructional technology can be conveniently used by the faculty.

3. The use of instructional technology should be increased for off-campus courses so that the faculty can teach via television/video (see Figure 4.7 on page 58).

4. Materials should be developed in a variety of forms so that instructors have a chance to choose a form that best suits their needs.
5. The use of instructional technology should be increased in classrooms as ratings were quite low as far as individual items were concerned. The use of television, video, and computer in teaching need special attention (see Tables 4.2 and 4.3 on pages 61 and 62 respectively).

6. The activities regarding the uses of instructional technology around the campus should be organized through conferences and seminars so that faculty get chance to see innovative uses of instructional technology.

7. A link should be established between various departments and through Iowa State University and industries for coordination of programs promoting the uses of instructional technology in different settings.

8. The use of library facilities such as the Reserve Desk and the Computer Lab should be encouraged by the faculty (see Table 4.4 on page 55).

9. The use of university facilities, i.e., the Media Graphics and the Photo Service, should also be encouraged by the faculty (see Table 4.4 on page 55).

10. The findings of this study should be made available to the teaching and extension faculty in the College of Agriculture at Iowa State University.

5.4 Recommendations for Further Study

The following recommendations are made for further studies in the use of instructional technology:
• The research regarding instructional technology should be conducted in other colleges of Iowa State University.

• The findings from various colleges should be compared with the results of this study.

• The variables other than those utilized in this study should be identified and investigated.

• Needs assessment should be conducted to determine what professional competencies faculty should possess for teaching and disseminating information while utilizing the channels of advanced technology.

• Further studies should be initiated to expand and validate the procedures used in this study.
6 BIBLIOGRAPHY


Black, H. B. 1962. Improving the programming of complex pictorial materials: Discrimination learning as affected by prior exposure to and relevance of the figural discriminandi. University of Indiana School of Education Memorandum, Bloomington.


Hortin, John A. 1981. Successful examples of instructional technology in higher education. ERIC ED 208 726.


Norusis, Marija J. 1988c. SPSS/PC+: Tables V2.0 for the IBM PC/XT/AT and PS/2. SPSS, Inc., Chicago.


Sturdivant, Patricia. 1985. Planning for the effective use of educational technology. ERIC ED 268 691.


First and foremost, the author would take this opportunity to pay the deepest sense of gratitude to Almighty Allah, Omnipresent, Omnipotent, Omniscient, Who bestowed upon me the potential and ability to accomplish this cardinal task.

The writer is indebted to Dr. W. Wade Miller, Major Professor; Dr. David L. Williams, Professor and Head, Department of Agricultural Education, for their constant help, guidance, moral support, and prompt evaluation of the script.

Special thanks are due to Dr. Harold R. Crawford, Professor and Assistant Dean, College of Agriculture; Dr. Mike Warren, Professor and Head, Technology and Social Change; Dr. Anton J. Netusil, Professor, Research and Evaluation; committee members, for their enlightening views and valuable suggestions.

Thanks are due to LaDena F. Bishop for her advice; Dr. William G. Miller; Linda J. Hutchison; Messrs Jeff Balvanz; Mark Beran; Wayne Hauber; and Kazi Aziz Ahmed for their assistance in understanding computer concepts; and for the utilities that made the job easier on mainframe and personal computer as well.

The acknowledgment will be incomplete if I forget the Media Center, the Microforms, lovely leaders, and crew who provided me all the avenues to educational technology. Karen Sinkule, Peggy Blumer, Mary Ellen Huls, Pam Williams, and Cheryl Meyer will always be remembered.
Special appreciations are due to Dr. M. Asharaf Pathan, Mumtaz Ali Pathan; Abdul Wahab Soomro; and Douglas E. Blomgren for their friendship, words of encouragement and inspiration particularly at the times when I needed the most.

Sincere thanks are due to Khairuddin L. Tunio; M. Muqeem Shah Rashdi; Din Mohammad Soomro; Dr. Shams Din Tagar; Dr. Nabi Bakhsh Sial; Dr. Rajab Ali Memon; Dr. Abdul Jabar Malik; Karamullah H. Agha; Dr. Shaukat Hussain Baluch; and Dr. Maharam Ali Sanjrani for their guidance and support.

Special thanks go to Dr. Abdul Qadir Ansari, then Vice Chancellor, for providing me an opportunity by granting study leave to pursue my doctoral degree. His leadership style impressed me and I learned patience from him during my contacts as Vice President of the Students’ Union.

In the last but not least, thanks are due to brothers, sisters, family, and relatives for their blessings, bearings, loving support, and confidence in me throughout my entire life. I really missed every one of them and appreciated the kinship and its importance from distance.
8 APPENDIX A

Cover Letter
DATE: March 1, 1989

TO: College of Agriculture Faculty
    Agriculture Extension Personnel

FROM: Harold Crawford  W. Wade Miller  Sayed Saban Shah Bukhari
      Assistant Dean  Associate Professor  Graduate Student

RE: Survey on the Use of Instructional Technology in the College of Agriculture

VCRs, data projection panels, and satellite dishes -- these are but a few of the instructional technology tools which have affected almost everyone who teaches classes or makes presentations. Many faculty members are using various forms of instructional technology in teaching and disseminating information. The purpose of this study is to assess the availability and use of instructional technology tools by faculty members. The results will help us to plan instructional improvement activities in the College of Agriculture.

We are asking for your help in this endeavor by completing the enclosed survey form. Your response will remain confidential -- the code number on the survey form is for follow-up purposes. Only group data will be reported.

We encourage you to take a few moments of your time to complete and return the survey by March 10, 1989. We know that you have recently been asked to complete a questionnaire on computer use in our college. This survey is designed to determine how we are making use of instructional technology tools and what our needs are for the future. Thank you for your input to this project.

kk
Enclosure
APPENDIX B

Questionnaire
AN ASSESSMENT OF INSTRUCTIONAL TECHNOLOGY AND
TEACHING METHODS IN THE COLLEGE OF AGRICULTURE

DIRECTIONS:
Please provide the answers requested for the following questions. Your response will be confidential; it will be reported as averages and used in comparisons only.

1. Gender: ___ Male ___ Female

2. Age: ___ 21-30 years ___ 31-40 years
       ___ 41-50 years ___ above 50 years

3. How is your time budgeted?
   ___% Teaching ___% Research
   ___% Extension ___% Administration
   ___% Other (please specify) __________

4. What is your present rank?
   ___ Assistant Professor ___ Associate Professor
   ___ Professor ___ Other (Please specify) __________

5. How many years have you taught/worked at ISU? ___ years

6. Please indicate the level you are now teaching
   ___ Graduate ___ Undergraduate ___ Both

7. What is the average size of your class/presentation(s)?
   ___ Graduate ___ Undergraduate ___ Other

8. What type of setting do you teach/give presentation(s)?
   ___ Formal ___ Nonformal ___ Both

9. Where do you teach class?
   ___ On-campus ___ Off-campus ___ Both

10. Please indicate your normal teaching/presentation load per semester
    ___ Cr ___ Course(s) Graduate
    ___ Cr ___ Course(s) Undergraduate
    ___ Number of Extension presentation(s)
    ___ Number of Research presentation(s)

11. Have you taught off-campus course(s) in the last five years?
    ___ Yes ___ No
12. Have you taught course(s) via television/video in the last five years?  
   ___ Yes  ___ No

13. What was your first experience in teaching?  
   ___ Elementary/high school teacher  
   ___ Graduate assistant, college level  
   ___ Assistant/associate or full professor  
   ___ Other (please specify) ____________

14. Do you hold or have you held a teaching certificate?  
   ___ Yes  ___ No  If yes, please indicate  
      Level __________  Subject __________

15. What educational training in instructional methods did you have when you began teaching? Please check all that apply.  
   ___ None  ___ University coursework  
   ___ Workshops  ___ Teacher education program  
   ___ Other (please specify) ______________

16. How many formal teaching method courses have you taken?  
   ___ One  ___ Two  ___ Three/more  ___ None

17. How many conference(s), seminar(s), and/or presentation(s) pertaining to instruction do you attend in a year?  
   ___ One  ___ Two  ___ Three/more  ___ None

18. The following services/facilities are available around the campus. Do you know about them? Please answer all that apply.  

   Computer short courses  ___ Yes  ___ No  
   Electronic mail  ___ Yes  ___ No  
   Satellite link  ___ Yes  ___ No  
   Telephone answering service  ___ Yes  ___ No  
   Fascimile (Fax machine)  ___ Yes  ___ No

19. How often do you use the following in your class?  

   1-------------2-------------3-------------4-------------5
   Never  Seldom  Sometimes  Often  Always

   Tape recorder/player  1  2  3  4  5  
   Audio teleconference  1  2  3  4  5  
   Television/VCR  1  2  3  4  5  
   Overhead projector  1  2  3  4  5  
   Computer  1  2  3  4  5  
   Interactive video  1  2  3  4  5  
   Movie projector(s)  1  2  3  4  5  
   Telephone conference  1  2  3  4  5  
   Data projection panel  1  2  3  4  5
20. How often do you use the following library facilities?

```
1------------2------------3------------4------------5
Never    Seldom    Sometimes    Often    Always
 Reserve Desk       1  2  3  4  5
 Media Center       1  2  3  4  5
 Microforms        1  2  3  4  5
 Computer Lab      1  2  3  4  5
```

21. How often do you use the following facilities at ISU?

```
1------------2------------3------------4------------5
Never    Seldom    Sometimes    Often    Always
 Media Graphics Facility       1  2  3  4  5
 Media Resources Center       1  2  3  4  5
 Photo Service             1  2  3  4  5
```

22. How much experience have you had in using a personal computer?

___ Much     ___ Some     ___ Little     ___ None

23. Do you have personal computer in the office? ___ Yes ___ No

24. What type of computer/terminal do you use in your office?
   Please check all that apply
   ___ Mainframe/terminal
   ___ Miniframe/terminal
   ___ Personal
   ___ None

25. Do you own a computer for home? ___ Yes ___ No
   If so, what type are you using?
   ___ IBM/compatible
   ___ Apple II
   ___ Macintosh
   ___ Other

26. How many years experience do you have in using computer(s)? ___ years

27. How much formal instruction on using computer(s) have you received?

___ Much     ___ Some     ___ Little     ___ None

28. Have you used online literature search to prepare for a class/presentation(s)? ___ Yes ___ No

29. Do you use computer(s) for a class? ___ Yes ___ No
   If so, for what purpose(s). Please check all that apply.
   ___ Word processing
   ___ Spreadsheet and/or grading
   ___ Communication and/or mail
   ___ Graphics and/or audio-visual aids
30. Have you used a facsimile (fax) machine? ___ Yes ___ No

31. Have you modified your teaching strategy to utilize instructional technology within last 5 years? ___ Yes ___ No
   If yes, what was/were the reason(s). Please check all that apply.
   ___ Effectiveness ___ Motivation
   ___ Interest ___ Efficiency
   ___ Other (please specify) ________________________________

32. What area(s) do you see as beneficial to improve your preparation for class? Please check all that apply.
   ___ Theory of learning ___ Instructional technology
   ___ Teaching methods ___ Educational psychology
   ___ Curriculum development ___ Planning and evaluation
   ___ Other (please specify) ________________________________

33. How do you improve your teaching? Please check all that apply.
   ___ Attend seminar(s)/conference(s)
   ___ Read articles about teaching
   ___ Utilize student/audience evaluation
   ___ Seek advice from a fellow faculty member
   ___ Other (please specify) ________________________________

34. Do you use student/audience evaluation? ___ Yes ___ No

35. Do you think student/audience evaluation can be used to improve teaching? ___ Yes ___ No

36. DIRECTIONS: Please use the following 5-point scale to describe your average use of instructional technology during a semester. Circle the number that most closely reflects your use.

<table>
<thead>
<tr>
<th>Never</th>
<th>Seldom</th>
<th>Sometimes</th>
<th>Often</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Transparencies</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Slides</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Models</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Flannel board</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Overhead projector(s)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Television</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Video Cassette Recorder</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Camera</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Audio Cassette Recorder</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Computer</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Photocopy machine</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Data projection panel</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
37. DIRECTIONS: Please use the following 5-point scale to rate the importance influencing your selection of instructional technology. Circle the number that most closely reflects your feelings.

1- Not Important
2- Somewhat Important
3- Important
4- Very Important
5- Extremely Important

<table>
<thead>
<tr>
<th>Item</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of hardware to use</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Cost of Software to use</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Development cost of materials</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Information about technology</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Availability of material</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Security of existing system</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Training to operate and use</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Time available for preparation</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

38. What assistance do you get in preparing materials for class? Please check all that apply.

- Secretary
- Research assistant
- Yourself
- Teaching assistant
- Other (please specify)

39. If you decide to use new technology, what problem(s) do you think you will face? Please check all that apply.

- Financial
- Training
- Time
- Other (please specify)

40. DIRECTIONS: What do you think about the use of technology at ISU in the year 2001? Please use the following scale to indicate change over existing use. Circle the number that best reflects your feelings.

1- No Change
2- Little Change
3- Significant Change
4- Complete Change
5- Do not know

<table>
<thead>
<tr>
<th>Item</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transparencies</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Slides</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Models</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Flannel boards</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Projector(s)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Television</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Video Cassette Recorder</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Camera</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Audio Cassette Recorder</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
DIRECTIONS: What do you think about the use of technology at ISU in the year 2001? Please use the following scale to indicate change over existing use. Circle the number that best reflects your feelings.

<table>
<thead>
<tr>
<th>Item</th>
<th>No Change</th>
<th>Little Change</th>
<th>Significant Change</th>
<th>Complete Change</th>
<th>Do not know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Color photocopy machine</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Interactive video</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>CamCorder</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Graphics</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Uplink</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Simulation</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Fascimile (Fax machine)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Printed materials</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Data projection panel</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

41. DIRECTIONS: Please use the following 5-point scale to describe your feelings about technology. Circle the number that most closely reflects your feelings.

<table>
<thead>
<tr>
<th>Item</th>
<th>Strongly Disagree</th>
<th>Undecided</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology can:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>make education more cost effective</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>make education more individualized</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>create interest and motivation</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>make instruction more understandable</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>make learning more effective</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

THANK YOU
10 APPENDIX C

Follow-up Letter
Date: March 15, 1989

To: College of Agriculture Faculty
    Agricultural Extension Personnel

From: W. Wade Miller
       Associate Professor

Re: Survey on the Use of Instructional Technology
    in the College of Agriculture

This is a reminder. You may recall receiving a survey form on the Use of Instructional Technology in the College of Agriculture. To date, we have not received a survey form from you.

If you would like to participate in the survey, we would appreciate it if you will fill out the enclosed form and return it by Friday, March 24. If you do not want to participate in the study please return the blank survey form.

Thank you for your input into this project.

Enclosures
11 APPENDIX D

Human Subjects Form
INFORMATION ON THE USE OF HUMAN SUBJECTS IN RESEARCH
IOWA STATE UNIVERSITY
(Please follow the accompanying instructions for completing this form.)

1. Title of project (please type): ASSESSMENT OF INSTRUCTIONAL TECHNOLOGY USED BY
   THE FACULTY OF COLLEGE OF AGRICULTURE WITH RECOMMENDATIONS TO IOWA STATE

2. I agree to provide the proper surveillance of this project to ensure that the rights
   and welfare of the human subjects are properly protected. Additions to or changes
   in procedures affecting the subjects after the project has been approved will be
   submitted to the committee for review.

   Sayed Saban Shah Bukhari 1/30/89
   Typed Names of Principal Investigator  Date  Signature of Principal Investigator

   223 Curtiss Hall
   Campus Address

3. Signatures of others (If any) Date  Relationship to Principal Investigator

   W. Wade Miller 1/30/89  Major Professor

4. ATTACH an additional page(s) (A) describing your proposed research and (B) the
   subjects to be used, (C) indicating any risks or discomforts to the subjects, and
   (D) covering any topics checked below. CHECK all boxes applicable.
   Medical clearance necessary before subjects can participate
   Samples (blood, tissue, etc.) from subjects
   Administration of substances (foods, drugs, etc.) to subjects
   Physical exercise or conditioning for subjects
   Deception of subjects
   Subjects under 14 years of age and/or Subjects 14-17 years of age
   Subjects in institutions
   Research must be approved by another institution or agency

5. ATTACH an example of the material to be used to obtain informed consent and CHECK
   which type will be used.
   □ Signed informed consent will be obtained.
   □ Modified informed consent will be obtained.

6. Anticipated date on which subjects will be first contacted: 2  10  89
   Anticipated date for last contact with subjects:  4 30  89

7. If Applicable: Anticipated date on which audio or visual tapes will be erased and/or
   identifiers will be removed from completed survey instruments: 7 31  89

8. Signature of Head or Chairperson  Date  Department or Administrative Unit
   ____________________________________________
   ______  ______  ______
   Head or Chairperson  Date  Department or Administrative Unit

9. Decision of the University Committee on the Use of Human Subjects in Research:
   □ Project Approved  □ Project not approved  □ No action required
   ________________________
   Name of Committee Chairperson  Date  Signature of Committee Chairperson
12 APPENDIX E

Additional Information
ADDITIONAL INFORMATION
REGARDING THE TEACHING AND EXTENSION FACULTY
IN THE COLLEGE OF AGRICULTURE AT IOWA STATE UNIVERSITY

NOTE:
The following questions were asked in the instrument but were not discussed in the dissertation. However, the means and frequencies are filled in the appropriate blanks. The underlined and bold figures are means and frequencies respectively.

1. How many years have you taught/worked at ISU? 16.2 years

2. What is the average size of your class/presentation(s)?
   13.8 Graduate 42.7 Undergraduate 59.6 Other

3. What type of setting do you teach/give presentation(s)?
   45 Formal 14 Nonformal 113 Both

4. Please indicate your normal teaching/presentation load per semester
   3.1 Cr 1.2 Course(s) Graduate
   3.8 Cr 1.6 Course(s) Undergraduate
   15.8 Number of Extension presentation(s)
   3.8 Number of Research presentation(s)

5. Have you taught off-campus course(s) in the last five years?
   79 Yes 103 No

6. Have you taught course(s) via television/video in the last five years?
   48 Yes 134 No

7. What was your first experience in teaching?
   28 Elementary/high school teacher
   98 Graduate assistant, college level
   45 Assistant/associate or full professor
   11 Other (please specify) _______________________

8. Do you hold or have you held a teaching certificate?
   26 Yes 156 No If yes, please indicate
   Level: HIGH SCHOOL Subject: DIFFERENT SUBJECTS
9. What educational training in instructional methods did you have when you began teaching? Please check all that apply.

- None: 102
- University coursework: 50
- Workshops: 41
- Teacher education program: 30
- Other (please specify): 5

10. How many conference(s), seminar(s), and/or presentation(s) pertaining to instruction do you attend in a year?

- One: 60
- Two: 48
- Three/more: 21
- None: 52

11. The following services/facilities are available around the campus. Do you know about them? Please answer all that apply.

- Computer short courses: 162 (Yes: 17, No: 17)
- Electronic mail: 152 (Yes: 25, No: 25)
- Satellite link: 149 (Yes: 28, No: 28)
- Telephone answering service: 156 (Yes: 22, No: 22)
- Fax (Fax machine): 142 (Yes: 33, No: 33)

12. How much experience have you had in using a personal computer?

- Much: 84
- Some: 58
- Little: 27
- None: 12

13. Do you have personal computer in the office? 138 Yes, 43 No

14. What type of computer/terminal do you use in your office?

- Mainframe/terminal: 43
- Miniframe/terminal: 9
- Personal: 135
- None: 23

15. Do you own a computer for home? 100 Yes, 81 No

- If so, what type are you using?
  - IBM/compatible: 43
  - Apple II: 28
  - Macintosh: 14
  - Other: 15

16. How many years experience do you have in using computer(s)? 8.7 years

17. How much formal instruction on using computer(s) have you received?

- Much: 10
- Some: 59
- Little: 52
- None: 60

18. Have you used online literature search to prepare for a class/presentation(s)? 50 Yes, 129 No

19. Do you use computer(s) for a class? 122 Yes, 59 No

- If so, for what purpose(s). Please check all that apply.
  - Word processing: 96
  - Spreadsheet and/or grading: 62
  - Communication and/or mail: 27
  - Graphics and/or audio-visual aids: 85
20. Have you used facsimile (fax machine)? 87 Yes 94 No

21. Have you modified your teaching strategy to utilize instructional technology within last 5 years? 126 Yes 50 No
   If yes, what was/were the reason(s). Please check all that apply.
   97 Effectiveness 57 Motivation
   83 Interest 78 Efficiency
   15 Other (please specify) ________________

22. What area(s) do you see as beneficial to improve your preparation for class? Please check all that apply.
   52 Theory of learning 107 Instructional technology
   94 Teaching methods 45 Educational psychology
   59 Curriculum development 84 Planning and evaluation
   10 Other (please specify) ________________

23. How do you improve your teaching? Please check all that apply.
   117 Attend seminar(s)/conference(s)
   97 Read articles about teaching
   155 Utilize student/audience evaluation
   107 Seek advice from a fellow faculty member
   12 Other (please specify) ________________

24. Do you use student/audience evaluation? 171 Yes 8 No

25. Do you think student/audience evaluation can be used to improve teaching? 168 Yes 8 No

26. What assistance do you get in preparing materials for class? Please check all that apply.
   140 Secretary 27 Research assistant
   171 Yourself 47 Teaching assistant
   18 Other (please specify) ________________

27. If you decide to use new technology, what problem(s) do you think you will face? Please check all that apply.
   106 Financial 107 Training
   143 Time 9 Other (please specify) _________