



Selected instructional strategies, learner outcome, and attitudes of adult learners in a mandatory education setting
by Barbara Ann White

A thesis submitted in partial fulfillment of the requirements for the degree of Doctor of Education
Montana State University
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Abstract:

The primary purpose of the study was an investigation of the teaching-learning transaction by determining the effect of selected instructional strategies on learning outcome of adults enrolled in a legislatively mandated pesticide recertification program. Attitudes and selected personal descriptors which might affect learning outcome were also examined.

The population for the study was 654 private pesticide applicators applying for relicensing. Ranging in age from 16 to 83, the pesticide applicators represented District V of the Montana Pesticide Recertification Program, encompassing 11 counties.

The recertification program was comprised of a six-hour block of instruction which included seven criteria deemed necessary in order to be licensed to purchase and apply restricted-use compounds. The fifth criteria, Pesticide Safety, served as the subject matter content for the development of the instructional strategies identified as lecture, representing a pedagogical methodology, and small group discussion, representing an andragogical methodology. Upon conclusion of the safety instruction, participants were asked to complete three data collection instruments, which included a measure of learning outcome, an attitudinal scale, and a general information questionnaire ascertaining personal descriptors.

Sixty-seven percent of the participants would have participated voluntarily had the program not been legislatively mandated; 45% indicated their agreement in favor of a legislatively mandated program. Ninety-four percent of the participants were favorable to the strategy they received while 80% indicated their prior experience did not eliminate the need for the safety information. Significant differences were found to exist for the independent variable of instructional strategy, with mean scores on learning outcome higher for the group receiving the lecture strategy. The group having completed an education level of 13 to 16 years demonstrated a significantly higher score on learning outcome. In addition, learning outcome was significantly related to the two attitude variables. Attitude toward instructional strategy received accounted for 58% of the variance in learning outcome.

Service providers of one-time, mandated educational activities need to consider the learning environment, attitudes of the learner, and personal descriptors, especially age and level of education, when selecting instructional strategies. Experience of the learner should also be considered as an important variable.

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OUTCOME, AND ATTITUDES OF ADULT LEARNERS
IN A MANDATORY EDUCATION SETTING

by

Barbara Ann White

A thesis submitted in partial fulfillment
of the requirements for the degree

of

Doctor of Education

MONTANA STATE UNIVERSITY
Bozeman, Montana

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of a thesis submitted by

Barbara Ann White

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ABSTRACT

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CHAPTER 1

INTRODUCTION

Background

Subtle but significant changes in the sequence of major transitions in people's lives are responsible for the increasing numbers of adults engaged in some form of learning experience. Aslanian and Brickell (1980) cite life changes -- past, present, and future -- as reasons to learn. Cross (1981) identifies the effects of technology, social and economic changes, political developments, and the increasing amount of available information as impetus for adults to seek out and participate in learning opportunities of all types. A specific issue of concern originating from social and political pressures, identified as mandatory education, has influenced the need for licensing, certified-licensing, recertification, and continuing education via short-term and/or one-time educational activities. Furthermore, legislatively mandated educational programs, such as pesticide applicator recertification, require participation and, in some instances, examination prior to the issuance of a license. To accommodate for such a variety of existing needs, organizations fostering the education of adults are considered to be providers of formal and nonformal educational activities as well as managers of a system of learning resources.

Numerous organizations providing education for adults realize that very few adult education enterprises in the United States are independent. Rather, program offerings are usually a part of, and often subordinate to, some larger enterprise. The adult education programs offered at the county level by the Montana State University Extension Service, for example, are an integral part of a county, state, and federal partnership with expectations at all levels for changes in behavior, evaluation, and accountability. In more specific terms, education is the primary mission of the Cooperative Extension Service (CES). As stated in Extension in the '80's (United States Department of Agriculture/National Association of State Universities and Land Grant Colleges [USDA/NASULGC], 1983, p. 2), the mission is "to improve agriculture and strengthen American families and communities through the dissemination and application of research-generated knowledge and leadership techniques." To carry out this mission, the CES is designed as an educational resource for the people of the United States for extending research results and advances in technology. Critical to the CES plan of action is an aggressive information and communications program, targeted toward specific needs and concerns, including:

- (1) The improvement of the internal and external visibility of the agency and its educational programs, and
- (2) The organization serving as a catalyst and focal point for the development and adoption of new communication technologies and alternatives to serve as delivery methods (USDA/NASULGC, 1983).

Of critical concern to the Extension Service is that all partners in the system seek to enhance the educational mission of the organization by implementing appropriate strategies and technologies with those partners in the system including educators of adults. Individuals dealing with adult populations are, therefore, confronted with the need for a decision-making process designed to: (a) identify program need at the county level, (b) develop program instruction to meet that need at both the county and state levels, and (c) implement evaluation and accountability at county, state, and federal levels.

Within the Cooperative Extension Service organizational structure, it is the adult educator's responsibility to design and/or develop the learning experience in a manner that is appropriate for acquiring the needed information, knowledge, or skills. Personnel, however, are faced with a dilemma not uncommon to many educators of adults: that of being unprepared for designing learning experiences appropriate for meeting adult learner needs and objectives. Therefore, careful evaluation of the target audience, educational need, purpose of learning experience, subject-matter content, and learning is critical. In addition, characteristics identifying diverse learner participation such as mandatory attendance, one-time exposure to the educational activity, political involvement, or previous experience provide pressure for the adult educator to develop strategies and methodologies appropriate for meeting learner needs. It is important, then, that organizations as providers of adult education consider learner attitudes toward the learning environment, motivating factors toward participation, and personal descriptors such as the current

developmental stage, education level, and lifestyle commitment. Awareness of such factors may contribute significantly to the decision-making process by educators as they design, develop, manage, and implement instructional strategies for the adult learner.

In addition to learner diversity, considerations allowing for the effectiveness of the teaching-learning transaction are also of concern to the educator of adults. An understanding of the conceptual assumptions of the andragogical and pedagogical models of learning suggest that the adult educator must be cognizant of the part each model plays in the overall educative process. Special attention must be directed toward the initial assumption underlying both andragogy and pedagogy:

Andragogy is a normal aspect of the process of maturation for a person to move from dependency toward increasing self-directedness, at different rates and in different dimensions of life (Knowles, 1980, p. 43).

In comparison, Knowles also describes the initial assumption relevant to pedagogy as follows:

The role of the learner is, by definition, a dependent one. The teacher is expected by society to take full responsibility for determining what is to be learned, when it is to be learned, and if it has been learned (Knowles, 1980, p. 43).

Traditionally, the function of the teacher or educator has been to teach and the student's role has been a relatively passive one. The approach, believed to result in a degree of passivity by the student, is in conflict with the humanistic philosophy imparted in andragogy, whereby the teacher takes on the role of facilitator, technician,

resource person, co-inquirer, or catalyst, rather than an expert in the dissemination of information (Knowles, 1980).

The implementation of andragogy, as an instructional methodology, into the adult education process suggests that it is important for the educator to remember that each group of learners is unique and that each individual in the group is unique. A procedure or strategy suitable for one group of learners may be inappropriate for another group. Educators of adults must be sensitive to the fact that they are working with a wide variety of people, that strategies are important, and that the appropriate selection and use of instructional strategies can mean the difference between ineffective adult education and education that: (a) actively involves the learner, (b) stimulates the learner to seek more knowledge, and (c) achieves the specific goals for which the strategy was designed.

Research related to the design and delivery of instruction has established a knowledge-base that provides movement toward the investigation of instructional practices (Gage & Berliner, 1979; Gagne', 1977). "The instructional system is viewed as composed of various interrelated components functioning together to achieve a purpose" (Hannum & Briggs, 1982, p. 9). A specific component of the instructional system is identified as Instructional Strategies and Media, with the decision regarding how the instruction will be conducted based upon evidence related to the effectiveness of various methods and media. Emphasis is placed upon the selection and use of instructional strategies appropriate to the learning tasks and characteristics of the learners, within the constraints of the

situation, reinforcing the idea that there is no one best medium or strategy for all instruction. Rather, decisions relevant to the selection of the instructional strategy should be based upon consideration of the nature of the objective to be met, characteristics of the students, and empirical evidence about the effectiveness of the strategy for the type of learning involved and the type of student (Cronbach & Snow, 1977).

Statement of the Problem

The primary purpose of the study was to investigate the teaching-learning transaction by determining the effect of selected instructional strategies on learning outcome of adults enrolled in a legislatively mandated pesticide recertification program. Secondary to the major purpose was the investigation of factors which might affect learning outcome, specifically, attitude toward mandatory pesticide education, attitude toward the instructional strategy received, and the personal descriptors of age, level of education completed, and year in recertification program.

Given the diversity of adult learners, the conceptual framework of andragogy and pedagogy characterized as methods of instruction, and the nature of a legislatively mandated pesticide education program, the problem of this study was three-fold:

- (1) To determine if a difference exists in learning outcome between two groups of participants receiving educational information by lecture or small group discussion while both are enrolled in a legislatively mandated program.

- (2) To determine if the independent variables of attitude and personal descriptors (age, level of education completed, and years in recertification program) interact with instructional strategy received on learning outcome.
- (3) To determine if a relationship exists between learning outcome and:
 - (a) instructional strategy;
 - (b) attitude toward mandatory pesticide education;
 - (c) attitude toward instructional strategy received; and
 - (d) the personal descriptors of age, level of education completed, and years in pesticide recertification program.

Significance of the Study

Findings from the study contribute to several broad educational areas. The first four contributions are relevant to the knowledge-base in the field of adult education, while the last three relate to the practice of educating adults. The first contribution is the strengthening of the assumptions underlying pedagogy and andragogy as models of learning appropriate for both children and adults. Until the early part of the 1980's, a large part of the literature in the field of adult education advocated the selection of one specific model of assumptions, coined "andragogy," to be used as the conceptual framework for teaching adults. The model advocated a collaborative, facilitative

mode of instruction. The alternative, presented as a dichotomy in the literature, was pedagogy, a teacher-centered approach traditionally used as a methodology for teaching children. However, in the late 1970's, Knowles recanted andragogy's exclusive application for adults, suggesting that the implementation of andragogy and pedagogy should be contextually determined. In 1980, viewing andragogy as one instructional methodology, Knowles redefines the implementation of the model, suggesting that andragogy is:

. . . simply another model of assumptions about learners to be used alongside the pedagogical model of assumptions, thereby providing two alternative models for testing out the assumptions as to their 'fit' with particular situations (1980, p. 43).

Lindsay (1984) suggests that there are similarities and differences between pedagogical and andragogical practice and that recommendations also exist within andragogical practice which, upon testing, will need modification if not abandonment. Additional research is needed, therefore, to explore these indicators further, to determine what strategies and "repertoires" -- of thought as well as action -- teachers of adults use. Lindsay (1984, p. 5) suggests, "We still need to know how these strategies and repertoires interact with adult learner motivation and capabilities, in terms of both achievement and satisfaction with the learning experience." In the present study, the examination of instructional strategies representing andragogical and pedagogical perspectives contribute to the substantiation of the statement posed by Knowles relevant to the fit of the model to the learning situation. The findings help in the clarifying of the appropriateness of an instructional method by adult educators, based on

an understanding of the rural adult learner, the context in which the learning takes place, the learning environment, and the attitude toward the instructional strategy received.

Since few recent studies have directed efforts to the rural learner's educational needs or their focus on learning activities (McCannon, 1983), a second contribution of the study is the addition of demographic and attitudinal data relevant to the rural learner. Currently, designers of rural postsecondary education programs are limited by a dearth of information about rural adults' educational interests, characteristics, motivations, and participation patterns, as little attention has been paid to the educational needs of rural adults beyond the emphasis on illiteracy in the 1970's (Treadway, 1984). In addition, Dubin (1972) has cited a 35-year information gap in the understanding of learning by adults, learning that occurs between the ages of 30 and 65. The present study contributes needed data relevant to location of residence, accessibility of educational offerings, age, and years of formal education. These data can help to provide additional information for establishing a profile of the rural learner in a mandatory educational setting.

A third contribution is found in the addition of data relevant to rural learner attitudes toward education, specifically mandatory education. Adolph and Whaley (1967, p. 152) suggest:

An individual's favorable or unfavorable attitudes toward the idea of adult education may in part aid him in making decisions to support or reject adult education programs. It is of interest then for professional adult educators to investigate the attitudes toward adult education of various social groupings as partial indication of support for adult education programs.

With minimal research into the area of mandatory education and governing policies, the findings of the study contribute to the decision-making process by the governing agency, administration, and the adult educator. This study is the first attempt in the history of the legislatively mandated Montana Pesticide Recertification Program to ascertain private applicator attitude toward the mandated program. In addition, information can be provided to the Montana legislature for use in identifying the future need, attitude, and success of legislatively mandated programs.

A fourth benefit of the study is to the service provider, identified as the Montana State University Extension Service. If administrators are to add dollars for developing new techniques, methods, and skills in order to provide a meaningful educational experience, research is continually needed to identify those instructional strategies which are most appropriate for the learning situation. Data from the present study identify indices of the effectiveness of selected instructional strategies vis-a-vis learning outcome, as well as attitudes toward the instructional strategy received.

A fifth contribution of the study relates to the area of instructional development, with specific attention to using a systems design model for the design of the educational activity. The use of a systems model provides the opportunity to investigate the teaching-learning transaction by observing the effectiveness of the model based on an identified sequence of steps (i.e., identification of goal; objectives, learner characteristics, and so on). Traditionally, instruction has

been designed based on subject matter content or test items to be administered, rather than on an identified educational goal and stated objectives. Also, a continued criticism in the instructional development literature relates to the lack of empirical research investigating the effectiveness of existing instructional models as compared with the often practiced mode of simply initiating a new model. This study's implementation of an existing systems model adds to existing data.

General Questions to Be Answered

Given a legislatively mandated pesticide recertification program, this study sought to answer seven major questions. The order of the questions is based on the presentation of the findings, as noted in Chapter 4.

- (1) What is the attitude of rural adult learners toward a legislatively mandated educational program?
- (2) What is the attitude of rural adult learners toward the instructional strategy received?
- (3) Do the variables of attitude and personal descriptors (age, level of education completed, and years in recertification program) of the rural adult learner interact with learning outcome and instructional strategy implemented?
- (4) Does the instructional strategy implemented make a difference in learning outcome of participants?
- (5) Do relationships exist between the learning outcome of adults enrolled in a mandatory program and the

independent variables of instructional strategy, attitudes of the participants, and personal descriptors of the learner?

- (6) Do inter-correlation(s) exist among the independent variables of instructional strategy, attitude, and personal descriptors?
- (7) What is the relative contribution of instructional strategy, attitude, and the personal descriptors to the variance in the dependent variable of learning outcome?

General Procedures

The researcher made contact with the Associate Director for the Montana State University Extension Service, seeking permission to conduct the study with the assistance of the Montana county extension agents. Upon receiving approval, names of county agent personnel, designated as providers of the 1987 District V pesticide recertification program, were obtained. An informal discussion of the study and the researcher's request for assistance from county personnel were presented during the District V pesticide recertification agent training session in December 1986. In addition, a tentative schedule of counties providing pesticide recertification programs during 1987 was obtained.

Formal contact by the researcher with personnel from each of the counties providing recertification programs was made by letter during January 1987 (Appendix A). Implementation of the instructional program, identified as pesticide safety, was included in each of the

six-hour pesticide recertification programs held during the months of February, March, and April of 1987. The data needed for the study were collected upon completion of the portion of the instructional program relevant to pesticide safety.

Limitations and Delimitations

Limitations of the study, identified as the restriction to a particular number or factor, and delimitations of the study, noted as the setting of limits, are listed below. The limitations include numbered items one through four; the delimitations include numbered items five and six.

- (1) County sites involved in the pesticide recertification program delivery were assigned a selected instructional strategy by the researcher, identified as lecture or small group discussion, as compared to providing the participants with a strategy of choice. Available county facilities restricted the number of small groups that could be accommodated in the small group discussion format.
- (2) All subjects comprising the population were asked to participate voluntarily in the study; some subjects may have chosen not to participate, thus limiting the use of the entire population applying for recertification.
- (3) An instrument for measuring learning outcome specifically relevant to the Pesticide Safety criteria was not available. The researcher was, therefore, limited to

questions measuring learning outcome extracted from the original Montana Private Applicator Recertification Examination.

- (4) Although consistency in format and content was built into the instructional design and instructional strategy using a systems design model, personality characteristics of the individuals delivering and participating in the dissemination process may have varied.
- (5) The study has as its only focus the pesticide recertification program in District V of the state of Montana.
- (6) The study was delimited to only those applicators applying for relicensure in Montana during the months of February, March, and April of 1987.

Definition of Terms

For the purpose of this study, the following terms are defined:

- (1) Adult Education -- A set of organized activities carried on by a wide variety of institutions for the accomplishment of specific educational objectives.

[It is] a process that is used by adults for their self development, both alone and with others, and it is used by institutions of all kinds for the growth and development of their employees, members, and clients. It is an educational process that is often used in combination with production processes, political processes, or service processes (Knowles, 1980, p. 25).

- (2) Andragogy -- A model of assumptions about learners identifying the concept of the learner as a self

directing one, the role of the learner's experience as cumulative, readiness to learn based on a need to learn, and an orientation to learning as one of immediate application. Andragogy represents a body of theory and practice on which self-directed learning is based.

- (3) Attitude Toward Mandatory Pesticide Education-Instructional Strategy Scale (AMPE-ISS) -- An 11-item questionnaire designed to identify, by Likert scale format, applicator attitude toward a mandatory pesticide education program and attitude toward instructional strategy received. Questions numbered 3 and 10 were designed to identify attitude toward mandatory pesticide education. Questions numbered 1, 2, 4, 5, 6, 7, 8, 9, and 11 were designed to identify attitude toward instructional strategy received.
- (4) Case Study Format -- A variation of small group discussion; a learning discussion beginning with consideration of a specific problem or "case" about which group members exchange perceptions, ideas, and possible solutions (Brilhart, 1982).
- (5) Certified Applicator -- Identifies any individual who is licensed and certified or issued a special-use permit to use or supervise the use of any restricted-use pesticide covered by his/her certification (Montana Pesticide Act of 1986).

- (6) Continuing Education -- Formalized learning experiences or sequences designed to enlarge the knowledge or skills of practitioners. These experiences "tend to be more specific, of generally shorter duration, and may result in certificates of completion or specialization, but not in formal degrees" (Rizzuto, 1982, p. 38).
- (7) Cooperative Extension Service -- A system which illustrates a way in which society, through the national and state governments, has established relationships with the interests of individuals in local communities. The national agricultural extension system represents one of the largest nonprofit adult education organizations in the United States, with the education of America's families its primary mission.
- (8) General Information Questionnaire -- Operationally defined as an instrument designed to secure descriptive information about private pesticide applicators including: age, level of education completed, years in recertification program, years in county residence, and applicator status.
- (9) Instructional Design -- The entire process of analysis of learning needs and goals and the development of a delivery system to meet the needs; includes development of instructional materials and activities, and tryout and revision of all instructional and learner assessment activities (Briggs, 1977).

- (10) Instructional Strategy -- A teaching method; a vehicle or technique for instructor-student communication, described by four categories: instructor-centered, interactive, individualized, and experiential (Weston & Cranton, 1986).
- (11) Lecture -- "A discourse given before an audience or class" (Penrose, 1981, p. 12); "a carefully prepared oral and formal presentation by a qualified speaker" with the purpose being the presentation of factual information in a direct and logical manner (Cooper, 1982, p. 39).
- (12) Licensure -- Defined by Bratton and Hildebrand (1980, p. 22) as:
- a mandatory legal requirement for certain professions in order to protect the public from incompetent practitioners. Licensing procedures are established or implemented by a political governing body that prescribes practice without a license.
- The recipient of the credential is the individual, not a program.
- (13) Mandatory Adult Education -- Education which is mandated by: (a) direct regulation in state licensure laws, (b) indirect regulation through professional membership, employment requirements, and specialized certificates, and (c) informal social sanctions (Rockhill, 1983).

- (14) Mandatory Continuing Education -- The adoption of relicensure or recertification requirements by many professional and trade associations (Long, 1983); considered to be more important for establishing general professional standards that will protect the health, safety, and welfare of the public.
- (15) Montana Pesticide Recertification Program -- An educational program based on the Federal Insecticide, Fungicide and Rodenticide Act of 1947, amended by Congress in 1972, requiring licensure of applicators who use restricted-use pesticides.
- (16) Pedagogy -- A model of assumptions about learners identifying the concept of the learner as a dependent one, the role of the learner's experience as of little worth, readiness to learn organized into a standardized curriculum, and orientation to learn as subject-centered. Pedagogy represents the body of theory and practice on which teacher-directed learning is based.
- (17) Pesticide Recertification Exam: Safety (PRES) -- Operationally defined as a 20-item, forced-choice test relevant to the criteria of Pesticide Safety, identified as Protective Clothing and Protective Equipment. The test is designed to measure the knowledge-base deemed necessary by the Environmental Protection Agency and the Montana Pesticide Task Force in the safe use of restricted-use compounds.

- (18) Practical Knowledge -- The possession of pertinent facts and the ability to use them in dealing with specific problems and situations (Montana Pesticide Act of 1986).
- (19) Private Applicator (Farm/Ranch Applicator) -- A farmer or rancher who applies or supervises the application of restricted pesticide(s) for the production of agricultural commodities on property owned or rented or as an exchange of services on another private applicator's property. Private applicators must be relicensed every five years by acquiring additional hours of training or by written examination.
- (20) Rural -- A residence on a farm, in open countryside, or in areas of fewer than 2500 residents; also includes individuals living in areas of extended cities with population density of less than 1000 persons per square mile (CRESS-NOTES, 1983/1984).
- (21) Small Group Discussion -- A small group of persons talking to each other face-to-face in order to achieve a goal, such as increased understanding or a solution to a shared problem (Brilhart, 1982).
- (22) System -- "An integrated plan of operation of all components (sub-systems) of a system, designed to solve a problem or meet a need" (Briggs, 1977, p. 6).

CHAPTER 2

REVIEW OF LITERATURE

The primary purpose of this study was the investigation of the teaching-learning transaction followed by the determination of factors which might affect learning outcome in a mandatory setting. The review of literature chapter includes four major areas central to the purpose of the study: (a) an overview of service providers of adult education, with specific attention to the national Cooperative Extension Service; (b) mandatory or compulsory adult education with attention directed toward governmental and/or legislatively mandated licensing programs; (c) assumptions underlying conceptual models of learning, identified as andragogy and pedagogy, with emphasis directed toward the models as methods of instruction; and (d) instructional design literature as it relates to the teaching-learning transaction. Special attention is directed toward systems design and the selected instructional strategies of lecture and small group discussion.

Providers of Adult Education

While the comparability of figures regarding numbers of adults participating in learning activities differs from survey to survey, the fact that the United States is becoming a nation of adults is apparent. Cross (1981) suggests that by the year 2000, the largest age group will be 30 to 44 years old with a rising curve for adults 45 to 64 years of

age. For those adults, the learning process can be defined by a variety of formats, as noted by Tough (1971), including deliberate efforts to acquire knowledge or a skill. As an example of the increase, Darkenwald and Merriam (1982) cite a national survey conducted by the Educational Testing Service which suggests that in 1972, one out of every three adults between the ages of 18 and 60 participated in some form of adult education, including self-education.

Research relevant to participation suggests that adult education is the most rapidly growing segment in all education, increasing by 17% between 1978 and 1981 (Cross & McCartan, 1984). The National Center for Education Statistics (1982) estimates that in 1981, 21 million adults participated in some organized educational activity, with nearly six million, or 28%, living in rural areas. The increase in the number of adults in the population accounts for nearly half of the growth, while the remaining half is attributed to the increased need and desire of adults to learn. The need for lifelong learning was identified as stemming from technological and social changes in addition to occupational obsolescence and the needs of special interest groups. Institutions identified as business and industry, labor and professional organizations, governmental agencies, and community organizations provided 46% of all courses taken by adults in 1981 (Cross & McCartan, 1984).

Darkenwald and Merriam (1982) describe environments of adult learning and education with particular attention to institutions and organizations providing educational opportunities for adults. Types of learning environments are described as highly informal to highly formal

with the connotation of informality representing "any purposeful, systematic, and sustained learning activity that is not sponsored, planned, or directed by an organization" (p. 152). Four categories used by the authors as an organizing framework for the overview of adult education organizations are noted in Table 1.

Table 1. Categories as an organizing framework for overview of adult education organizations.

Agency Type	Categories
Educational	Public school adult education Community college Four-year colleges and universities Cooperative Extension Service
Non-Educational	Business and industry Government agencies Armed forces Unions Correctional institutions Hospitals Trade associations Chambers of Commerce
Quasi-Educational	Cultural organizations Community organizations Occupational organizations
Independent Organizations	Community-based agencies Proprietary schools External degree agencies

Also important to the field of adult education are those organizations nurturing and giving direction, in addition to the defining of the adult educator role based on the organizational climate. Categorization of organizations has been considered based upon who benefits from the activities. One example originates from Blau and Scott's

(1962) cui bono typology which yields a modified version of categories pertinent to the distinctive clienteles in adult education, including: (a) general public or some portion of it; (b) employees (including volunteers); (c) members; and (d) clients, patients, or customers. Darkenwald and Merriam (1982) note the crudeness of the modified typology, but identify the value of such categories in the way they correspond to major types of provider organizations (e.g., schools and colleges, business and industry, professional associations). As a part of both adult education theory and practice, knowledge of clientele categories provides an avenue for the identification of characteristics, which can ultimately play a role in defining goals and methods of adult education, as well as the resulting program development process. A problem that does exist, however, is that many adult education organizations will fall into more than one category. Distinctions between formal and informal education, teacher-centered or learner-centered approaches, and training or performance-oriented adult education become confusing. However, Knowles (1964) and Houle (1969) suggest the possibility of a broad classification schema, with the education of adults playing a primary, secondary, or sole function within the organization. The national Cooperative Extension Service, as an example, serves as an educational organization, with its sole mission the dissemination of research-based educational information to the general public, with specific attention to the broad program areas of agriculture, home economics, community development, and youth. A discussion of the rural learner and the Cooperative Extension Service

follows since the learner category and organization play a critical role in the context of the current study.

Adult Education and the Rural Learner

The Rural Scene in the United States

The geographic rural areas in the United States are engaged in a process of change. Although distinguishable by a direct economic dependence on resources of the land, an immediate relationship between the social and the natural environment, low population density per square mile, and the presence of small, closely knit communities, changes are apparent. The continental countryside contains more than 16,000 towns of 15,000 or less population where more than 70 million people live (McCannon, 1985). However, Treadway (1984) suggests that fewer than two million of the 22 million rural people who are gainfully employed labor in agriculture, forestry, or fisheries.

Dominant demographic and economic conditions are associated with being rural. Barker (1985) characterizes the rural United States by an agriculture tradition, sparse population, and isolation. Also noted are communities being long distances from goods and services, culturally homogeneous, and having minimal public transportation. There are usually fewer cultural attractions, limited public services, and less opportunity to attract federal and state funding for educational programming.

The urban to rural migration, in addition to the diversity of cultural and economic factors, has increased the awareness by the federal government of the educational needs of the rural adult,

including a concern for educational equity for rural citizens. Unemployment, advances in technology, recertification requirements, career changes, and the continually growing knowledge base prevalent in a changing society provide a very real need for rural adult learners to continue their education.

The rural learner in an agriculture setting. In 1974, the National Advisory Council on Adult Education suggested that the outlook for the occupational group identified as "agriculture" was declining. Specifically, it was noted that farm work as an occupation would decline by 48% between 1972 and 1985. These figures substantiate the projected decrease in agriculture as an occupation from 37.5% in 1900 to 3.6% in 1973. However, the mechanization of agriculture, improvements in communications and transportation systems, industrialization, and the growing demand for research development, scientific and technical experience, and ecological development have changed the face of the farmer and rancher. Rural adults are therefore turning increasingly to educational providers as a means of accommodating for needed change in their lives.

Added to the noted societal changes and expectations is the consideration of motivation behind the need for learning. Houle (1961) identifies adult learners as having three types of orientation to learning: goal-oriented with an emphasis on accomplishing fairly clear-cut objectives; activity-oriented, identified as individuals who take part for reasons other than content; and learning-oriented, those who seek knowledge for its own sake. Other researchers (Cross, 1981;

Knowles, 1980) suggest that adults enter learning situations with a particular focus in order to meet an immediate need.

Recent isolated studies in the literature propose the notion that in the past, rural adult learners have selected learning activities for reasons of personal development rather than for vocational advancement. Again, however, with the increased need for certification and licensing, mandated continuing education requirements have been on the rise for various occupations, including agriculture. Treadway (1984) suggests that motivation to pursue learning is driven by real-life needs. The resultant continuing education and training after a person's first formal round of learning, therefore, is taking place at more and more junctures in a person's lifetime.

Residents of rural communities are also described by Treadway (1984) as being older, having fewer years of formal education, and having a tendency to be more alike than are people in large cities. With the number of farmers/ranchers declining, the farm population is left with a highly skewed age distribution. Persons over the age of 45 are therefore a steadily increasing portion of the total. The median age of farm operators in the United States rose from 43 years in 1920 to 50 in 1960 (Hathaway, 1965). Treadway (1984) further emphasizes the age factor of rural adults by noting that in non-metropolitan areas, 38% of the population is over 44 years of age.

Another factor relevant to a description of rural learners is the level of education completed. The occupational schooling medians, presented by the National Advisory Council on Adult Education (1974), indicates the median years of schooling completed for farm occupations

was 10.7 years in 1973. Those employed in farm occupations with 12 years of schooling or more comprised just over 40% of the total number employed in agriculture. The National Center for Education Statistics (1982) reported that in 1981 nearly six million adults, participating in some form of adult education, were from the rural United States.

Cooperative Extension Service

In the early 1800's, acts designed to further establish a relationship on the part of the federal government to the cause of education were enacted. The impetus that followed to establish centers of learning for the non-professional classes contributed to the enactment of the Morrill Land-Grant Act of 1862, providing the majority of states with potential legislation for land-grant institutions. Expansion of the legislation continued with the Hatch Experiment Act of 1887, followed by other legislation supplementing the Hatch Act and adding resources for teaching. Subsequent legislation, identified as the Smith-Lever Act, became the legal basis for the national cooperative extension system "and provided the most massive program of adult education the world has ever seen" (Burlingame & Bell, 1984, p. 34).

Characteristics of the Cooperative Extension Service. The characteristics of the Cooperative Extension Service are defined by the report of the joint United States Department of Agriculture/National Association of State Universities and Land-Grant Colleges (USDA-NASULGC) Extension Committee on Cooperative Extension (1968) as:

- (1) It is educational in program content and methodology, not regulatory or financial; thus, is administratively

attached directly to the public university system and is a major part of it, rather than being attached directly to state government.

- (2) It provides informal, non-credit education conducted primarily beyond the formal classroom, and for all ages.
- (3) It helps people solve problems and take advantage of opportunities through education.
- (4) It features the objective presentation and analysis of factual information for decision-making by the people themselves. It is typically research-based with free flow of communication among research, extension, and resident teaching functions of the state university system, and also with the resources of the United States Department of Agriculture and other agencies, public and private.
- (5) It functions through local offices, which are semi-autonomous units accessible to and subject to influence by local residents.
- (6) It involves cooperative but not necessarily equal sharing of financial support among federal, state, and county or local levels.
- (7) It requires cooperative but not necessarily equal sharing of program development among federal, state, and county or local levels.
- (8) It is practical, problem-centered, and situation-based. Extension education starts with helping people to

identify and understand their needs and problems and to use new technology or information in solving them.

- (9) The funding and administrative relationships permit educational programs directed at broad national purposes, yet serving specific local needs with priorities determined locally.
- (10) It is a professional function staffed by college trained personnel specifically qualified for their positions.

Program development. Program development within the Cooperative Extension Service is designed as a process of planning, implementing, and evaluating an educational effort and consists of a series of deliberate, thoughtful considerations that lead to a prepared and well-executed plan of action. Prawl, Medlin, and Gross (1984) identify four basic points which serve as a guide in the program development process, including: (a) expressed needs of people, (b) analysis of environment and other conditions of society, (c) emerging research results, and (d) administrative response to recommendations and pressures of Cooperative Extension support groups.

Historically, the Cooperative Extension Service has been organized into four major program areas: (a) agriculture and natural resources, (b) home economics, (c) 4-H youth development, and (d) community resource development. With regard to agricultural and natural resource programs, the Extension Service and its personnel extend into a variety of agriculture areas ranging from conducting experimental trials on farmers' and ranchers' fields to interpreting facts on public policy issues affecting agriculture. Reviewing program priorities has become

an essential component of the program development process with the need for better cooperation and coordination with other United States Department of Agriculture agencies and agribusiness concerns essential.

Montana State University Extension Service

In 1893, when the Agricultural College was established, Montana was just beginning to consider itself an agricultural state. Although enrollment in the four-year academic program in agriculture was low, a brisk demand soon appeared for short courses of a practical nature. The Experiment Station activities, therefore, fit the immediate needs of rural Montana, with research on the many untouched problems confronting agriculture considered a necessity. To assist in answering questions from both the Farmer's Institute participants and those not in attendance, the Experiment Station began to publish bulletins. Personnel, finding themselves immersed in extension work, constantly looked for organizations which could assist in the educational efforts. With continued growth, including special agricultural trains, dry farm experiments, and the development of a series of Dry Farming Congresses, the demands for extension activities increased. After a number of years of continued educational work, the 1913 Montana Legislative Assembly approved a Department of Agricultural Extension at Montana State College, with the organization of an extension division largely a matter of turning over the resources that had been provided for the already functioning Farmers' Institute Office and changing the name to Extension Service. With the establishment of the Department of Agricultural Extension and the continued participation by the counties,

Montana was in an appropriate position to take full advantage of the national assistance legislated by the Congress of the United States in 1914.

Montana Pesticide Recertification Program

Extension education can play a vital role in the formation and implementation of agricultural policy. The task of the agricultural policymakers is described by Maunder (1972, p. 8) as:

. . . to determine the direction of growth of agriculture, to set goals for development, to devise means of achieving these goals, to evaluate progress periodically and to revise goals and programs when necessary. It is usually necessary also for policymakers to devise legislation required for the implementation of the policies which have been adopted.

Agricultural policy is formulated by government officials and touches upon the interests of all segments of the population. However, the execution of policy begins with changes in the attitudes and a redirection of action by the masses of primary producers, the farmers and ranchers. Without cooperation of the population, very little change will occur. Therefore, appropriately conducted extension programs can serve as a line of two-way communication between policymakers and the people of the state. Questions relevant to the needs of rural people, the effect a given policy will have upon the clientele welfare, how rural people will react to a particular policy, and what adjustments must be made to fit local situations are all answerable through the agricultural extension concept. The Montana Pesticides Act Administrative Rules of 1986, cooperatively administered and implemented by the Montana State University Extension Service and the

Montana Department of Agriculture, stands as an example of the roles played by agricultural extension and a legislative policymaking body. The resulting educational program, offered by the Extension Service, is an example of a legislatively mandated educational program formulated by a political governing body and offered by a non-profit, educational agency based in a land-grant system.

Prior to the mid-60's, state involvement with the use of pesticides was handled by the Montana Department of Health. In 1966, legislators began a dialogue relevant to the passage of a law comprised of several elements, including a procedure for the licensing of pesticide applicators. Although defeated in legislative committee in 1968, a special committee within the legislative council was created to study the potential for the development of a pesticide law. Basic components of the law were defined to: (a) revise the process for the registration of products; (b) create a licensing program for commercial and government applicators, including operators that worked under applicators; and (c) create a licensing program for dealers, with both areas (applicators and dealers) having to take an exam to qualify. In the law, the committee also indicated that standards could be established for applicators to maintain some sort of qualifications; however, this was only for commercial and government applicators. In terms of private pesticide applicators, identified as farmers and ranchers, the law empowered the Department of Health to restrict a compound and, by so doing, required any applicator handling that compound to meet some sort of qualification. The legislation was passed in 1970, based on active communication between the agriculture

community and legislators representing environmental concerns (Gingery, 1987).

The final version of the law was based on the American Association of Pesticide Control "model bill" in addition to state laws from across the states. Negotiation between the agriculture legislators and the legislators representing environmental interests were held, with both groups wanting the law. Emphasis was placed on the questions of: "What is licensing?" "Why should there be an exam?" and "What type of exam would be appropriate?" (Gingery, 1987). The need for individuals to have greater knowledge was assumed, with additional support from agriculture legislators who felt very strongly that for commercial and governmental applicators, advanced education was needed. However, within the discussions, the topic of how the educational information would be structured, other than the agencies to be involved, was missing (Gingery, 1987).

In the original legislative proposal, the Department of Health retained all the registration aspects; the Department of Agriculture was responsible for the licensing functions. When the bill was finally passed, the Department of Agriculture was assigned the responsibility of both the registration and the licensing functions (Gingery, 1987).

During the first year, 1971, the licensing program was developed for both commercial and government applicators. At the same time, Congress passed the amended Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), which required certification of applicators handling restricted-use pesticides. Prior to that point in time, the law was strictly a registration law with no licensing or certification

involved. The only education offered was that normally provided through county extension agents and a few of the agencies that wanted to be involved in the educational aspect.

In the mid-70's, when the Environmental Protection Agency (EPA) passed rules on certification for commercial, governmental, and farm/ranch applicators, plans for private applicator certification came into being. "Montana was either the first or second state to submit its approved certification program to EPA" (Gingery, 1987). The plan was approved and ultimately developed cooperatively between the Department of Agriculture and the Montana State University Extension Service. The educational program basically required people wanting to use restricted-use compounds to be certified by exam or by training. However, because a poor mechanism for maintaining qualification existed, representatives from the licensing agency and the educational provider began a series of meetings in the early 80's. These meetings culminated in a new system for certifying applicators (Gingery, 1987).

Not only was the process of certification reviewed, but the question of how quality was to be maintained was also considered. The process in 1984 was considered to be one of quality; however, a few legislators disagreed with the program and in 1985, modifications resulted in a reduction in the training requirements for private applicators. As a result, the Department of Agriculture and the Extension Service again met and altered the system to meet legislative requirements. For recertification, an applicator needed to attend six hours of training every five years as compared to the 1984 system of

mandatory attendance at three training programs in five years (Gingery, 1987).

The process involved in the issuance of a license is based on several steps. Initially, a qualification sheet or document is sent to the Extension Pesticide Specialist, which is then returned to the Department of Agriculture bearing the names of people that are requalifying in a particular district (Montana is composed of five pesticide districts). Based upon that listing, the Department sends applications directly to those individuals that have been in the system. The application(s) are then returned with the licensing fee. The credential, identified as a certificate, is then issued by the Department. For people who are not qualified, a list is sent to the county agent who then has the responsibility of contacting those applicators and indicating the months in which recertification training will be provided. Upon completion of the recertification program, the county agent signs the application form to indicate attendance and participation in the program. The license is then issued by the Department of Agriculture upon receipt of the agent's list.

Mandatory Education and the Adult Learner

Historically, adult education has been considered to be largely voluntary, and compulsory adult education a repulsive idea.

Forcing individuals to further their education . . . somewhat concealed in promotion considerations which require advanced degrees or certification . . . is antithetical to the ideals which the early American adult education movement cherished (Day, 1980, p. 5).

The concern is either for the individual learner or it is not; if it is, then the individual's right to a variety of quality learning opportunities -- programs, networks, institutions -- and especially to accept or reject any or all of these opportunities must be respected (Day, 1980). However, the notion that some of the educational activities within the lifelong learning process may also be the result of any number of societal pressures on the learner is becoming more apparent. Providing a basis for the often controversial issue of mandatory adult education, compulsory adult education, or forced adult learning is the pressure arising from consumer protection groups, professional associations, and licensing boards in an effort to accommodate for societal and occupational change. Although the purpose of the following literature review is not to debate the pros and cons of mandatory education, a brief discussion is appropriate since the context of the present study is set within the realm of a legislatively mandated educational program.

With the existence of a variety of interpretations relevant to the components of mandatory education, the researcher has provided a conceptual framework from which the literature review for the present study is structured (Figure 1). Specific attention is directed to the areas of licensure and the process of relicensure via mandatory continuing education within the context of a governmentally mandated educational setting.

Critical to an understanding of "mandatory" adult education is an interpretation of the context in which the term mandatory is used (that is, the adult education environment), as the concept represents a wide

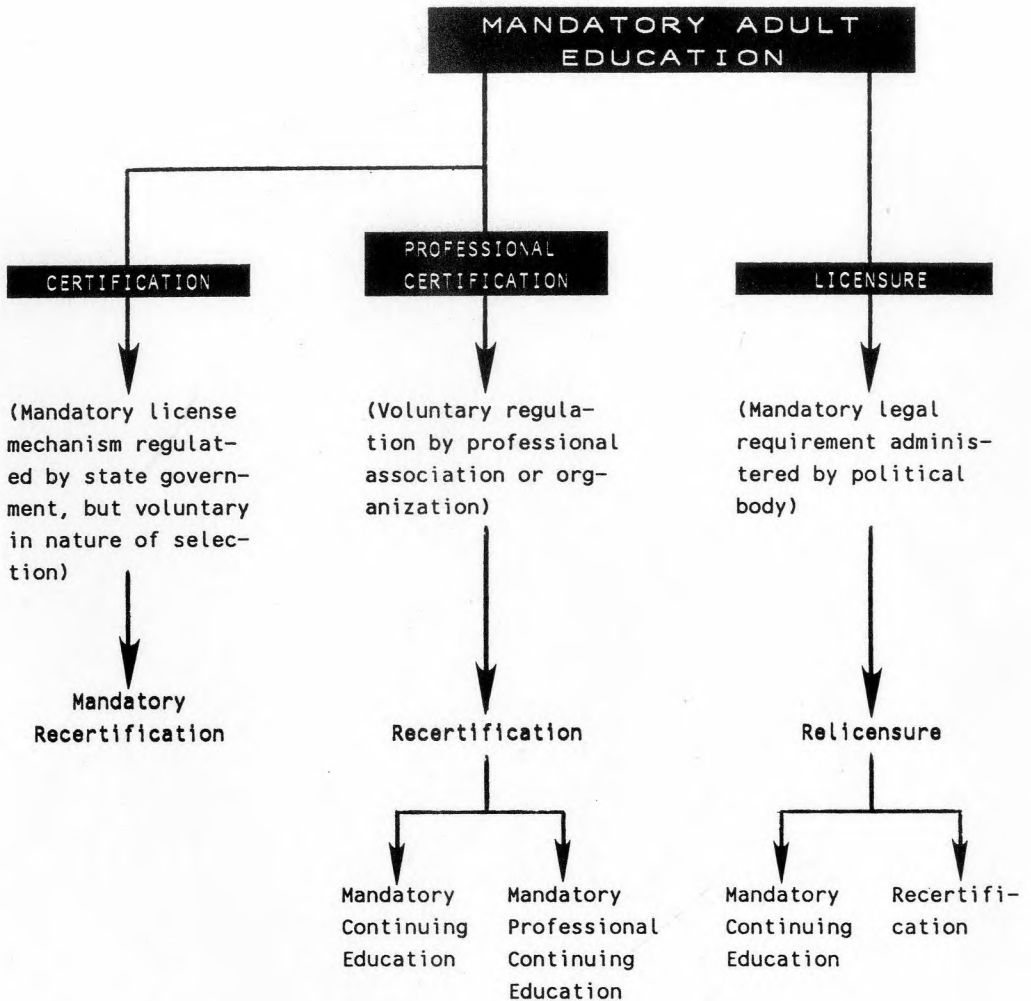


Figure 1. Conceptual framework for mandatory adult education with emphasis on credentialing.

range of meanings. In the preliminary data report on participation, the National Center for Education Statistics (1980) defines adult education as consisting of courses and other activities, organized by a teacher or sponsoring agency, and taken by persons beyond compulsory school age. In its more technical meaning, Knowles (1980) describes adult education as a set of organized activities carried on by a wide

variety of institutions for the accomplishment of specific educational objectives. Complementary to the notion of adult education as a set of organized activities, Knowles (1980, p. 25) further states:

Adult education is a process that is used by adults for their self development, both alone and with others, and it is used by institutions of all kinds for the growth and development of their employees, members, and clients. It is an educational process that is often used in combination with production processes, political processes, or service processes.

A more recent definition originates from Darkenwald and Merriam (1982) stating that adult education is a process whereby persons, whose major social roles are characteristic of adult status, undertake systematic and sustained learning activities for the purpose of bringing about changes in knowledge, attitudes, values, or skills. The key factor in the above definitions, and others of a similar nature, however, is the assumption that adult education is voluntary and that adults participate in learning activities of their own volition.

Mandatory Adult Education

The conclusions of the Adult Education Association of the United States of America Task Force Report on Voluntary Learning (Heaney, 1980, p. 3) challenges the concept of compulsory adult education as "incompatible with the ideals of social democracy and furthers totalitarian, monolithic tendencies in our society." Rockhill (1983, p. 111), providing an overview of the issue of mandated education, states:

The extension of education to be mandated over the entire life span of the individual may be one of the most significant social developments of our time with ramifications analogous to the common school movement, compulsory secondary school attendance, and the advent of mass higher education in the post World War II era.

Interpretation of the term "mandatory education" involves a variety of meanings and uses within numerous educational contexts. A popular generalization cited in the sociology literature is that occupations are becoming "professionalized" with the label loosely applied to increasing specialization and transferability of skills, as noted in the process of licensing, or certification (Wilensky, 1964). The rationale underlying compulsory or mandatory education is competence, a very much related notion to obsolescence, with shared concerns for keeping up with or maintaining some evolving standards. Shimberg (1978, p. 215) suggests that "the major justification for state regulation of an occupation is to protect the public from those who are unfit to practice."

The concept of mandatory education appears to extend beyond the desire by society to provide the public with well-qualified, up-to-date professional services. The majority of national data relevant to mandatory adult education is limited to examples of state regulation through licensure laws. An example of the current emphasis of mandatory education was noted in a televised interview involving a dialogue between representatives of a national television network and a representative of the Florida State Legislature and the Florida Parks and Recreation Department (Gumble, 1987). The proposed legislation would require any adult applying for a license to operate a recreational, motor-powered boat to attend a one-day educational program on boating safety. To relicense, applicants would be required to continue participation in the educational programs at regular intervals, as mandated by the state.

A similar requirement is seen in the Environmental Protection Agency mandate relevant to the purchase and application of restricted-use pesticide compounds by commercial, governmental, or private pesticide applicators. In the state of Montana, for example, private pesticide applicators are legislatively mandated to attend six hours of educational programming, within a five-year period, in order to relicense and legally be able to purchase and apply restricted-use pesticide chemicals. Although mandated originally by the federal Environmental Protection Agency, the Montana state legislature enacted a more specific law with the intention of providing continued competence in the use of dangerous agriculture compounds (Montana Pesticide Act of 1986).

Credentialing. Compounding the nature of mandatory education are the numerous processes identified as a "means to an end." The Collins Dictionary of the English Language (Hawks, 1982, p. 351) defines credential as ". . . something that entitles a person to confidence, authority. . . . a letter or certificate giving evidence of the bearer's identity or competence." Bratton and Hildebrand (1980) suggest that a clearer distinction could be made between the credentialing processes if three factors are reviewed: (a) the recipient of the credential, (b) the certifying body, and (c) the degree of volunteerism required for each. Galbraith and Gilley (1985) purport the need to distinguish between the processes used in mandatory adult education, identified as accreditation, licensure, and certification. While each attempts to regulate the measurement of competencies, the methodology, population, and purposes of regulation differ. Bratton

and Hildebrand (1980, p. 22) provide the following definitions and distinctions between the terms:

a) Accreditation is the process whereby an agency or association grants public recognition to a school, college, university, or specialized study program that meets certain predetermined qualifications or standards.

b) Licensure is a mandatory legal requirement for certain professions in order to protect the public from incompetent practitioners. Licensing procedures are generally established or implemented by a political governing body that proscribes practice without a license.

c) Certification is the process by which a professional organization or an independent external agency recognizes the competence of individual practitioners.

The direction of the present study is toward the investigation of a governmentally legislated licensing program. Specific comments relative to licensing literature follow in the paragraphs below.

Licensure. "Society expects that practitioners of all disciplines should be professional and competent" (Galbraith & Gilley, 1986, p. 1). A variety of mechanisms exist for identifying and determining competence, one of which is licensing. Galbraith (1987, p. 15) defines the process of licensure as "the credentialing of individuals by a political body which is mandatory if the individual is to practice in the profession." Friedman (1962, p. 145) defines licensing as requiring:

. . . some demonstration of competence. . . . and anyone who does not have a license is not authorized to practice and is subject to a fine or a jail sentence if he does engage in practice.

Gross (1978) suggests that licensing is used in the literature to refer both to the arrangement whereby practice is restricted as well as to all collaboration between a state and a profession, including

registration and title certifications. The recipient of the license is the individual and not the program.

A license is a credential, respected by society, assuming that those so endorsed have demonstrated competencies in specific areas. The process and procedures associated with licensure involve questions of ethics, quality of service, types of standards, and price of service by control of supply for both professional and non-professional occupations. It appears to be the public's belief that the possession of a license by a practitioner is evidence that a state agency has checked the applicant's qualifications and administered appropriate tests to ensure that the individual is fully competent. It is also believed that licensing boards monitor their licensees to ensure that they have maintained their competence and are still fit to practice. In addition, the continued question of competence, suggesting a certain level of training and achievement relevant to a particular level of skill, continues in the forefront of the licensure discussion.

Spector and Frederick (1952) suggest three major trends in the 20th century regarding the licensing process: (a) for licensing to include an even greater number of occupations, (b) for the type of licensing to go from title certifications to compulsory licensing of practice, and (c) for the raising and tightening of standards. Moore (1961) suggests that the existence of licensing laws indicates a shift of opinion in the last century from the notion that people know what is best for themselves to the notion that society is the best judge. In retrospect, Goode (1960) suggests that the pressure for licensing is

greatest for occupations that deal with clients as individuals and where competence cannot be easily demonstrated.

Mandatory Continuing Education

Stuart (1975) defines continuing education as encompassing all those learning activities that occur after an individual has completed his/her basic education. Rizzuto (1982) provides a more specific definition of continuing education as formalized learning experiences or sequences designed to enlarge the knowledge or skills of practitioners. Continuing education opportunities and experiences "tend to be more specific, of generally shorter duration, and may result in certificates of completion or specialization, but not in formal degrees" (1982, p. 38). The American Hospital Association, in its landmark statement of 1979, suggests that continuing education is a planned series of activities that enables an individual to acquire the skills, knowledge, and behavior needed to meet current job requirements or to remedy identified deficiencies.

The need for continuing learning in order to remain current in practice is widely recognized. Attention to rapidity of change has resulted in increased opportunities for adults to continue their education, both within the employment setting and through external job-related programs. Edwards and Green (1983) suggest that continuing education is a required condition for the renewal of a professional license, the renewal of a specialty certification, and continued membership in a professional association. However, the growing concern within both the professional and non-professional occupations is the

issue of mandatory continuing education (MCE). As a result, continuing education requirements are receiving attention in three areas, as noted by Egelston (1974): (a) establishment of voluntary continuing education recognition programs developed by professional associations, (b) development of self-assessment examinations managed through professional associations, (c) modification of licensing laws to make continuing education a requirement for re-registration or relicensure. How state professional and occupational groups view continuing education, however, critically influences whether or not state licensing boards develop mandatory continuing education requirements.

Cunningham and Hawking (1980, p. 13) define mandatory continuing education as "education which is required of an adult to either maintain certification or licensure in a vocational pursuit or to meet/avoid requirements for a special reward/punishment." Rockhill (1983) suggests that education is mandated by: (a) direct regulation in state licensure laws; (b) indirect regulation through professional membership, employment requirements, and specialized certificates; and (c) informal social sanctions. Regulatory officials and legislators, as an example, have considered ways to ensure that licensees are not only initially competent, but that they maintain their competence. One option involves convincing the state legislature to pass a law requiring all licensees to show they have engaged in some minimum amount of continuing education as a condition of license renewal. At question, as noted by Rockhill (1983), is whether licensure laws, and the often concomitant mandatory continuing education, exist in

protection of the public's interest or in order to protect self-serving interests of occupational groups.

Attitudes Toward Mandatory Continuing
Education (MCE)

Apps (1980) suggests two reasons why states mandate continuing education: (a) Society is experiencing a knowledge explosion and professionals must be forced to keep abreast of relevant developments, and (b) consumers are insisting on competent and caring professionals. Statements purporting a rationale in favor of mandatory continuing education include such comments as: (a) MCE is an assurance of continued competence, and (b) MCE is promoted as an alternative acceptable to professional groups, forestalling demands for periodic examination for relicensure or recertification or for a system of peer review. Lisman and Ohliger (1978) suggest the trend toward mandatory continuing education is especially evident in those fields where education is a mandatory condition of relicensing, citing that some form of continuing education was required for 14 professions in 45 states. More recently, Phillips (in Jaschik, 1986) noted a total of some 40 states in which 16 professions mandate continuing education for relicensure. In addition, many local, state, and federal employees such as police officers, firefighters, and agricultural extension agents are required to enroll in continuing education offerings, with similar pressures on architects and members of the clergy.

Rationale in favor of MCE. Statements purporting a rationale in favor of mandatory continuing education include comments such as: (a) MCE is an assurance of continued competence; and (b) MCE is

promoted as an alternative acceptable to professional groups, forestalling demands for periodic examination for relicensure or recertification or for a system of peer review. The main argument in favor of mandatory continuing education is that professionals must continue their education in order to remain current in their field.

Underlying the argument about professional obsolescence is the concern relative to professional competence. In response to the pressure from the public sector, professional associations and governmental regulatory agencies have taken steps to assist practitioners in maintaining competence. The American Hospital Association (1979), for example, suggests that legislatures enact statutes requiring continuing education as a condition for license renewal. Rizzuto (1982, p. 38) provides an example in a statement relevant to mandatory continuing education in the field of nursing:

Inherent in the mandatory continuing education laws are the assumptions that knowledge gained will be applied in the professional's practice and that the amount of educational time required for relicensure is sufficient to prevent outdated or incompetent practice.

Rationale against MCE. Ohliger (1981, p. 5) suggests, "Not only is there no evidence that MCE guarantees worthwhile learning, but there is a growing awareness that, indeed, it undermines it." This is clearly a statement in opposition to the value of mandatory continuing education. In response to the need for mandatory continuing education, as demonstrated by public pressure, Ohliger suggests that the recent thrust represents primarily the spread of the industrial model in its dying days from workers in factories who could not escape MCE to professionals who until recently were the imposers, not the imposed-upon.

The view that mandatory continuing education is a safeguard against incompetence is also discounted by Edwards and Green (1983, p. 44) who state that "there is little evidence that suggests any clear relationship between participation in continuing education as it now exists and continuing professional competence." Stuart (1975, p. 11) suggests the necessity in keeping practice relevant and future-oriented, but provides an added caution relative to mandated education:

Educational theory tells us clearly that adults learn best when objectives are relevant to needs. Intrinsic motivation is more productive than extrinsic motivation; therefore, the person seeking education to meet legal requirements may be less selective in material to be learned and less involved in the learning process.

Professional and occupational attitude. Cooper (1973), in reference to nursing literature, stresses that learning cannot be forced. Buckner (1974) concurs, suggesting the greatest danger of mandatory continuing education is that it may focus on the individual needs of the learner rather than encourage a process of self-assessment by the learner. Kotzan and Jowdy (1970), citing the work of Yamamoto, Thomas, and Karus, provide the following:

Perceptions should not be ignored by curriculum planners since meaningfulness, and, hence, the motivation for learning, will largely depend upon the psychological significance and interest each subject matter holds in the student's mind (p. 21).

Examples of attitudes toward the concept of mandatory continuing education are found in a wide range of professional and occupational literature bases, a substantial contribution being made by the health fields, specifically nursing. Whitis (1972) surveyed a random sample of 300 registered nurses regarding their attitude toward mandatory

continuing education; 83% of those responding felt that continuing education should be on a voluntary basis. Mattson (1974), using a random sample of 150 nurses, found 68.4% to be in favor of voluntary continuing education, while 23.7% were in favor of mandatory continuing education. A significant relationship was found to exist between educational level of respondents and their support of a voluntary or mandatory approach to continuing education. Those respondents holding bachelor's or master's degrees supported the voluntary approach less frequently than those individuals holding a diploma or an associate degree. In other words, the study suggests that individuals with a higher level of education were more favorable toward a voluntary continuing education program.

The purpose of a study by Miller and Rea (1977) was also to determine attitudes and opinions of a group of nurses in northern Illinois concerning mandatory continuing education. A 25-item, multiple-choice questionnaire was distributed to 30 nurses residing within 50 miles of a large northern Illinois city. A 100% return rate was observed. Of the respondents (80% of them holding diplomas), 70% indicated that mandatory education was a step forward for nursing, while 23% disagreed and 6% were undecided.

A total of 229 questionnaires were distributed by Larocco and Polit (1978) with a 50% return rate. An analysis of the Likert items indicated that the large majority of respondents were highly supportive of continuing education, although attitudes toward MCE were not as favorable. There was a tendency for younger nurses and less experienced nurses to be more favorable toward continuing education and more

likely to favor mandatory continuing education. The latter was especially true for the two younger age groups (20-25 and 26-35), who consistently demonstrated more positive attitudes than the older groups (ages 36-45, 46-55, and 56 and older). Higher levels of education were also associated with more favorable attitudes toward MCE. With regard to length of experience, there was a marked tendency for nurses with relatively few years of experience to have a more favorable opinion of mandatory continuing education. Attitude scores of the group with five years or less experience differed significantly from the attitude scores of the other two groups, identified as having 6-15 years and 16 years or more experience. With regard to significant predictor variables, age and number of years of experience were found to have the strongest relationship to attitudes toward MCE.

Mathews and Schumacher (1979) found that 48% of the 150 respondents strongly agreed or agreed that continuing education credits should be required by state law for nursing licensure renewal. Schoen (1979) found 40 of 58 nurses enrolled in a community college health education class approving or strongly approving of legislation requiring continuing education as a condition for relicensure to practice nursing. Peay (1979) conducted a survey of 1200 registered nurses licensed in Utah. Seventy-seven percent indicated they thought mandatory continuing education for relicensure would become a reality within the next five years; 56% said they would be in favor of MCE.

Schoen (1982), from a study population of 95,191 registered nurses licensed with the state of Illinois, drew a random sample of 395 subjects for the purpose of investigating the issue of voluntary and

mandatory continuing education. A Likert scale was used to assess subjects' attitudes toward continuing education as a requirement for relicensure, with just over 50% of the responses representing a positive direction. The researcher found no significant relationship between age and attitude.

One final study relevant to nursing was conducted by Arneson (1985), who investigated the attitudes of Iowa nurses toward mandatory continuing education and the relationships among attitudes, educational level, and length of professional experience. Using an attitude scale of 15 statements on a nine-point Likert scale, the researcher drew a random sample of 1000 subjects from a population of 21,910 registered nurses. Of the 1000 questionnaires, 673 usable instruments were returned. Regarding attitude toward MCE, 73% held either a favorable or strongly favorable attitude. Supportive written statements endorsed the importance of mandatory continuing education. Arneson makes one distinction, however, in the interpretation of the data. The nurses participating in the study were experiencing the realities of mandatory continuing education, in contrast to many of the previous studies where MCE was treated as a possibility. Nineteen percent of the respondents demonstrated a more neutral attitude and 7% were unfavorable, resenting the idea of being coerced into participating. Of the personal characteristics investigated, a significant relationship was found to exist between nurses' attitudes and their educational level. Favorable attitudes toward MCE were more frequently associated with advanced levels of educational preparation; that is, the nurses holding either

baccalaureate or higher degrees tended to have more positive attitudes than those holding either diplomas or associate degrees.

Viewing mandatory continuing education from a different perspective, other members of the allied health field, identified as hospital administrators, believe continuing education is so important that it should be made mandatory. To determine the effect of MCE on level of performance of hospital administrators, a stratified random sample of 706 hospitals was drawn. A sample of administrators was selected with a total of 1733 respondents. The findings of the study (Boissoneau, 1979) indicated the following:

- (1) Forty-eight percent of the administrators reported that the impact of MCE would result in a "moderated increase in effectiveness"; 27% indicated "no change in effectiveness."
- (2) In regard to years of experience, nearly 50% of the respondents indicated a preference for the choice "moderate increase in effectiveness." Level of education was not a factor of difference; both administrators graduating from a program in the field and those who did not suggested MCE would have the impact of a "moderate increase in effectiveness."
- (3) Age was not a factor.

In reviewing the MCE literature, the attitude by a variety of states has been that the enforcement approach holds forth the likelihood that at least some unsafe or marginally safe practitioners would be identified, exposed to remediation, or deprived of their licenses.

Iowa was the first state to mandate continuing education for professional engineers and land surveyors. The Report of the Regulatory Force for California, although providing implementation for a continuing education program, has suggested that there is in fact no evidence that the California requirement for pharmacists has any bearing on public health, safety, or welfare (Shimberg, 1978). A similar comment was made with respect to the Dental Board.

The attitude of professionals in the area of Certified Public Accounting (CPA) has also been demonstrated throughout the history of the profession. Future projections by the year 2000 (Schlosser, Lee, & Rabito, 1987) include:

- (1) All American Institute of Certified Public Accountants (AICPA) members will be required to participate in continuing education programs.
- (2) The national curriculum will be the foundation for all acceptable CPE programs approved for required continuing professional education.
- (3) CPE programs will be less instructor-dependent and the educational technology of delivery will be vastly improved.
- (4) Mandated programs of CPE will be part of the profession's peer review process.

Within the span of years since the inception of compulsory education for certified public accountants, a variety of attitudes and procedures have been identified. For example, a 1970 report suggested levels of acceptable continuing education for the state of Iowa

(Lembke, Smith, & Tidwell, 1970). In order to satisfy the requirements of compulsory continuing education, formal educational experience was required, defined as an experience composed of a predetermined subject and format available to a group of persons at a scheduled time with a qualified leader in charge. However, in 1972, the question relevant to formal programs was brought forth, with changes in the definition of "formal" and a change in the level of acceptable education; that is, "The committee has concluded that as a general rule those who engage in extensive self-study also participate in formal programs of education" (Beamer, 1972, p. 34).

In 1971, a survey of the American Institute of CPA's council, state societies, and the State Board of Accountancy was conducted with 170 respondents returning the survey instrument. Ninety percent agreed that the profession should adopt a requirement for continuing education (Beamer, 1972, p. 35). In reviewing the alternatives for imposing the continuing education requirement, state regulations or statutes were recommended with respondents to the survey demonstrating an 80% rate in favor of state regulation.

In 1972, Brenner and Strawser reported findings from a survey of 379 CPA's selected at random from the membership of the American Institute of CPA's. Initially, 1000 individuals were contacted by mail with a return rate for the survey instrument of 37.9%. Sixty-five percent of the respondents indicated they were in favor of MCE for their profession. When asked if some type of continuing education should be a condition precedent to re-registration or renewal of permit

to practice, 53% reported that such a requirement should be a condition for validation.

In 1985, the membership of the AICPA was asked to take a fresh look at standards for professional conduct due to leadership concern about public confidence and deficiencies in performance and compliance. At issue was the question, "What should be the nature and scope of education for accountants?" (Ellyson, Nelson, & MacNeill, 1985, p. 95). As a result, one of the four broad areas for which recommendations were made was the establishment of AICPA membership requirements for both continuing professional education and basic education to enter the profession.

Studies conducted over the years by organizations, such as the Commission on Auditors' Responsibilities and the Federation of Schools of Accountancy, validated the Institute's support of the concept of mandatory continuing professional education. Such validation culminated in the 1984 Model Public Accountancy Bill, a policy which embodied an educational experience for CPA's. Support for the mandatory requirement was noted in one poll taken in 1984, indicating that 65% of Texas CPA's in public practice supported a five-year education requirement. In Florida, just a few months prior to the Texas inquiry, a poll was taken indicating that 70% of the state society members supported the legislation mandating continuing education (Ellyson et al., 1985). Support was also noted in other states, including California, Illinois, New York, and Utah.

The American Institute of CPA's believes there is a need to improve the quality of practice through greater adherence to standards.

However, it is thought the profession, not government, should do this. The goal is to improve all quality of practice. That is seen as the advantage of using a self-regulatory approach in the private sector compared to being subject to governmental review by regulatory agencies (Collins & McRae, 1987).

As noted earlier, one of the two bases for credentialing in the United States was teacher credentialing with models of teacher certification continuing to serve as licensing mechanisms. The case for certification, as defined by the AACTE Task force, include three fundamental observations. First, in those cases where incompetent practice in an occupation may lead to harm or injury, the state has the right and the obligation to determine whether an individual is competent to practice before the individual is allowed to do so. A second basis for certification relates to the complexity of the teaching process; that is, no certification examination or short-term performance evaluation can fully assess the final set of competencies required for teaching. In addition, a certain amount of education and training is required in order to perform complex tasks, and the education and training program should contain multiple opportunities for assessment of the full set of competencies. A third basis for certification is built upon the recognition by some of a body of research evidence indicating that individuals who are fully certified are more effective teachers and more satisfied employees than those who are not fully certified. However, the latter basis is one of a highly controversial nature and much discussion both pro and con is present in the teaching education literature.

In 1986, a survey study of state directors of teacher certification was conducted to obtain opinions regarding: (a) establishment of a National Board of Standards for certification of teachers, (b) authority and jurisdiction of a National Board of Standards, (c) use of a two-certificate system for the issuance of instructional licenses, and (d) past and proposed changes in licensing laws and procedures (Hunt, 1987). To access directors' opinions, a questionnaire was mailed to directors of teacher certification in June, 1986, in the 50 states and the District of Columbia. Two follow-up questionnaires were mailed in August and September, 1986, with a 78% return. Findings included the following:

- (1) Establishment of a National Board of Standards governing certification was not favored by 52.5% of the directors.
- (2) It was indicated by 85% of the directors that state teacher certification should not be subordinate to a National Board.
- (3) A two-certificate system for issuance of instructional licenses, with one certificate referred to as entry-level teacher's certificate, was favored by 77.5% of the directors.
- (4) Directors recommended changes in teacher licensing laws and procedures.
- (5) Thirteen states reported issuing fewer licenses than five years previous, 14 states reported issuing more, and 11 states reported issuing about the same number.

Directors did not appear to be resistant to change, including a recommendation to establish performance-based certification. A second recommendation was to become more flexible and increase reciprocity among the states in terms of licensing teachers, administrators, and the school personnel.

Andragogy and Pedagogy:
Methodologies for Instruction

In the early 1970's, Dubin and Okun (1973, p. 3) suggested that "no single learning theory is applicable in all educational settings." Andrews (1981, p. 11) continues with statements relevant to the design of educational programs:

Educational programs are not designed for adults. They are designed primarily by instructors who use what they have learned (or more likely have experienced) about teaching children, adolescents, or college students.

Butler (1985) suggests that educators have long needed a comprehensive, generalizable model of the teaching-learning process that would serve as a practical guide in making decisions about the instructional design of curricula. Lindsay (1984) notes that educators are knowledgeable in terms of educational theory as it applies to the instruction of children (pedagogy), but may be inappropriately applying these pedagogical processes to adult learners. Compounding the problem of instructional approach is the pace at which change has taken place within society. Input of new knowledge, technological innovation, vocational displacement, population mobility, and change in political and economic systems no longer extends over generations. The result

for the learner, child or adult, is the fact that knowledge gained at any one point in time is largely obsolete within a span of a few years.

In an attempt to understand the adult learner and the learning environment, a variety of research endeavors have been undertaken. Descriptive case studies and survey designs focused on the internal processes of adult learning during the 1950's and early 1960's. Houle's (1961) typology suggesting the existence of three groups of adult learners, identified as goal-oriented, activity-oriented, and learning-oriented, set a precedent for adult motivational studies. Rogers (1969) challenged the traditional schooling model, asserting the theory of student-centered education, followed by Tough's (1971) investigation into the area of natural learning capability. Early in the 1970's, Knowles introduced into his writing the term "andragogy," defined as "the art and science of helping adults learn," in contrast to the term "pedagogy," defined as "the art and science of helping children learn." Yonge (1985, p. 160), however, restricts the context of andragogy to "those situations where an adult (or adults) assists and accompanies . . . another adult (adults). . . ." Critical differences between situations identified as andragogical or pedagogical, as noted by Yonge (1985) include: (a) A situation identified as pedagogical always involves an adult assisting a child to become an adult; (b) the structure of the relationship between the participants, which includes trust, understanding, and authority, must exist between adult and child in a pedagogical situation with more emphasis on authority; and (c) there are differences in the nature and position of the adult and the child within a societal context. Knowles (1972), in

a continued effort to identify specific elements the educator of adults would want to include within the instructional development process, suggested the following:

- (1) Establishing a climate conducive to learning,
- (2) Creating a mechanism for mutual planning,
- (3) Diagnosing the needs for learning,
- (4) Formulating program objectives that will satisfy these needs,
- (5) Designing a pattern of learning experiences,
- (6) Conducting these learning experiences with suitable techniques and materials, and
- (7) Evaluating the learning outcomes and rediagnosing learning needs.

Andragogy is an unusual and distinctive term, attracting attention from any number of adult educators, in addition to individuals outside the field. As a result, the review of the underlying assumptions of andragogy and published criticism of the model became an integral part of the adult education literature during the late 1970's and early 1980's. Houle (1972) perceived andragogy as a technique or set of techniques, while McKenzie (1977) suggested the notion of andragogy as the basis for a philosophical position. Knowles (1978) continued investigating andragogy as a learning theory, while Carlson (1979) suggested the consideration of andragogy as a political reality. Elias (1979) questioned the need to consider differences in adults and children as justification for a varied educational approach.

At the onset of 1980, Knowles acknowledged that adults learn better from pedagogical approaches under certain circumstances, thus viewing andragogy more as a technique than a theory. Andragogy and pedagogy were viewed as poles on a continuum. Four assumptions provided the basis for each end of the continuum, representing andragogy and pedagogy, as stated below:

- (1) Andragogy is a normal aspect of the process of maturation for a person to move from dependency toward increasing self-directedness, at different rates and in different dimensions of life.
- (2) As people grow and develop they accumulate an increasing reservoir of experience, with more meaning attached to learnings gained by experience as compared to learnings acquired passively.
- (3) People become ready to learn when they experience a need to learn in order to cope more satisfyingly with real-life tasks or problems.
- (4) Learners view education as a process of developing increased competence to achieve their full potential in life (Knowles, 1980, p. 43).

These assumptions, recognized as being part of the literature of adult education, developmental psychology, and humanistic psychology, have led to important differences between the educational designs for children and adults, as noted in the contrasting assumptions relative to pedagogy:

- (1) The role of the learner is, by definition, a dependent one. The teacher is expected by society to take full responsibility for determining what is to be learned, when it is to be learned, and if it has been learned.
- (2) The experience learners bring to a learning situation is of little worth; accordingly, the primary techniques in education are transmittal techniques -- lecture, assigned readings, audio-visual presentations.

- (3) People are ready to learn whatever society says they ought to learn, provided the pressures on them (like fear of failure) are great enough. Learning should be organized into a fairly standardized curriculum, with a uniform, step-by-step progression for all learners.
- (4) Learners see education as a process of acquiring subject-matter content, most of which they understand will be useful only at a later time in life. People are subject-centered in their orientation to learning (Knowles, 1980, p. 43).

Based on these premises, the following conclusions were identified relevant to the appropriate methodologies to be implemented in adult education:

- (1) Adult education should be learner-centered.
- (2) The teacher should function as facilitator and guide rather than as a conveyor and evaluator. Responsibility for the learning rests with the learner rather than with the teacher or provider of the educational experience.

Despite the variety of interpretations regarding the basis for andragogy, researchers in the late 1970's and early 1980's began efforts to define, operationalize, and evaluate the concept. Research in the area of educational orientation, as measured on an andragogical/pedagogical scale, suggested that andragogy could be operationalized and that educational orientation might vary by gender, department, institutional setting, and discipline (Davenport, 1984). These findings helped to provide an empirical base for the discussion of andragogy in light of educational program planning and curriculum development. Research into student orientation followed as did investigations and dialogue regarding philosophical orientations, an

area contributing heavily to the andragogical-pedagogical debate relevant to instructional methodologies.

Philosophical Origins

Beder (1985, p. 14) notes, "The issue of how adults should be educated is central to the profession," and further suggests that the predominant view of andragogy is derived from progressive and humanist philosophy. Elias and Merriam (1980) state that the progressive model purports the teacher-learner relationship as reciprocal with experiential learning emphasized. The process of learning is stressed rather than the content. A description of the humanist viewpoint places greater emphasis on the learning process as compared to the teaching exchange. The teacher serves as facilitator of the process rather than as a disseminator of knowledge.

In contrast, Elias and Merriam (1980) also note the literature supporting the liberal and behaviorist philosophical orientations. They identify liberal education as an embodiment of the teacher as subject matter expert charged with transmitting his/her expertise to neophyte learners. The behaviorist philosophy, although different in many respects, shares similarities in that the educator "engineers" the learning experience by manipulation of the learning environment, and provides reinforcement which, in turn, may encourage the learner to learn what the educator desires. Both positions, liberal and behaviorist, are teacher-centered with the responsibility for learning with the teacher and the educational system. Both positions are representative of the term pedagogy.

Evolution of andragogical orientation. The questions of teacher versus learner-centeredness, locus of responsibility for learning, and whether the teacher should function as expert/conveyor or facilitator have become a dominant component in the discussion of methodology appropriate for adult learners. Within the literature related to philosophical orientations, Knowles (1978) reviewed two basic metaphysical orientations. Here, he contrasted the mechanistic model with the organismic model. The mechanistic model denotes a deterministic-interactive perspective of humankind, while the organismic model represents a perspective viewing the individual as ultimately free and creative. Knowles (1974) initially selected the organismic model deeming it a more accurate representation of humankind. McKenzie (1977) suggested existentialism was at the base of Knowles' theory with the central concern of needs and goals strongly associated with a main tenet of existentialism, namely, the sovereign freedom of the individual. By addressing the issue in what McKenzie (1977, p. 225) calls a phenomenological tact, Knowles viewed andragogy as follows:

As a person matures he experiences a change in self-concept from a condition of dependency to a condition of self-directedness, he accumulates a reservoir of experience and becomes a resource for learning, his readiness to learn is ordained toward developmental tasks and social roles, and his time perspective changes from one of postponed application of knowledge to immediacy of application. The latter phenomenon inclines the adult to problem-centered rather than subject-centered learning.

In affirming the Maslowian concept of self-actualization, Knowles (1974) further grounded andragogy in the philosophical orientation of

humanism, manifest by aspects of subjective truth and the centrality of the individual-in-the-world. He further stated that as a practitioner of andragogy, the adult educator must consider that human beings are essentially good and capable of self-directed learning. The task of the educator is not to direct or motivate, but to facilitate. With regard to principles of teaching, diverse competencies of facilitation are urged, based on the characteristics of the adult learner.

Andragogy as a Teaching-Learning Transaction

Boyer (1984) provides an overview of the need to realign the goals, assumptions, and practices of education whenever and wherever learning is to occur. The author further acknowledges the inclusion of direct pedagogical approaches in some instances, but identifies the firm belief that the theory of freedom in self-directed inquiry is the most appropriate design in many environments for most ages. The long-standing commitment to humanistic ideals, in addition to the recognition of an existence of an "organismic" self that is present at birth, suggests an interweb of program design based on a humanistic philosophy. The statements by Boyer (1984) reinforce the later thoughts by Knowles (1980) in which the assumption involving self-directedness is considered along with, rather than in opposition to, the need for appropriate fit of methodologies to the learning environment.

Truskie (1981) incorporated the "organismic" model into management development training, encouraging the design of educational programs based on the diverse needs and interests of individuals. The concept

emphasizes an attitude toward the student, encourages diversity of individual opportunity, and stresses the role of training as the source of development. Manifestations of this trend, including non-traditional study and external degree programs, have evolved reiterating the purpose of education in descriptive terms as the continuous development of the individual throughout the lifespan. The model represents a person as an organized entity whose parts gain meaning and function from the whole in which they are integrated. The organismic model provides an avenue for individualizing the process of learning to be more closely allied with the functions and responsibilities of the practitioner, recognizing individual needs and encouraging the learner to be proactive in seeking appropriate learning opportunities. In addition, the model provides flexibility permitting the learner to be self-paced and selective in identifying methods of instruction compatible with the learner's style.

Early-on, Knowles (1974) delineated the organismic model as a more accurate representation of the individual, a model which depicts learning as the holistic development of the individual's capabilities for perceiving, knowing, thinking, feeling, valuing, and doing, in order to cope more confidently with life.

This definition of learning requires that we educators shift the focus of our attention from transmitting content to helping learners develop the skills of inquiry, and providing environments that are rich in the resources needed for various kinds of inquiry (Knowles, 1974, p. 302).

Knudson (1980), investigating the andragogical/pedagogical issue, chose a different approach to educational programming for adults,

referring to an alternative model as "humanogogy." Stressing the development of the whole human being, humanogogy represents the differences and similarities between adults and children as learning human beings. Humanogogy approaches learning as a matter of degree, not kind; adults are not different in kind from children, but only different in degree. The point suggested by Knudson's model is that adult educators need to examine critically their teaching-learning approaches and keep in mind that human life is a process which cannot be adequately described in terms of "either/or" approaches.

A similar model proposed by Rinke (1982), termed "holistic education," focuses on the whole teaching-learning situation and varies the teaching-learning strategy to meet the needs of the learner, the teacher, and the situation in an effort to attain educational outcomes which are greater than the sum of the parts. The inference is that both the teacher and the learner bring certain personality traits, teaching-learning style preferences, and other social-psychological constructs to every teaching-learning encounter. The holistic educator is fully cognizant of the situational variables which affect the teaching-learning process and varies the approach accordingly. Such variables include environment, time, and motivational factors; knowledge, information and/or skills to be transmitted; budgeting constraints; equipment capabilities; and any other factors which might impinge on the educational process. In practice, a holistic educator might follow a pedagogical model at one time and at another time act as a facilitator observing andragogical principles. If appropriate, a mix of the two may occur.

Holistic education, as interpreted by Rinke (1982), is dedicated to assisting learners to reach their own unique potential and emphasizes the promotion of learning as a lifelong process. The holistic model incorporates several key concepts, including:

- (1) Recognition that learning needs of adults vary extensively;
- (2) Acknowledgement that overall mental development of an adult, depending on environmental circumstances and inherent abilities, may be located anywhere along a continuum;
- (3) Recognition that learners do not have to progress to the extreme right of the continuum to reach potential;
- (4) The hypothesis that skills or competencies to be learned by adults may be viewed as hierarchical and overlapping in nature;
- (5) A belief that there is nothing permanent except change; therefore, as adults move along a learning continuum, they also move along a continuum of change.

Beder (1985), however, contends that the controversy over the selection of an appropriate teaching-learning transaction is not one only of philosophical orientation, but of confusion regarding what adult education really is. If, in fact, the issue revolves around consideration of the process of educating adults, two important factors must be considered, including the classification of adult learning and the structure of knowledge sought by the learner.

A variety of classifications of adult learning have been identified in the literature, including education which occurs in a natural or unplanned setting and that delivered through learning organizations. Tough (1971) initiated the use of the term "self-planned/self-initiated learning" in contrast to those learning from efforts planned by educational agencies. A third element has been added by Brookfield (1984) defined as experiential learning in addition to the natural and formal setting.

Bradford (1958) previously reiterated the importance of the teaching-learning transaction by stating two basic assumptions. First, the teaching-learning process is a human transaction involving the teacher, learner, and learning group in a set of dynamic interrelationships. Teachers and learners engage in a complex process of exploration and diagnosis of needs for and resistances to learning and change, of experimentation and fact-finding, of testing and planning for the utilization of learning and change in the life of the individual. The second assumption states that the target of education is change and growth in the individual and his/her behavior, and thus in his/her world.

These two assumptions lay a basis for a re-examination of a teaching-learning theory. They indicate the need to combine teaching procedures and understandings of the motivational, emotional and cognitive characteristics of the teacher and learners, with skills of working with learners and learning group in creating conditions for learning and change (Bradford, 1958, p. 135).

Additional descriptors of the varied classification systems include: (a) identified providers of education; (b) goals of

educational experience such as whether knowledge, skills, or attitudes are to be acquired; (c) identification and meeting of needs of the learner; and (d) classification based on who will benefit.

The question, however, of what teaching behavior or strategy is appropriate under what circumstance is, at best, confusing and unanswered. To address this issue, Beder (1985) suggests a classification system based on the structure of knowledge sought, identified as formal/segmented knowledge and problem-oriented knowledge. Formal/segmented knowledge represents an integrated, cumulative body of knowledge that begins with basic principles and culminates in complex and often abstract principles. In order for the individual to master the higher order principles, the learner must master the basics. In addition, the meaning of higher order principles is known only to the teacher who is charged with the dispensation of knowledge. To organize the formal knowledge classification, the body of content is segmented into units which build on each other. Failure to master initial units of knowledge leads to eventual failure at mastering the whole of the body of knowledge; in order to ascertain the mastery, evaluation becomes the function of the teacher. In the educational process, the learner begins with the identification of a task to be performed. Learning objectives are set for each skill and a sequentially ordered instructional program results. This approach parallels the behaviorist philosophy in which "learning by objective" is the key element.

In contrast, the problem-oriented knowledge pertains to distinct information or skills an individual needs to learn in order to solve or cope with a problem posed by the environment or life situation. The

problem-oriented knowledge is integrated with experience itself; learners themselves are accountable in problem-oriented learning. The highly individualized approaches characteristic of teacher-centered education are therefore warranted. However, the teaching is appropriately learner-centered and non-evaluative. A large portion of adult learning falls into the realm of problem-oriented knowledge with direct implication to self-planned, self-initiated learning. Examples include learning derived from a need to perform life roles and learning initiated by life changes which comprise some 80% of adult learning, according to Aslanian and Brickell (1980).

Instructional Design and the Adult Learner

What is needed is a dynamic general strategy enabling learners to select at any moment the particular tactic that is optimal for their unique configurations of aptitudes at that moment in time. . . . They must have a wide variety of tactics available to them but not so many that they are overwhelmed by the number of choices. They must be provided a procedure for adapting slowly to this dynamic instructional environment since all their previous experience has been fixed treatments which have been administered to them and over which they have had little or no control (Merrill, 1975, p. 219).

Numerous trends and issues representing paradoxes faced by educators of adults suggest an increasing need for both credit and non-credit educational activities and wider adoption of nontraditional schemes for certifying learning (Long, 1983). An activity that starts at birth and can be expected to continue for a lifetime, learning can be accidental and coincidental. However, in classrooms and training centers, facilities and personnel representing education, business,

industry, and government are employed to provide learners with education opportunities and activities. The design of that education opportunity is to prepare all students to work and participate in the society in which they live. The view implying the need for a dynamic quality within the educator/learner relationship, especially regarding the involvement of the learners, is critical. Mahan and Bollman (1968) contend that it is precisely at this point that the educational process may fail, not in the content competencies of the educator nor in the learning abilities or motivation of the learner, but in the relationship between the two. In this sense,

. . . education is defined as 'any learning process' resulting in a change of behavior on the part of the learner. Process means the dynamic interaction between the educator and the learner (Mahan & Bollman, 1968, p. 101).

Learning Theory and Instructional Design

Learning theory. The interpretation of instruction involves a study of the factors influencing learning by whatever means. Romiszowski (1981) interprets the purpose of instruction as the promotion of learning in individuals, with theories of instruction based on theories of learning. In reviewing research studies of learning, Gagne' (1970) notes three questions relative to instruction:

- (1) How should the learning task be presented?
- (2) What kinds of activities on the part of the student should be required or encouraged?
- (3) What provision must be made to ensure retention and future use?

Current theoretical viewpoints on learning and instruction provide clarity to an area of constant change. Romiszowski (1981), in a review of learning theories, notes the behaviorist position, as exemplified by Skinner, is based on a definition of learning as an observable change in behavior, not caused by physical maturation or growth.

The structure of internal thinking and learning processes is considered irrelevant to the process of instruction, which is seen as the structuring of the environment in such a way as to maximize the probability of the desired new behavior being learned (p. 166).

The process is based on the principle of reinforcement where the instructor: (a) arranges the stimulus, (b) observes the learner's response, and (c) reinforces desired responses and withholds reinforcement if responses are not desired.

Romiszowski (1981) continues with the neo-behaviorist viewpoint, suggested by Gagne', which purports certain characteristics remaining throughout a decade of gradual change and evolution. Two points which distinguish Gagne' from strict behaviorists include the belief in a variety of types of learning, with each type associated with specific strategies of instruction, and an interest in the functioning of the internal mental processes which govern learning. Eight categories of learning, identified by Gagne' (1985), suggest a hierarchy proceeding from very simple conditioning-type learning to complex learning such as problem-solving. In addition, lower levels of learning are prerequisite to higher levels. The eight categories include: signal learning, stimulus-response, chaining, verbal chaining, discrimination learning, concept learning, rule learning, and problem-solving.

Romiszowski (1981) also reviews the cognitive/developmental viewpoint exemplified by Piaget and Bruner, proponents of the discovery approach as it relates to instruction. Ausubel (1968), a powerful influence on instructional thinking, was noted in opposition to the discovery movement, arguing that much instruction, particularly at higher levels of education, is successfully performed by the process of exposition leading to meaningful reception learning. The learning task does not involve independent discovery on the part of the learner; the entire content of what is to be learned is presented to the learner in final form. The approach is in contrast to discovery learning in which the principal content of what is to be learned is not given but must be discovered by the learner before he/she can incorporate it meaningfully into his/her cognitive structure.

The cybernetic viewpoint places emphasis on problem-solving and rule-following activities as compared to lower-level types of learning. The premise underlying the model, based on work with older students, states that it is impossible to solve an intellectual problem without carrying out specific intellectual operations (Romiszowski, 1981). Rule learning is not considered complete until the learner can apply the rule correctly and on the appropriate occasions. Similarities are noted between Gagne' and Landa in that Gagne' is much more concerned with the teaching of the rules or intellect skills that are relevant to particular instructional domains. "For Gagne', the objectives of instruction are intellectual skills or capabilities that can be specified in operational terms, can be task analyzed, and then can be taught" (Romiszowski, 1981, p. 177).

As an alternative to repetition or practice, Gagne' (1970) suggests that the most dependable condition for the assurance of learning is prior learning of prerequisite capabilities, often called "specific readiness or enabling conditions" for learning. Implications for the design of instruction can be derived from Gagne's work with specific attention to three factors: (a) collection of previously learned prerequisite skills, (b) the set of prerequisite skills not yet mastered, and (c) consideration of periodic and spaced reviews in comparison to additional practice.

An act of learning requires the presence of a variety of internal states that have previously been learned, identified by Gagne' and Briggs (1974) as information, intellectual skills, and cognitive strategies. Factual information can occur in three ways. It can be communicated to the learner in a form that remains accessible, previously learned, or by process of retrieval from previous learning and storage. Intellectual skills must be recalled by the learner in order for learning to occur, with previous learning more effective for recall than for immediate new learning. Strategies of attending to a complex stimulation, of selecting and coding parts of the stimulus, of solving problems, and of retrieving what has been learned are dependent on "self-management" capabilities of the learner, with learning supported by stimulation provided by the teacher. As the learner gains experience in learning, dependence on internalized strategies is heightened with the learner becoming more of a "self-learner." Motor skills and attitudes are also considered a part of the variety of internal learning events, with the latter representing the "affective"

domain. "The effect of an attitude is to amplify an individual's positive or negative reactions to a person, or thing, or situation" (Gagne' & Briggs, 1974, p. 25).

Investigation into the learning emphases in instruction suggests that concentrating instruction on any one type of capability alone, or any two in combination, is insufficient. Multiple aims for instruction must be considered with the human learner attaining several varieties of learning capabilities. Romiszowski (1981) suggests that there is no one theory of instruction appropriate for all learning situations. The suggestion is made, however, that both nature (heredity) and nurture (experience) play important parts in the learning process. In addition, some things (bare facts) are best learned by rote, while other things (concepts) are better learned in some meaningful context. One may have a variety of different aims (objectives) for teaching a topic and these may require a variety of different instructional methods and techniques.

Instructional design. Reigeluth (1983) defines instructional design as a decision-making process by which the most appropriate instructional method is selected to teach a given objective under a particular set of conditions. Gagne' and Briggs (1974) suggest four basic assumptions underlying the instructional development process:

- (1) Instructional planning must be for the individual.
- (2) Instructional design has phases that are both immediate and long-range.
- (3) Systematically designed instruction can greatly affect individual human development.

- (4) The design of instruction must be based upon knowledge of how human beings learn in addition to fully accounting for learning conditions that need to be established.

Designers of instruction, however, often find themselves caught between two factors over which they have little control. First is the content, which is usually predetermined by general objectives. Second is the learner who brings to the learning situation a set of attitudes, feelings, prior experiences, and knowledge which the educator accepts as a given. In addition, instructional designers must select, adapt, develop, and refine a wide variety of instructional processes and products which can be placed on a continuum from tightly-organized to loosely-structured.

A key decision relevant to the instructional design process is the selection of an instructional model that is congruent with the forces, goals, and framework for the learning of events and outcomes. A variety of theoretical and qualitative action models exist, including: (a) the learner generative model, (b) the instructional systems model, and (c) the learner-educator collaborative model. Smith (1983) defines the learner generative model as a model which focuses on the learners throughout the learning process. The learners have the primary responsibility for identifying, designing, developing, implementing, and evaluating the desired learning. In this model, the decision points are always based within the learner's framework with the designer assuming a role of providing stimulus information and activities for learner exploration and by adapting these inputs through interpersonal dialogue for use by the learner.

The learner-educator collaborative model recognizes the importance of identifying and acknowledging the learning level and resources of learners, but also recognizes that the knowledge and expertise of the content specialist and the instructional expertise of the educator are equally important. The end product will be that learners will acquire (learn) knowledge and skills that both they and the educators consider to be necessary (Smith, 1983, p. 100).

The instructional systems model is grounded in a rational, systematic, empirically-based structure with emphasis on the professional educator as the designer of effective learning experiences. Kasworm (1983, p. 10) suggests this model has

. . . proved to be valuable in designing learning experiences for adults who must demonstrate specific knowledge and skills for a particular task setting, job requirement, or certification standard.

Some of the elements of the model are also evident in the programming for rural adults and undereducated adults, showing a preference for an instructor-group format. It is considered an effective instructional design approach for adults who enter a learning experience desiring explicit direction and expertise from the instructor. "Often, this model facilitates learning in a rapid, tangible fashion, in contrast to the process-oriented learner generative model" (Kasworm, 1983, p. 11). Cited as principal assumptions underlying the instructional systems model are the following:

- (1) Learning occurs through instruction based on the principles of cognitive psychology.

- (2) Program design is conducted in a systematic, sequential series of steps based on empirical data collection.
- (3) Learning is structured according to definable learning outcomes that are objective, measurable, and testable. Each event in the system is predetermined to lead to a change in knowledge, skills, or attitude.
- (4) Major issues focus on learning conditions that should be established for desired outcomes.
- (5) Learning content is defined through systematic task analysis, which provides a classification of measurable objectives for instruction.
- (6) Learner characteristics are predetermined and screened. Learners enter the program after meeting specific pre-program criteria, and they exit the program only after exemplifying the learning outcomes.
- (7) The professional educator's role is predominantly based on the skills and knowledge required for conducting task analyses, defining behavioral objectives, determining and sequencing appropriate learning strategies for achieving learning outcomes, and developing appropriate pre- and post-assessment systems.

Systems design. The systems approach originated in the field of systems engineering and was initially applied to the design of electronic, mechanical, military, and space systems. Training then became a target for systems design and by the late 1950's and early 1960's, an integral part of education. Approaches to instructional

development and delivery have been applied to the tasks of developing instructional materials, learning modules or units, instructional programs, and large-scale instructional systems (Hannum & Briggs, 1982).

The term "system," in the present context, is considered to be an integrated plan of operation of all components (sub-systems) of a system, designed to solve a problem or meet a need (Briggs, 1977). The planning represented by a systems approach implies the analysis of the various components of the system in a logical order, with careful coordination of the total effort and with flexible sequence allowing for self-correction. Wileman and Gambill (1983) suggest systems analysis deals with the investigation of the component events of a task or a process and the relationship of these events to each other and to the environment.

The systematic process of developing instruction is usually present in the form of a model, ranging from simple to complex. Basic steps in the process include: (a) selection of an objective(s), (b) task analysis, (c) analysis of tasks to allow for manageability, (d) design of instructional strategies, (e) field testing, and (f) continued field testing until acceptable criterion is reached. Dick and Carey (1978) suggest a systems model which provides a basis for design, production, evaluation, and revision techniques. The model, initially used with courses at Florida State University beginning in 1968, does not represent a simplistic or complex design, but is described as a behaviorally oriented model which stresses the identification of skills students need to learn, and the collection of data from students to revise instruction. The authors suggest two

traditions which have contributed the most to the growth of systematically designed instruction. These traditions are characterized by the humanistic approach and the behavioral science or systems approach to instruction. The authors contend that educators who consider themselves to be representative of the humanistic approach have a genuine interest in the total development of individual children. Recognition of the importance of individual differences and a strong focus on the personal growth and development of the individual are of high priority.

In essence, humanistically oriented teachers believe that there is no best way to manage a classroom or to organize a learning experience. They believe there is no single formula for good teaching, but rather a number of approaches, one or more being appropriate for the needs of a particular student (Dick & Carey, 1978, p. 3).

Educators who prefer a behavioral approach to teaching view the teacher as one responsible for instruction in cultural heritage, social responsibilities, and specific subject matter. Emphasis is placed on a carefully prepared lesson plan, logically organized material, and specific educational objectives. "In essence, these teachers prefer a systematic approach which utilizes research knowledge on the conditions of learning required for students to achieve clearly defined outcomes" (Dick & Carey, 1978, p. 3). Both the humanistic and the behavioral instructional approaches, however, emphasize the significance of individual differences and the necessity for providing appropriate instruction to the student.

The systems approach for designing instruction suggested by the authors brings together many of the concepts previously stated. The

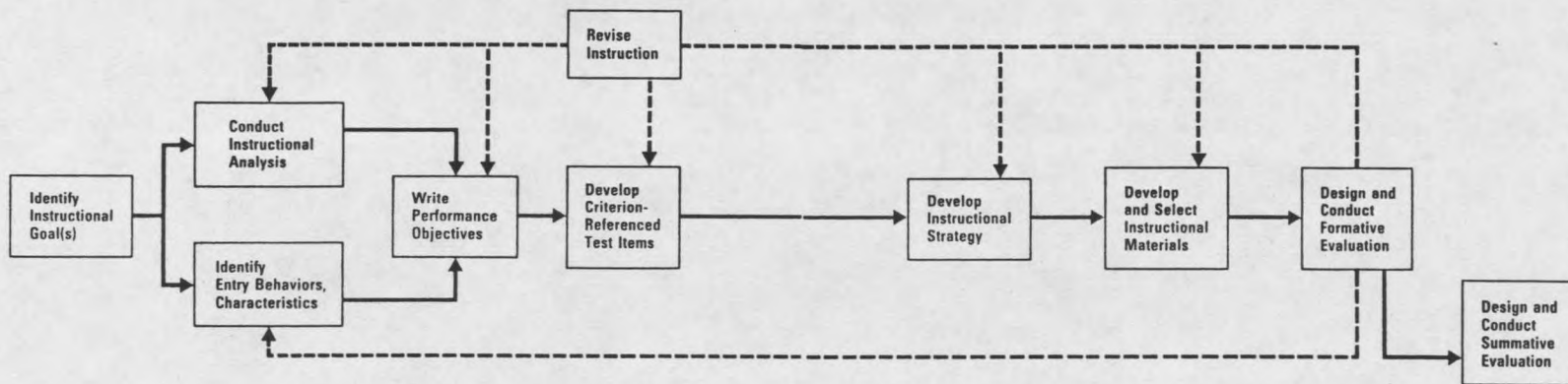
model includes eight interconnected boxes with a major line indicating feedback from the last component to the earlier boxes (Figure 2). A final step, and the first step in a repeat cycle, is revising the instruction based on data summarized from the various formative evaluations. Summative evaluation is the culminating evaluation of the effectiveness of the instruction and is not considered a part of the design process. "The model described here is intended to be used at that point when the instructor is able to identify a specific instructional goal" (Dick & Carey, 1978, p. 11).

Selection of Instructional Method

Approaches to instructional improvement have taken many forms and have been guided by a variety of philosophical orientations and assumptions. Some approaches have emphasized the systematic design of instruction, while others have begun with the assumption that personnel need training in specific teaching skills. Still others advocate the design or redesign of courses as the point for improvement. In addition, clarification as to what is meant by the term "instructional (teaching) method" is a critical part of the review of instructional development literature.

Verner and Booth (1964) attempted to analyze and classify the purposes and operations of adult education by proposing a distinction among methods, techniques, and devices as processes of adult education, defining each as follows:

- (1) Method was defined as the relationship established by the institution with a potential body of participants



Source: Dick & Carey, 1978, p. 9.

Figure 2. Systems design approach for developing instruction.

for the purpose of systematically diffusing knowledge among a prescribed but not necessarily fully identified public.

- (2) Technique was identified as the relationship established by the instructional agent (adult educator) to facilitate learning among a particular and precisely defined body of participants in a specific situation.
- (3) Device(s) was identified as the mechanical instruments or environmental factors used by the adult educator to augment the methods and techniques employed.

Method described the way in which people were organized for instruction, while technique described what an adult educator did to help adults learn. Application of the classification of processes suggests that once the method has been determined, a broad range of techniques and devices become available for selection and implementation in order to facilitate a variety of types of learning in specific situations.

The emphasis placed on method as a classification of process parallels to some degree Knowles' (1980) reassessment of pedagogy and andragogy as "instructional methodologies." Philosophical orientations of adult education, as defined by Elias and Merriam (1980), call attention to the characteristics of the liberal and behaviorist philosophies as teacher-centered compared to the progressive and humanist orientations characterized as collaborative and facilitative. Davenport and Davenport (1985) suggest an educator adhering to the set of pedagogical assumptions would advocate an instructional climate that

was formal, authority-oriented, and competitive. The instructor would have the responsibility for diagnosing of needs, planning, formulation of objectives, and evaluation, with the design of the instructional process dependent upon the logic of the subject matter and content units. Traditional formats would be used to transmit information from instructor to student, with instructional strategies including lecture, assigned readings, and canned audio-visual presentations.

The authors offer an opposite approach stemming from andragogical assumptions, suggesting an instructional climate that is mutually respectful, informal, and collaborative. Instructor and student would work toward a mutual process relative to diagnosing of needs, planning, formulation of objectives, and evaluation. Critical to the design of the instruction would be the student readiness to learn, with learning occurring from experiential techniques actively involving the learner. Instructional strategies or techniques would include group discussion, role playing, skill-practice exercises, field projects, action projects, laboratory methods, consultative supervision, demonstration, seminars, the case method, and the critical-incident process. The individual responsible for the learning situation, previously identified as the instructor, would be more properly viewed as a facilitator of learning rather than as a disseminator of information. Both instructional methodologies -- pedagogy and andragogy -- represent the systematic diffusion of knowledge by an organization/institution/agency to a prescribed audience.

Alternative interpretations regarding the terminology of instructional methods include an awareness of traditional strategies to

instruction such as lecture, assigned readings, and use of textbook and recitation, as compared to what is termed "non-traditional" techniques such as individualized instruction, credit for experience, performance contracting, facilitative self-training workshops, and technology as a mode of self-instruction (i.e., cable television, audio cassette instruction, interactive computer programs). Laska (1984) suggests the existence of four basic methods of instruction with each of the four consisting of a number of specific techniques. The four methods include presentation, practice, discovery, and reinforcement. Specific strategies or techniques for presentation, for example, include lecture, film, field trip, or demonstration. An alternative to the presentation method is seen in the discovery method involving structure and student involvement in discovery activities with the knowledge coming from within the learner.

Instructional Strategies

The selection or development of teaching strategies is a very complex, yet often overlooked area. Dick and Carey (1978, p. 106) suggest that an

. . . 'instructional strategy' describes the general components of a set of instructional materials and the procedures that will be used with those materials to elicit particular learning outcomes from students.

Five major components comprise an instructional strategy, including:

(a) pre-instructional activities, (b) information presentation, (c) student participation, (d) testing, and (e) follow-through.

The term "instructional strategy" is used to describe both the teaching method and the materials used in the teaching process, and is

defined as the vehicle or technique for instructor-student communication. Instructional strategy can be described as comprising at least four categories: (a) instructor-centered, (b) interactive, (c) individualized, and (d) experiential. The most familiar of the instructor-centered methods is lecture, characterized by the teacher being primarily responsible for conveying information to a group of students; the direction of communication tends to be one-way, from the instructor to the audience. At the lower levels of the cognitive domain, the goal of the instruction is to expose students to information or concepts or values. Students are expected to demonstrate only that they have received and retained the information; they do not have to use it. Weston and Cranton (1986, p. 260) state:

The lecture is an efficient and effective method for instruction at the lower levels (knowledge and comprehension) of the cognitive domain, particularly in large classes; students are passive rather than active participants in the teaching and learning process.

Interactive methods utilize communication among students, as well as between instructor and students, and are characterized by active participation. Class discussion, a commonly used interactive method, is particularly effective for instruction in the upper levels of the cognitive domain (analysis, synthesis, evaluation), and in all levels of the affective domain. When the group is larger, students' interests are varied, or when students feel more comfortable with a smaller number of individuals, discussion groups can be used in place of class discussion. "The nature of this type of learning requires that students interact with the concepts in some way or that they interact with other students, the instructor, or in a situation in the real

world" (Weston & Cranton, 1986, p. 278). Instructor-centered and interactive instructional strategies represent techniques commonly implemented into learning experiences for adults. A more detailed discussion of the lecture and small group discussion techniques is provided in the paragraphs that follow, since they represent the instructional strategies for the present study.

Lecture strategy. "Lecture occurs whenever a teacher is talking and students are listening" (Lowman, 1984, p. 96). Penrose (1981, p. 12) defines lecture as "a discourse given before an audience or class, etc." Cooper (1982, p. 39) defines lecture as "a carefully prepared oral and formal presentation by a qualified speaker" with the purpose being the presentation of factual information in a direct and logical manner. The strategy is particularly appropriate for that information not readily available elsewhere.

Although what constitutes a lecture appears obvious, the literature suggests variations from the teacher talking to a group of students, who are presumably listening, to teachers who encourage questions on the part of the students, or ask questions themselves. Wallen and Travers (1963, p. 481) suggest, "About the most definitive statement one can make about the lecture method is that during most of the time the instructor is 'talking to' the students."

A variety of lecture types exist, ranging from a formal oral essay to the lecture laboratory with variations in between, including the expository lecture, provocative lecture, lecture demonstration, question-lecture, and lecture-recitation (Lowman, 1984). Sweeney and Reigeluth (1984) emphasize the variations of the general lecture model

as the interactive lecture, the demonstrational lecture, and the interactive demonstration.

Advantages and disadvantages of the lecture strategy have been debated for years in the educational literature. Weaver (1980) suggests one of the greatest advantages is that lecture is an excellent vehicle for presenting human models to a group (i.e., effective in creating in an audience a sense of relationship between the model and the subject the model is presenting). That is to say,

The presentation of the subject matter by the personality has an affective impact on the audience in that it will make direct associations between the value of the information and the impressions it has of the speaker (Sweeney & Reigeluth, 1984, p. 7).

Other advantages include the suggestion that lecture is an economical strategy, is flexible, and is readily transcribed or recorded and can be re-used easily. Cashin (1985, p. 2), however, states nine weaknesses of the traditional lecture strategy as:

- (1) Lectures lack feedback to the instructor about the student's learning.
- (2) In lectures, the students are passive.
- (3) Students' attention wanes quickly (in 15 or 25 minutes according to studies).
- (4) Information learned in lectures tends to be forgotten quickly.
- (5) Lectures presume that all students are learning at the same pace and level of understanding.
- (6) Lectures are not well suited to higher levels of learning such as application, analysis, synthesis, influencing attitudes or values, developing motor skills.
- (7) Lectures are not well suited to learning complex, detailed, or abstract material.
- (8) Lectures require an effective speaker.

- (9) Lectures emphasize learning by listening, which is a disadvantage for students who prefer to learn by reading, doing, or some other mode.

Gagne' (1977) earlier suggested the lack of effectiveness of the traditional teaching methods, most of which were centered around the lecture, in that they do not promote the kind of involvement and responsibility needed for effective learning.

In regard to appropriate use of the lecture strategy, Sweeney and Reigeluth (1984, p. 8) suggest the following times and places for implementation: (a) when large numbers of students must, or can be, instructed at the same time; (b) when the group is homogeneous; (c) when there is a need to arouse interest in a subject; (d) when information is urgent; and (e) when information changes rapidly or frequently. However, Osterman and Coffey (1980) suggest specific situations where the lecture strategy is inappropriate, including the following: (a) when subject matter is highly abstract or complex, (b) when long-term retention is necessary, (c) when immediate evaluation of individual understanding is required, and (d) when individual student record management is required.

Group discussion. Rogers (1969) advocates the transformation of students into a community of learners. The premise is based on a belief that students need to be assisted in becoming active in the learning process with the teacher becoming a facilitator of learning rather than the traditional dispenser of knowledge. Brilhart (1982) suggests the view that learning is much more than the acquisition of actual information and skills. "Learning has come to mean any change that comes about in a person due to experience; education as the

structuring of situations in which change will be facilitated" (p. 290).

Three kinds of circumstances are cited by Harnack and Fest (1964) as operating to bring together the members of a discussion group, including casual circumstances, voluntary association, or as a result of some organizational requirement.

Implied . . . is that the group's goal is to seek--in the best interests of the group and the circumstances--the truth, the best answers, the wisest decision, or the most practical course of action at any given point in time (Potter & Anderson, 1976, p. 2).

When deciding to implement group discussion, Woeste (1967) states three important assumptions the adult educator is making. First, the educator assumes that a climate will exist in the group so that individuals will interact and feel free to enter into discussion, test their ideas, and evaluate ideas suggested by others. Second, the educator is assuming that the members of the discussion group are familiar with and understand the content to be discussed and are able to verbalize their thoughts. Third, the educator is assuming that the individuals involved have sufficient experience in discussion groups to perform effectively as group members.

Discussion provides an avenue to meet a variety of educational objectives. Lowman (1984) suggests that discussion is most useful to teach the process of learning, identified as thinking. Discussion is also considered to be a particularly effective way of revealing learner attitudes in addition to increasing learner involvement. The technique can also promote learner rapport, independence, and motivation.

Small group discussion. Brilhart (1982, p. 4) defines small group as:

. . . a group of a size such that members can all perceive each other as individuals with awareness of the role of each member, who meet face-to-face, share some identity or common purpose, and share standards for governing their activities as members.

Bormann (1975) suggests group discussion refers to one or more meetings of a small group of people who thereby communicate, face-to-face, in order to fulfill a common purpose and achieve a group goal. The definition implies several characteristics of the technique as:

- (1) The number of members is small enough for each to be aware of and have some reaction to each other (from three to rarely more than 15 members).
- (2) There is a mutually interdependent purpose so that the success of each member is contingent upon the success of the entire group in reaching this goal.
- (3) Each person has a sense of belonging, of being a part of the group.
- (4) Oral interaction is used, involving speech communication via both verbal and nonverbal symbols.
- (5) A sense of cooperation exists among the members.

The value of discussion is noted by Wagner and Arnold (1965) in four ways. First, discussion allows for the application of empirical thought to the processes of group deliberation. Second, some problems can be more accurately and efficiently solved by groups than by individuals. Third is the fact that those who share in forming decisions are usually willing to support decisions afterward. Finally,

experience in problem-solving discussion helps to establish habits of thinking and communication that prove valuable in other human activities.

Limitations of the strategy, as noted by Harnack and Fest (1964), include:

- (1) Discussion consumes time.
- (2) Discussion technique spreads responsibility for quality contribution.
- (3) Technique may be limited by diverse and conflicting value systems of participants.
- (4) Discussion is poorly suited for providing emergency decisions.
- (5) Discussion technique may be unable to cope with effects of status differences within the group.

In addition, identification and/or arrangements for the physical set-up for small group discussion can provide a barrier in the use of the technique.

Upon considering small group discussion as a teaching-learning method, the teacher takes a much more subsidiary role. Figure 3 depicts the communication process as noted by group discussion in contrast to Figure 4 which depicts communication patterns in formalized teaching, using lecture as an example (Hills, 1979, p. 58). The major role of the educator is to make sure that the purpose of the particular strategy or technique is fulfilled in addition to encouraging the student to exchange ideas and seek and/or give help.

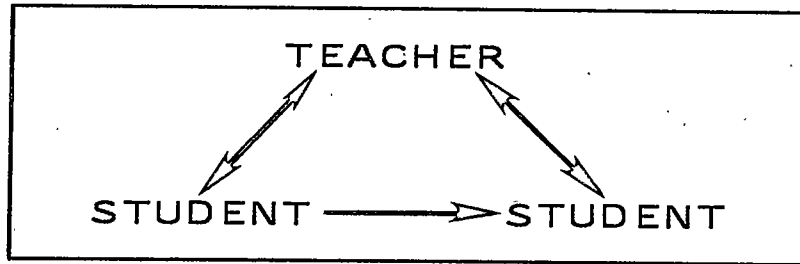


Figure 3. Communication pattern represented by small group discussion.

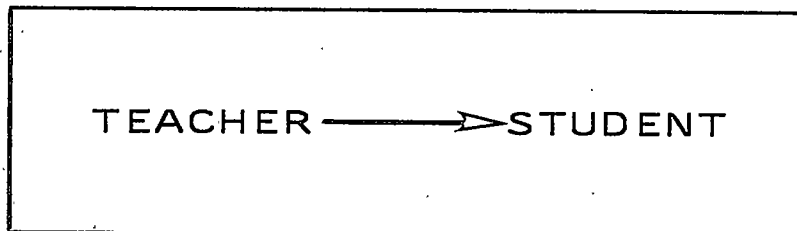


Figure 4. Communication pattern represented by formalized teaching method of lecture.

Case study. Brillhart (1982, p. 287) defines case discussion as "a learning discussion beginning with consideration of a specific problem or 'case' about which group members exchange perceptions and ideas, as possible solutions." Cooper (1981) defines a case as a well-written description of a series of incidents or a particular situation, written in as much detail as possible.

In conducting a case study, it is the teacher who listens and asks questions; the students define the elements, analyze the problem, propose solutions, and begin to gain confidence in their ability to come up with answers (Gorman, 1969, p. 109).

Synonyms for the term include case analysis technique, case conference discussion, and case method.

The case study technique has application to a wide range of problems and consists of presenting a discussion group with a description of a situation which the members are first to examine and then to suggest procedures for handling (Harnack & Fest, 1964). Dunn and Dunn (1978, p. 74) state, "A case study stimulates and helps to develop analytical skills." The format also provides the following:

- (1) A strategy for developing material within the student's frame of reference.
- (2) An approach that can be stimulating and meaningful if student identification is fostered and debate is structured to understand different points of view on recognized problems and situations.
- (3) Safe, nonthreatening situations for students who can enter the analysis without direct personal effect.
- (4) Training and development in problem solving, analytical skills, arriving at conclusions, and planning for new directions in learning situations and in real life (Dunn & Dunn, 1978, pp. 74-75).

Format for case studies may be written as very short stories, audio or videotaped dramatizations, films, psychodramas, news events, or historical happenings -- real or fictional. The focus should be on a single event, incident, or situation. Critical to the success of this small-group technique is the relevance; that is, the reality or potential credibility related to the frame of reference of the students. Andrews (1960, p. 215) states, "A good case is the vehicle

by which a chunk of reality is brought into the classroom to be worked over by the class and instructor."

Research Findings Regarding Lecture
and Discussion Strategies

The effectiveness of lecture compared with discussion or other instructional techniques has been documented in the literature for decades. The following statements summarize findings of Verner and Dickinson (1967) and other researchers relative to associated characteristics and comparative effectiveness:

- (1) Populations included pre-adult students enrolled in classes conducted by educational institutions, and adults either in classes or in other kinds of instructional situations.
- (2) Immediate or delayed recall of factual information has been the major basis for measures of learning achieved. In addition, learning has also been measured by degree of modification of specific attitudes toward technique. Bane (1931), based on a series of experiments with lecture and discussion employing six instructors in three colleges, concluded two major points: (a) lecture and group discussion are approximately equal in effectiveness when the criterion is immediate recall of facts, and (b) discussion results in greater retention of measured information than does lecture.
- (3) Captive participants comprise populations readily available for study and experimentation; research

design with this population has involved lecture as an instructional technique used in class method and for acquisition and retention of information. In addition, effect of class size on learning has been a point of investigation with the majority of studies finding that class size was not a significant variable.

- (4) Verner and Dickinson (1967) note the 1953 work by Bloom regarding the variable of student response. Lecture was successful in securing attention, but evoked primarily those thoughts which were appropriate for following and comprehending of information.
- (5) Form of presentation of factual information has been explored relevant to order of material presented, length of sentences, difficulty of material, cultural level of student, repetition of material, visible actions of lecturer, and delivery style (Hildebrandt & Stevens, 1963; Jersild, 1928; Kramer & Lewis, 1951). Hovland, Janis, and Kelly (1953) indicate that variables such as credibility of the lecturer, order of presentation, presentation of one side of an issue versus presentation of both sides, and emotionality of argument are factors in determining the effect of a lecture. McKeachie (1963) cites the Yale studies as indicating that the greatest change in reported behavior occurred in those groups to which a minimally fear-arousing lecture was given.

- (6) With respect to immediate recall, a "preponderance of the evidence indicates the utility of the lecture when the instructional objective involves the immediate recall of information. . . ." (Verner & Dickinson, 1967, p. 89).

It is evident from the work by Verner and Dickinson (1967) that as early as the 1930's, researchers were investigating the strategies of lecture and group discussion in light of acquisition and retention of information. Stovall (1956, p. 10) posed the question relevant to the inquiry into effectiveness of instructional strategies as:

What are the comparative values of the lecture and group discussion for increasing students' knowledge, improving their ability to think critically, and as a means of developing more democratic attitudes?

Ricard (1946) concluded from a series of experiments at Northwestern University involving pre-tests and end-tests, that "teacher-led" discussion produced improved results by 17%. A follow-up six months later indicated the discussion sections scored 56% higher than their matched lecture sections. Two studies investigating immediate recall further substantiated the earlier findings by Bane (1931). Gerberick and Warner (1936), in a study comparing lecture and discussion strategies in the teaching of American Government at the University of Arkansas, revealed little difference in the ability to impart information. Johnson and Smith (1953) also corroborated previous findings in a study of effects of different types of leadership in college classrooms, concluding that in terms of immediate recall, no significant differences in effectiveness of the two methods existed.

Palmer and Verner (1959), investigating techniques, conditions, and situational contexts, compared three instructional strategies: lecture, discussion, and lecture-discussion. Air Force officers and cadets comprised the 130 students enrolled in aviation physiology classes, ranging in age from 19 to 27. A standardized aptitude test was used to determine acquisition and recall of knowledge. Using a pre-test to measure students' knowledge of the content at the beginning of the course, a 50-item true-false test was constructed and administered to the three groups. The same test was administered to the three groups at the end of the course. On the final test, no significant differences existed among the three groups. As an added check on the results of the test, the scores for the three groups were computed from the results attained by the students on an Air Force standardized test, described as a 50-item multiple-choice test designed to determine students' status with respect to minimal content required. The scores from this test showed a significant difference between lecture and lecture-discussion groups indicating a gain in achievement by the lecture group.

In the work by Verner and Dickinson (1967), research identified with adult groups outside the institutional, classroom setting has been varied. Variables investigated include the participant, form of presentation, comparative effectiveness, and attitudes and behavior. Numerous studies have investigated behavior of participants during a lecture. With regard to form of presentation, studies suggest the intelligibility of a lecture tends to increase as the educational level of the audience increases. Vernon (1950) suggests that, in general,

very little of a lecture can be recalled except in the case of listeners with above average education and intelligence. Goldin (1948) and Vernon (1952) suggest that learning from lecture is related to the formal educational level of the participant, and those with more education learn more from a lecture than those with less. Length of time has also been established as an important factor; Trenamen (1951) suggests that learning begins to diminish after 15 minutes and at 45 minutes the learner is in danger of losing much of the material acquired earlier. Verner and Dickinson (1967) suggest the optimum length of a lecture appears to be somewhere between 20 and 30 minutes. The authors further note the importance of the meaningfulness of the material to the listener. Topic and subject matter are more important than the lecturer, with interest generally greatest when the content is only partially understood.

Variables investigated relevant to comparative effectiveness also include comparisons between the lecture technique and learning devices (e.g., textbook, programmed text, teaching machine, illustrated manual, film, television), illustrative devices (e.g., charts, graphs), and instructional processes (e.g., discussion, dialogue, dramatization, recordings, panel discussion). Verner and Dickinson (1967, p. 93) conclude: "Other instructional techniques as well as various instructional devices used to augment the lecture will increase its effectiveness with adults." However, with regard to alternative instructional techniques, studies involving the comparison of lecture and discussion in acquisition of information have shown no significant difference between the two techniques (Carison, 1953; Hill, 1960).

Oddi (1983), in a continued review of the literature, notes the following relative to Verner and Dickinson's conclusions in that:

. . . the lecture method is an effective approach for conveying information to adults if it is properly used, that the nature of the learning task to be accomplished determines whether or not the lecture method is appropriate, and that other instructional techniques and devices should be used in conjunction with lecture to increase its effectiveness for adults (p. 222).

She goes on to note that in the years since the review by Verner and Dickinson, there has been a paucity of research on the lecture technique in the adult education field. The investigations noted were conducted in diverse subject areas (e.g., graduate students, Adult Basic Education, community college students) and the majority were concentrated in a classroom setting. For the most part, research designs encompassed experimental or quasi-experimental studies with random assignment of treatment to pre-existing groups. Research investigations, relevant to the effectiveness of the lecture method, were, for the majority, conducted over the minimum time period for completion of a given course. Most studies measured cognitive achievement with a variety of instruments used to measure acquisition of knowledge.

Oddi (1983) suggests that the studies under review were broadly concerned with the effectiveness of lecture as compared with other methods in relation to acquisition of knowledge and attitudes of the learner. A study by Slaten (1973) involving 72 pre-adult learners compared lecture to a group laboratory discussion session with learners tested for application and recall ability following the course. No significant difference in mean achievement scores was found; a trend

was noted, however, suggesting lecture was better for assisting learners in the recall of facts. Rothman (1980), studying a sample of 48 graduate students, investigated cognitive gain by implementing the case method/discussion technique and lecture. Although marginal, the lecture technique was found to yield significantly better results in cognitive gain.

Attitudes and Instructional Strategies

A variety of efforts have been made to determine the efficiency of a technique in addition to determining the attitude toward strategies of instruction. Palmer and Verner (1959) suggest there are innumerable variables which can influence the efficiency of a technique including instructor competence, the nature of the content, the experience of the group, and the students' response to the instructional process. To investigate the attitude variable, the authors continued their investigation of three instructional strategies by ascertaining attitudes of 130 Air Force officers and cadets. To assess student satisfaction with the three techniques studied -- lecture, discussion, lecture-discussion -- both oral and written critiques were used. A standard was designed as a measure of course critique, involving two scales: (a) quality of course, and (b) morale. In terms of student satisfaction, the lecture-discussion group indicated more satisfaction with its technique than did the other two groups, with statistically significant differences between the lecture and lecture-discussion on both quality and morale. Stovall (1956) cites a study wherein efforts were made by lecture to persuade a group of industrial supervisors to

accept a change in work methods. The group split sharply, 50% opposing the change and 50% in favor. As a result of group discussion, a similar group was in 95% agreement to accept the change or to compromise. Stovall (1956, p. 12) further states, "The best research which has been reported in this area indicates that group discussion is distinctly superior to lecture in changing attitudes and affecting behavior." Casey and Weaver (1956) substantiate the previous conclusion, based on their findings establishing the superiority in attitudes for small-group discussions as compared to lectures. Verner and Dickinson (1967) suggest that conclusions are overwhelming regarding the superiority of discussion in favor of the lecture in attitudinal and behavioral change. However, conclusions must be approached with some caution. "In most cases, the studies cited . . . involve comparisons between two methods of adult education rather than two instructional techniques within a single method" (Verner & Dickinson, 1967, p. 93).

CHAPTER 3

PROCEDURES

The present study was designed to examine the effects of instructional strategies, attitudes, and various personal descriptors of adult learners on learning outcome, while involved in a legislatively mandated educational program. In the previous chapter, a review of the literature offered information related to the service provider, mandatory adult education, a conceptual model of andragogy and pedagogy, and instructional design as it relates to the teaching-learning transaction. The procedures chapter focuses upon the methodology that was implemented in the study. It includes a description of the population studied, research design, variables and instrumentation, hypotheses, and method of data analysis.

Population

In line with regulations from the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) as amended (Public Law 92-516) and the Montana Pesticide Act of 1972, amended in 1983, the Montana legislature mandated the implementation of a statewide pesticide act for licensing users of restricted-use pesticide compounds. Within the state of Montana, there are over 8000 private pesticide applicators who may choose to apply for relicensure and participate in a mandatory pesticide recertification program. The educational program is offered

on a rotating basis in designated requalifying sites throughout the state. The state is divided into five districts; each district is assigned a specific year for providing the recertification program.

The majority of private pesticide applicators within the state are farmers and ranchers, applying for relicensure in order to purchase and apply restricted-use compounds deemed as dangerous chemicals by the Environmental Protection Agency. The procedure followed by the private applicator is to attend six hours of educational programming over a five-year period, with the educational program developed and delivered by the Montana State University Extension Service, in conjunction with the Montana Department of Agriculture.

The population for the study included all licensed applicators of restricted-use pesticides in the state of Montana applying for relicensing during the months of January through April, 1987. Eight counties served as requalifying sites for the 11-county Montana District V recertification program, as noted on the map in Appendix B. A total of 654 pesticide applicators comprised the study population, with an age range of 16 to 83 years. For reasons to be discussed in the data collection procedure section, four county requalifying sites and specific data items from some of the subjects were not usable. Thus, the total number of individuals from which usable data were gathered was 654.

Research Design

Quasi-experimental Design

There are many natural social settings in which the researcher can introduce something similar to an experimental design into the scheduling of data collection procedures (e.g., the when and to whom of measurement), even though full control over the scheduling of experimental stimuli (the when and to whom of exposure and the ability to randomize exposures) is lacking. Wiersma (1986, p. 139) offers the following definition of quasi-experimental research as involving "the use of intact groups of subjects in an experiment, rather than assigning subjects at random to experimental treatment." Quasi-experimental designs require that the researcher be thoroughly aware of which specific variables the particular design fails to control. With the present study employing a quasi-experimental design, the focus of the research design section is directed toward procedures employed to control such variables.

Equivalence of groups. In the use of two or more intact groups, the credibility of the research depends on the extent to which the groups are similar on relevant variables. Although the groups were not randomly assigned, the presence of important antecedent information about the groups provides an argument for group similarity. For internal validity, the researcher has attempted to establish the degree of equivalence between groups by considering characteristics or variables that may be related to the variables under study. In the present study, four of the independent variables (age, level of

education, years in the recertification program, years in county residence), in addition to applicator status, were used as antecedent information. Detailed information substantiating the similarity of the two groups, by three of the six independent variables, is presented in Chapter 4 (Tables 5, 6, and 7). No significant differences existed between the groups on the characteristics analyzed, suggesting that the groups were similar even though subjects were not selected at random. An additional factor supporting the equivalence of the population was the previous attendance of all participants in an initial pesticide applicator certification program, requiring the passage of a written examination monitored by the Montana Department of Agriculture.

Post-test only, non-equivalent multiple-group design. Wiersma (1986) suggests that a quasi-experimental design of this type dictates that one group receives the experimental treatment while a second group receives a second experimental treatment. In the present study, one group of private applicators received Experimental Treatment Number One, identified as the instructional strategy of lecture. A second group of private applicators received Experimental Treatment Number Two, identified as the instructional strategy of small group discussion, implemented by a case study approach.

Extraneous variables. In order to reduce the influence of extraneous variables on the dependent variable, the following were identified as methods of control:

- (1) All applicators applying for relicensing of restricted-use pesticide chemicals attended the six-hour recertification program in its entirety.

- (2) All applicators received educational information relevant to the Pesticide Safety criteria by one of two methods, lecture or by small group discussion, which was pre-assigned to requalifying sites by the researcher.
- (3) All applicators completed the data collection instruments immediately following the delivery of the instruction relevant to the Pesticide Safety criteria.

An additional method used to control for contaminating variables was to build potentially extraneous variables into the design as attribute variables, providing the opportunity to observe interactive or main effects of the attribute variables (age, level of education completed, years in recertification program) with the designated independent and dependent variables.

Data Collection Procedure

Authorization and Initial Contact

Authorization from the Acting Director and the Pesticide Specialist for the Montana State University Extension Service was obtained during November, 1986, enabling the researcher to proceed with the data collection process. An initial step was to contact the county extension personnel involved in the planning and implementation of the 1987 pesticide recertification program. During the December, 1986 county agent training session, the investigator informally discussed with the appropriate agents the design of the study and the request for assistance. County personnel from the eight requalifying sites in

District V agreed to participate in the study and, at the same time, provided preliminary estimates of applicant number by site.

Since the primary purpose of the study was the investigation of the effect of selected instructional strategies on learning outcome, it became necessary to assign a specific strategy to each of the participating requalification sites. Estimated applicant number, by site, was initially used as the deciding factor in assigning the instructional strategy of lecture or of small group discussion. Also, a key factor was the availability of facilities suitable for the division of a large group into multiple groups of seven to ten participants.

Based on the identification of requalification sites and assignment of instructional strategy, the next step was to ascertain the program schedule between January 15 and April 30, 1987. Table 2 provides the recertification program schedule for the original eight counties involved in the study. While the original number of requalification sites was eight, one county was unable to participate because of inadequate facilities for accommodating the small group discussion format. A second county initiated an effort to provide a lecture format, but because of personnel changes at the last minute, was unable to carry out the program in the necessary format, and therefore could not be included in the study. A third county had previously divided the pesticide recertification program into two consecutive weekly sessions of three hours each, which was inconsistent with the original program plan of one six-hour session. Therefore, the county could not be included in the study. A fourth county could not be included because the recertification program was held prior to the date the

researcher could begin the data collection process. The configuration for the implementation of the instructional strategies in participating counties is provided in Table 3.

Table 2. Pesticide applicator requalification schedule by county site.

County	Program Date
Judith Basin	January 29, 1987
Big Horn	February 10, 1987
Fergus*	February 12, 1987
Yellowstone*	February 13, 1987
Stillwater*	March 11, 1987
Carbon*	March 11, 1987
Musselshell*	March 12, 1987
Sweet Grass	March 19, 1987

*Counties participating in the study

Table 3. Breakdown by county of population number.

Lecture		Small Group Discussion	
County	Number of Applicants	County	Number of Applicants
Fergus	181	Stillwater	126
Yellowstone	129	Musselshell	67
Carbon	97		
Musselshell	54		
Total	461		193

As noted, one county served as the basis for the implementation of both lecture and small group discussion. Musselshell County provided an opportunity for the total group to be split into two groups (i.e., 54 in the lecture group and 67 in the small group discussion). The

participants in small group discussion were taken into a separate facility at the same time and the other group received the lecture. However, prior to and following the presentation of the safety information, the participants were involved in the same sequence of program events.

In addition to the identification of the recertification program dates, the process for identifying personnel needed for the implementation of each of the instructional strategies by county was necessary. After discussion with county agent personnel, the decision was made to deliver the Pesticide Safety information using the lecture strategy in the designated counties, scheduling this component at the same point during the six-hour program at each site. Plans were also made with county agent personnel, implementing the small group discussion strategy, for the researcher to meet with volunteer discussion leaders. One volunteer from each group of seven to ten applicators was selected to meet an hour ahead of the scheduled recertification program. Format, materials, and procedures were explained to the volunteer group leaders. At the appropriate time in the six-hour program, consistent with the timing of the lecture strategy, the volunteer discussion leaders began the small group discussion strategy by implementing a case study approach. A discussion of the strategies and materials is provided in the following section.

Variables and Instrumentation

Dependent Variable

The dependent variable, identified as learning outcome, was ascertained by selected questions from the Montana Private Applicator Recertification Examination. Items related to seven criteria, mandated by the Environmental Protection Agency (EPA) and the Montana Department of Agriculture (DOA), comprise the basis for the examination in its entirety and are based on the body of literature and knowledge assembled by the EPA and deemed necessary for applicators of restricted-use compounds. Twenty items relevant to the fifth criterion, Pesticide Safety, were randomly arranged within the original examination. For the present study, however, the 20 forced-choice questions were extracted from the total examination and arranged in order duplicating the sequence of the original examination. A sample of the test is found in Appendix C.

Validity. "Validity refers to the appropriateness of the interpretation of the results of a test or inventory, and it is specific to the intended use" (Wiersma, 1986, p. 290). In the case of the Montana Private Applicator Recertification Examination, a process for the establishment of content validity (that is, establishing the representativeness of the test items with respect to the domain of skills, task, or knowledge) was initially used by the Extension subcommittee responsible for the design of the test items. The general and applied principles were reworded in behavioral terms, compatible with realistic experiences of the applicators. During 1984, questions

were distributed to all members of the statewide Pesticide Education Task Force for evaluation relevant to the representativeness of each question. Individuals with expertise in the area of textiles, clothing, and farm safety were also included in the item evaluation process, as were members of the Department of Agriculture involved in the recertification program. Implementation throughout the 1986 District IV relicensing process provided an additional opportunity for the Extension Service Pesticide Coordinator to identify and exclude questions surfacing as problem items by applicators and committee personnel.

Reliability. Data relevant to the consistency of the examination in measuring knowledge of pesticide use were unavailable to the researcher from either of the cooperating agencies. Therefore, using the Cronbach alpha formula, the researcher calculated the reliability coefficient of .91 for the 20-item instrument, relevant to Pesticide Safety. The reliability coefficient, a measure of the internal consistency or homogeneity of the test material, is indicative of high intercorrelations among the items on the test and suggests that the items are measures of much the same attribute.

Format. The one-page recertification examination has two components. The first 10 questions are true-false items. The remaining 10 questions are of a multiple-choice design. Computerized scoring was used to obtain the total number of correct items, representing the dependent variable of learning outcome.

Independent Variables

The six independent variables included in the study were: (a) instructional strategy, (b) attitude toward mandatory pesticide education, (c) attitude toward instructional strategy received, (d) age, (e) level of education completed, and (f) years in the recertification program. Each of the variables is described in the following paragraphs.

Instructional strategy. Using a systems model from the instructional design literature (Dick & Carey, 1978), the educational program was developed. The initial development of the instruction, noted as the identification of the goal, objectives, criterion-referenced evaluation, and implementation schedule was identical for the two groups. The point of differentiation within the instructional development plan was in the selection and implementation of the instructional strategy and accompanying instructional medium. Two strategies were selected for use as the avenues of information dissemination, lecture and small group discussion, with the latter implemented by a case study format. The lecture strategy served as Treatment Number One; the small group discussion served as Treatment Number Two. One of the seven criteria mandated for inclusion in the statewide recertification program, Pesticide Safety, comprised the subject content for both strategies.

Attitude variables. Selected attitudes comprised two of the independent variables for the study. Attitude toward mandatory pesticide education was the first. A five-item Likert scale was used

to assess the degree to which pesticide applicators agreed or disagreed with a statement relative to their attitude toward mandatory pesticide education. The second, pesticide applicator attitude toward the instructional strategy received, was determined by nine questions. Responses were based on five-item Likert scales, with specific attention to: (a) instructional strategy received, (b) importance of experience and previous information relevant to pesticide safety, and (c) use of informational materials. Appendix D provides an example of the instrument.

The establishment of content validity for the instruments measuring the attitudinal variables was approached initially by determining the face validity of the questions, with an assembly of test items the first step in the validation process. Individuals familiar with the Montana Pesticide Recertification Program were asked to review a list of questions and select those most appropriate for the purpose of identifying applicator attitude toward mandatory pesticide education and attitude toward instructional strategy received. Individuals familiar with attitude surveys from the field of adult education were also asked to complete the same task.

A second phase in the content validation process was the establishment of logical validity, which finds its greatest use in measures of achievement and in measures of newly defined characteristics where no direct criterion external to the measure itself seems available (Helmstadter, 1970). Evaluators were asked to consider two factors: (a) careful definition in behavioral terms of the content area to be

measured, and (b) a breakdown of the total subject-matter area defined into categories which represent major aspects of the content area.

Demographic variables. The General Information Questionnaire (GIQ) served as the instrument to obtain the relevant demographic information. Appendix E provides an example of the questionnaire. Interval categories were used to identify the information relevant to age, level of education completed, years in the recertification program, and years in residence within the county. Name and county requalifying site were also requested of each pesticide applicator, with the name of the individual used only as a method of matching the GIQ with the other instruments of data collection. Confidentiality was assured verbally by the researcher at the time of data collection. In addition, each data set was assigned a number representing each participant with ensuing data compilation by numbered instrument rather than by name.

Statistical Hypotheses

The statistical hypotheses were designed to answer five of the seven research questions, as stated in Chapter 1. Each hypothesis is stated in the null form. All hypotheses were tested with non-directional alternative hypotheses at the .05 level of confidence.

- (1) H_0 No significant interaction exists between the independent variables of instructional strategy and attitude toward mandatory pesticide education, on learning outcome.

- (2) H_0 No significant main effects exist among the independent variables of instructional strategy and attitude toward mandatory pesticide education, on learning outcome.
- (3) H_0 No significant interaction exists between the independent variables of instructional strategy and attitude toward instructional strategy received, on learning outcome.
- (4) H_0 No significant main effects exist among the independent variables of instructional strategy and attitude toward instructional strategy received, on learning outcome.
- (5) H_0 No significant interaction exists between the independent variables of instructional strategy and age, on learning outcome.
- (6) H_0 No significant main effects exist among the independent variables of instructional strategy and age, on learning outcome.
- (7) H_0 No significant interaction exists between the independent variables of instructional strategy and level of education completed, on learning outcome.
- (8) H_0 No significant main effects exist among the independent variables of instructional strategy and level of education completed on learning outcome.
- (9) H_0 No significant interaction exists between the independent variables of instructional strategy and

- years in the pesticide recertification program, on learning outcome.
- (10) H_0 No significant main effects exist among the independent variables of instructional strategy and years in the pesticide recertification program, on learning outcome.
- (11) H_0 No significant relationship exists between the dependent variable of learning outcome and the independent variables of: (a) instructional strategy, (b) attitude toward mandatory pesticide education, (c) attitude toward instructional strategy received, (d) age, (e) level of education completed, and (f) years in the pesticide recertification program.
- (12) H_0 No significant inter-correlation(s) exist among the independent variables of: (a) instructional strategy, (b) attitude toward mandatory pesticide education, (c) attitude toward instructional strategy received, (d) age, (e) level of education completed, and (f) years in the pesticide recertification program.
- (13) H_0 No significant multiple correlations exist between the dependent variable of learning outcome and the set of independent variables, identified as: (a) instructional strategy, (b) attitude toward mandatory pesticide education, (c) attitude toward

instructional strategy received, (d) age, (e) level of education completed, and (f) years in the pesticide recertification program.

Data Analysis

Analysis of frequency and percentage distributions for the personal descriptors of the population was conducted in order to provide a profile of the rural private pesticide applicator. In addition, Chi square tests of independence were conducted to determine whether differences between personal descriptors existed in the population.

Frequency and percentage distributions were also analyzed to assess attitudes of the rural learners toward the legislatively mandated educational program and toward the instructional strategy received. Three methods of analysis were used to test the 13 null hypotheses. Hypotheses 1 through 10 were tested using two-way analysis of variance (ANOVA). When a significant main effect difference was found and the df equaled or exceeded two (2), all possible pairwise comparisons were tested with the 'Scheffe' post hoc multiple comparison test. Hypotheses 11 and 12 were tested by the use of the Pearson product-moment correlation coefficient. The final hypothesis to determine the contribution of the independent variables to the criterion variable was tested by the use of a multiple correlation equation.

CHAPTER 4

FINDINGS AND ANALYSES

This chapter presents the descriptive findings and statistical analysis of the data obtained from the 654 pesticide applicators comprising the study population. The descriptive findings provide a profile of the population, including data about age, level of education completed, applicator status, years in pesticide recertification program, and years in county residence. In addition, data from analyses of selected personal descriptors are provided, verifying the similarity of the population. Also included are the findings relevant to applicator attitude toward the legislatively mandated pesticide program and the instructional strategy received during the educational program. The statistical data relevant to the performance on the dependent and independent variables are presented by individual hypothesis and include the following information: (a) hypothesis statement in the null form, (b) table(s) of statistical results, (c) discussion relevant to acceptance or rejection of the hypothesis, and (d) interpretation of results.

Descriptive FindingsDemographic Information

As depicted in Table 4, private pesticide applicators ranged in age from 16 to 83; 60% were between 31 and 55 years of age. The mean

Table 4. Frequencies and percentages for demographic characteristics of 654 pesticide applicators, District V, Montana.

Variable	Frequency*	Percent
<u>Age:</u>		
16-17 years	4	1.0
18-30 years	79	13.0
31-55 years	353	60.0
56 and over	<u>157</u>	<u>26.0</u>
Total	593	100.0
<u>Level of Education Completed:</u>		
1-8 years (elementary)	31	5.1
1-4 years (high school)	302	50.2
1-4 years (college)	246	40.9
5 years college plus	<u>23</u>	<u>3.8</u>
Total	602	100.0
<u>Years in Recertification Program:</u>		
1-2 years	69	12.6
3-4 years	55	10.1
5-6 years	116	21.3
7 years plus	<u>306</u>	<u>56.0</u>
Total	546	100.0
<u>Applicator Status:</u>		
Commercial status	32	5.0
Private status	543	90.0
Other	<u>27</u>	<u>5.0</u>
Total	602	100.0
<u>Years in County Residence:</u>		
1-5 years	7	1.2
6-10 years	575	95.8
11-15 years	<u>18</u>	<u>3.0</u>
Total	600	100.0

*All totals may not equal 654 due to missing data.

age was 41.37 years. Fifty percent of the applicators responding had completed one to four years of high school, while 41% had completed one to four years of college. Fifty-six percent of the respondents had participated in the recertification program for seven years or more. Ninety-six percent of the pesticide applicators had lived in their resident county for six to ten years. Ninety percent of the 602 responses to the question of applicator status were designated as private pesticide applicators.

Information substantiating the similarity of the groups by variable is presented in Tables 5, 6, and 7. Chi-square was used for this purpose. No significant differences were found to exist between the two groups, suggesting that the participants in the groups were similar by characteristic, even though not by random selection.

Table 5. Contingency table showing relationship between instructional strategy and age.*

Instructional Strategy		Age			Total
		18-30	31-55	56-Plus	
Lecture	N	54	250	102	406
	%	9.17	42.44	17.32	68.93
Small Group Discussion	N	25	103	55	183
	%	4.24	17.49	9.34	31.07
Total	N	79	353	157	589
	%	13.41	59.93	26.66	100.00

* $\chi^2 = 1.753$; $p = .416$

Table 6. Contingency table showing relationship between instructional strategy and level of education completed.*

Instructional Strategy		<-----Level of Education----->				Total
		<u>Elem.</u> 1-8 yrs	<u>High</u> 1-4 yrs	<u>College</u> 1-4 yrs	<u>Col. +</u> 4 yrs +	
Lecture	N	22	217	161	16	416
	%	3.65	36.05	26.74	2.66	69.10
Small group Discussion	N	9	85	85	7	186
	%	1.50	14.12	14.12	1.16	30.90
Total	N	31	302	246	23	602
	%	5.15	50.17	40.86	3.82	100.00

$$*\chi^2 = 2.663; p = .446$$

Table 7. Contingency table showing relationship between instructional strategy and years in the pesticide recertification program.*

Instructional Strategy		Years in <---Pesticide Recertification Prog.--->				Total
		1-2 yrs	3-4 yrs	5-6 yrs	7 yrs +	
Lecture	N	52	38	71	222	383
	%	9.52	6.96	13.00	40.66	70.15
Small group Discussion	N	17	17	45	84	163
	%	3.11	3.11	8.24	15.38	29.85
Total	N	69	55	116	306	546
	%	12.64	10.07	21.25	56.04	100.00

$$*\chi^2 = 6.196; p = .102$$

A final component included in the descriptive profile is the data relevant to applicator attitude toward a legislatively mandated educational program and attitude toward the instructional strategy received during the mandated program. Tables 8 and 9 provide information relevant to the research question directed toward mandated education, while Tables 10, 11, and 12 address findings from the second research question regarding attitude toward instructional strategy received.

General Questions to Be Answered

Research Question #1. What is the attitude of rural adult learners toward a legislatively mandated educational program?

Table 8. Frequency and percentage distributions for pesticide applicator response to the question: If the pesticide education program had NOT been mandated by Montana law, would you have attended a program of this type voluntarily?

Attitude	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Strongly agree	76	12.8	76	12.8
Agree	326	55.1	402	67.9
No opinion	99	16.7	501	84.6
Disagree	77	13.0	578	97.6
Strongly disagree	14	2.4	592	100.00

Over 67% of the responding pesticide applicators indicated they would have participated voluntarily had the program not been legislatively mandated. Only 15% disagreed or strongly disagreed with participation on a voluntary basis. This suggests that the need for pesticide safety information is important enough to participants that

if the program were not legislatively mandated, they would attend anyway.

Table 9. Frequency and percentage distributions for pesticide applicator response to the question: Do you think a pesticide education program such as you are participating in should be legislatively mandated?

Attitude	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Strongly agree	63	10.7	63	10.7
Agree	200	34.0	263	44.7
No opinion	106	18.0	369	62.8
Disagree	155	26.4	524	89.1
Strongly disagree	64	10.9	588	100.0

Approximately 45% of the respondents indicated their agreement in favor of a legislatively mandated pesticide education program. Slightly over 37% of the respondents indicated their disagreement with the concept.

Research Question #2. What is the attitude of rural adult learners toward the instructional strategy received?

Data relevant to applicator attitude toward instructional strategy received are related to three areas, identified in Tables 10, 11, and 12 as: (a) appropriateness of strategy received (lecture or small group discussion), (b) role played by experience, and (c) use of supportive materials. Analysis of descriptive data indicated 94% of the applicators were favorable to the strategy they received during the pesticide program. Eighty percent indicated their prior experience did not eliminate the need for the safety information, while 66% indicated

their experience was sufficient to answer the questions involved in daily practice.

Table 10. Frequency and percentage distributions for pesticide applicator response to questions regarding the appropriateness of strategy received (lecture or small group discussion).

Attitude	QUESTION 1 Was the method of instruction you received of help to you in understanding the information?		QUESTION 4 Would you participate in another program using the same instructional strategy as you received today?		QUESTION 7 Did the person presenting the information do so in a clear, concise manner allowing for questions and interaction from the participants?	
	N	%	N	%	N	%
Strongly agree	116	19.3	80	13.4	150	15.1
Agree	451	75.0	445	74.5	406	67.9
No opinion	25	4.2	51	8.5	33	5.5
Disagree	8	1.3	18	3.0	9	1.5
Strongly disagree	1	0.2	3	0.5	0	0.0

Ninety-four percent of the participants agreed that the method of instruction was of help in understanding the information; 87% indicated they would participate in another program using the same strategy as the one they received. Ninety-three percent of the participants thought that the person presenting the information did so in an acceptable manner. With regard to Table 11, 80% of the participants disagreed with the statement that their experience eliminated the need for information. Ninety percent agreed that based on the information received, they would change their behavior. Sixty-six percent agreed that their experience was sufficient to answer questions about pesticide safety. Table 12 indicates that 91% of the respondents would

Table 11. Frequency and percentage distributions for pesticide applicator response to questions regarding role played by experience.

Attitude	QUESTION 2 Does your experience with pesticides eliminate the need for information relevant to the safe use of chemicals?		QUESTION 5 Based on the information received today in the Safety portion of the program, will you change the way you protect yourself and your environment when using pesticides in the future?		QUESTION 8 Is the experience you bring to the pesticide education program sufficient to answer questions about the safe use of pesticides?	
	N	%	N	%	N	%
Strongly agree	15	2.5	139	23.2	40	6.7
Agree	75	12.7	399	66.7	352	59.2
No opinion	29	4.9	34	5.7	96	16.1
Disagree	347	58.6	23	3.8	94	15.8
Strongly disagree	126	21.3	3	0.5	13	2.2

Table 12. Frequency and percentage distributions for pesticide applicator response to questions regarding use of supportive materials.

Attitude	QUESTION 6 Do you think you will use the handout materials in the future for reference in the safe use of pesticides?		QUESTION 9 Would followup information provided on a regular basis in the form of a fact sheet or a newsletter, relevant to the safe handling of pesticides, be of help to you in the future?		QUESTION 11 Would you rather receive pesticide information from your peers, trained in the necessary subject matter, rather than from the Department of Agriculture or the Cooperative Extension Service?	
	N	%	N	%	N	%
Strongly agree	115	19.2	133	22.5	24	4.1
Agree	434	72.6	396	66.9	87	14.9
No opinion	34	5.7	45	7.6	174	29.7
Disagree	12	2.0	15	2.5	243	41.5
Strongly disagree	3	0.5	3	0.5	58	9.9

use the handout materials in the future. Eighty-nine percent were in agreement with the usefulness of followup information while 50% of the handout materials in the future. Eighty-nine percent were in agreement with the usefulness of followup information while 50% of the participants indicated they would rather receive educational information from the state agencies rather than from their peers.

Statistical Hypotheses

Providing the basis for the statistical analysis were 13 hypotheses, as stated in Chapter 3. The hypotheses were designed to provide a basis for testing the five remaining general research questions of the study. The results are presented and interpreted in the following section. All hypotheses were tested at $\alpha = .05$. Descriptive statistics (means and standard deviations) of scores on the dependent variables are provided in Table 13.

Table 13. Means and standard deviations for dependent variable of learning outcome by treatment.

<u><--Treatment #1--></u>		<u><--Treatment #2--></u>		<u>Total</u>	
<u>Lecture</u>		<u>Small Group Disc.</u>			
Mean	SD	Mean	SD	Mean	SD
15.5705	4.2244	14.8860	5.3888	15.3685	4.6051

Hypotheses

Hypothesis 1. No significant interaction exists between the independent variables of instructional strategy and attitude toward mandatory pesticide education, on learning outcome.

For Hypothesis 1, Table 14 indicates that the F-ratio was not significant; therefore, the null hypothesis was retained. The analysis substantiated the assumption that the variables of instructional strategy and attitude toward mandatory pesticide education do not interact on learning outcome.

Table 14. Two-way ANOVA determining interaction between instructional strategy and attitude toward mandatory pesticide education and main effects among levels of independent variables.

Source of Variation	Sum of Squares	df*	Mean Square	F	Signif. F
<u>Two-way Interaction:</u>					
Instructional Strategy and Attitude Toward Mandatory Pesticide Education	1.692	2	.846	.187	.830
<u>Main Effects:</u>					
Instructional Strategy	6.778	1	6.778	1.497	.222
Attitude Toward Mandatory Pesticide Educ.	5.318	2	2.659	.587	.556

*Critical Values, df 1, 589, alpha = .05, F = 3.86
 Critical Values, df 2, 589, alpha = .05, F = 3.02

Hypothesis 2. No significant main effects exist among the independent variables of instructional strategy and attitude toward mandatory pesticide education, on learning outcome.

No significant difference for main effects was found to exist among the independent variables of instructional strategy and attitude toward mandatory pesticide education, as noted in Table 14. Hypothesis 2 was therefore retained.

Hypothesis 3. No significant interaction exists between the independent variables of instructional strategy and attitude toward instructional strategy received, on learning outcome.

The null hypothesis was retained for Hypothesis 3; Table 15 indicates no significant interaction was found to exist between the independent variables.

Table 15. Two-way ANOVA determining interaction between instructional strategy and attitude toward instructional strategy received and main effects among levels of independent variables.

Source of Variation	Sum of Squares	df*	Mean Square	F	Signif. F
<u>Two-way Interaction:</u>					
Instructional Strategy and Attitude Toward Instructional Strategy Received	.759	1	.759	.169	.681
<u>Main Effects:</u>					
Instructional Strategy	5.722	1	5.722	1.276	.259
Attitude Toward Instructional Strategy Rec'd	38.924	1	38.924	8.680	.003**

*Critical Values, df 1, 598, alpha = .05, F = 3.86

**Significant at alpha = .05

Hypothesis 4. No significant main effects exist among the independent variables of instructional strategy and attitude toward instructional strategy received, on learning outcome.

For Hypothesis 4, a significant difference was found to exist for the main effect of attitude toward instructional strategy received, as noted in Table 15. The null hypothesis was rejected and the

alternative hypothesis stating the existence of significant main effects was accepted. A significant difference was found to exist among the mean scores on learning outcome for the two levels identifying pesticide applicator attitude toward the instructional strategy received. These data are presented in Table 16.

Table 16. Mean scores for main effect of attitude toward instructional strategy received.

	←-----Attitude-----→		
	Strongly Agree	No Opinion	Strongly Disagree
Mean	15.97	16.61	00.00
N	(116)	(486)	(00)

Participants who had stated "no opinion" regarding their attitude toward the instructional strategy received achieved a higher learning outcome score than did participants who indicated a "strongly agree" attitude toward the instructional strategy.

Hypothesis 5. No significant interaction exists between the independent variables of instructional strategy and age, on learning outcome.

No significant interaction was found to exist between the independent variables of instructional strategy and age, as indicated in Table 17. Hypothesis 5 was retained as stated.

Hypothesis 6. No significant main effects exist among the independent variables of instructional strategy and age, on learning outcome.

No significant difference for main effects was found to exist for the independent variables of instructional strategy and age; Hypothesis 6 was also retained as stated.

Table 17. Two-way ANOVA determining interaction between instructional strategy and age and main effects among levels of independent variables.

Source of Variation	Sum of Squares	df*	Mean Square	F	Signif. F
<u>Two-way Interaction:</u>					
Instructional Strategy and Age	56.946	2	28.474	1.279	.279
<u>Main Effects:</u>					
Instructional Strategy	44.786	1	44.786	2.011	.157
Age	63.567	2	31.783	1.427	.241

*Critical Values, df 1, 583, alpha = .05, F = 3.86

Critical Values, df 2, 583, alpha = .05, F = 3.02

Hypothesis 7. No significant interaction exists between the independent variables of instructional strategy and level of education completed, on learning outcome.

The two-way analysis of variance indicated that no significant interaction exists between the independent variables of instructional strategy and level of education completed, as noted in Table 18. Therefore, Hypothesis 7 was retained.

Hypothesis 8. No significant main effects exist among the independent variables of instructional strategy and level of education completed, on learning outcome.

Significant differences were found to exist for Hypothesis 8 among main effects for both of the independent variables, as identified in Table 18. Therefore, the null hypothesis was rejected and the alternative hypothesis stating the existence of significant main effects was retained.

Table 18. Two-way ANOVA determining interaction between instructional strategy and level of education completed and main effects among levels of independent variables.

Source of Variation	Sum of Squares	df*	Mean Square	F	Signif. F
<u>Two-way Interaction:</u>					
Instructional Strategy and Level of Education Completed	139.407	3	46.469	2.165	.091
<u>Main Effects:</u>					
Instructional Strategy	88.665	1	88.665	4.131	.043**
Level of Edn. Completed	229.206	3	76.402	3.560	.014**

*Critical Values, df 1, 594, alpha = .05, F = 3.86

Critical Values, df 3, 594, alpha = .05, F = 2.62

**Significant at alpha = .05

For the independent variable of instructional strategy, a difference was found to exist in learning outcome between the group receiving the lecture strategy and the group participating in the small group discussion. The 416 participants receiving the lecture strategy had a significantly higher mean score (15.57) than did the 186 applicators involved in the small group discussion format (14.82).

For the independent variable of level of education completed, a significant difference was found to exist among the mean scores on learning outcome for the four designated educational levels, as noted in Table 19.

Table 19. Mean scores for main effect of level of education completed.

	<-----Level of Education Completed----->			
	<u>Group 1</u>	<u>Group 2</u>	<u>Group 3</u>	<u>Group 4</u>
	1-8 yrs.	9-12 yrs.	13-16 yrs.	17 yrs. +
Mean	13.81	14.96	15.95	15.83
N	(31)	(302)	(246)	(23)

Significant differences, using the Scheffe' post hoc procedure, were found between the means of Group 1 and Group 3, and between the means of Groups 2 and 3. The mean learning outcome score of Group 3 was significantly higher than those of Groups 1 and 2.

Hypothesis 9. No significant interaction exists between the independent variables of instructional strategy and years in the pesticide recertification program, by learning outcome.

No significant interaction was found to exist between the independent variables of instructional strategy and years in the pesticide recertification program, as indicated in Table 20. Hypothesis 9 was therefore retained.

Hypothesis 10. No significant main effects exist among the independent variables of instructional strategy and years in the pesticide recertification program, on learning outcome.

For Hypothesis 10, a significant difference was found to exist for the main effect of instructional strategy; therefore, the null hypothesis was rejected. The 383 pesticide applicators receiving the lecture strategy demonstrated a significantly higher mean score (15.50) on learning outcome than did the 163 applicators participating in the small group discussion format (14.63).

Table 20. Two-way ANOVA determining interaction between instructional strategy and years in the pesticide recertification program and main effects among levels of independent variables.

Source of Variation	Sum of Squares	df*	Mean Square	F	Signif. F
<u>Two-way Interaction:</u>					
Instructional Strategy and Years in Pesticide Recertification Prog.	30.709	3	10.236	.447	.720
<u>Main Effects:</u>					
Instructional Strategy	91.125	1	91.125	3.976	.047**
Years in Pesticide Recertification Prog.	55.692	3	18.564	.810	.489

*Critical Values, df 1, 538, alpha = .05, F = 3.86

Critical Values, df 3, 538, alpha = .05, F = 2.62

**Significant at alpha = .05

Hypothesis 11. No significant relationship exists between the dependent variable of learning outcome and the independent variables of: (a) instructional strategy, (b) attitude toward mandatory pesticide education, (c) attitude toward instructional strategy received, (d) age, (e) level of education completed, and (f) years in the pesticide recertification program.

The product-moment correlation coefficients presented in Table 21 resulted in the identification of two significant relationships between the dependent variable of learning outcome and the independent variables. The null hypothesis was therefore rejected. The findings indicate that pesticide applicators' attitude toward mandatory pesticide education correlated positively with scores on learning outcome. Those with a more positive attitude toward the legislatively mandated pesticide program tended to earn a higher score on the measure of learning outcome.

Table 21. Correlation coefficients between the dependent and independent variables plus inter-correlations between independent variables (N=654).*

Variable	r
Learning outcome and instructional strategy	-.0678
Learning outcome and age	-.0999
Learning outcome and level of education completed	.0648
Learning outcome and years in recertification program	-.0814
Learning outcome and attitude toward mandatory pesticide education	.5389**
Learning outcome and attitude toward instructional strategy received	.7648**
Instructional strategy and age	.0778
Instructional strategy and level of education completed	.1095
Instructional strategy and years in the recertification program	.0115

Table 21--Continued.

Variable	r
Instructional strategy and attitude toward mandatory pesticide education	-.0107
Instructional strategy and attitude toward instructional strategy received	-.0486
Age and level of education completed	.2146**
Age and years in the recertification program	.4513**
Age and attitude toward mandatory pesticide education	-.1358
Age and attitude toward instructional strategy received	-.0851
Level of education completed and years in recertification program	.2409**
Level of education and attitude toward mandatory pesticide education	.0000
Level of education completed and attitude toward instructional strategy received	.0872
Attitude toward mandatory pesticide education and attitude toward instructional strategy received	.6823**

*Two-tailed test; Critical Values, df 100, $r = \pm .195$

**Significant at alpha = .05

The second finding identifies a positive correlation between the level of pesticide applicator attitude toward the instructional strategy received and the performance on the measure of learning outcome. Those with a more positive attitude toward the instructional strategy received tended to earn a higher score on the measure of

learning outcome. The correlation coefficient of .7648 ($R^2 = .5849$) indicated that 58% of the variability in learning outcome scores can be explained by knowledge of attitude toward the instructional strategy received.

Hypothesis 12. No significant inter-correlation(s) exist among the independent variables of: (a) instructional strategy, (b) attitude toward mandatory pesticide education, (c) attitude toward instructional strategy received, (d) age, (e) level of education completed, and (f) years in the pesticide recertification program.

Four significant correlation coefficients were found to exist between pairs of independent variables, as noted in Table 21. The null hypothesis was rejected and the alternative hypothesis stating the existence of significant relationships was retained.

The first finding involved a significant positive correlation between the age of the applicators and the level of education completed by pesticide applicators. As the level of education increased, so did applicator age. A similar finding involved the significant positive correlation between age of the pesticide applicators and years involved in the pesticide certification program. As expected, as the years in the program increased, the age of the pesticide applicators increased. A third significant correlation was found between the level of education completed and applicator years in the pesticide recertification program. As the level of education completed increased, the number of years of participation in the pesticide recertification program increased. The fourth significant finding indicated a positive correlation between pesticide applicator attitude toward the mandatory

pesticide education program and attitude toward instructional strategy received. Those with a more positive attitude toward mandatory pesticide education also tended to have a more positive attitude toward the instructional strategy received.

Hypothesis 13. No significant multiple correlation exists between the dependent variable of learning outcome and the set of independent variables, identified as: (a) instructional strategy, (b) attitude toward mandatory pesticide education, (c) attitude toward instructional strategy received, (d) age, (e) level of education completed, and (f) years in the pesticide recertification program.

Stepwise multiple regression was used to determine the order of entry of the independent variables in the multiple regression model. The variable entered at Step One was attitude toward instructional strategy received, yielding an R^2 of .58496. At Step Two, the variable of years in the recertification program was added to the model, increasing the R^2 to .58852. At Step Three, since none of the remaining variables would significantly increase the R^2 , all remaining variables were entered, culminating in an R^2 for the full model of .59029. These results indicated that the independent variable of attitude toward instructional strategy accounts for 58.4% of the variance in learning outcome. The addition of the five remaining independent variables increases the percentage of variance accounted for to .59029, an increase of .00533. While this increase is statistically significant, it does not appear to be of any practical consequence. Because the R^2 's at each step were statistically

significant, the null hypothesis was rejected and the alternative hypothesis retained. The data are presented in Table 22.

Table 22. Stepwise multiple regression for entry of six independent variables.

Step	Variable Entered	R ²	F
1	Attitude Toward Instructional Strategy Received	.58496	.919*
2	Years in Program	.58852	.465*
3	Instructional Strategy Age Level of Educ. Completed Attitude Toward Mandatory Pesticide Education	.59029	.155*

*Significant at .05 level of confidence

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

The purpose of this chapter is to present conclusions based on an interpretation of the findings of the study and to make recommendations for further research and practice. The conclusions are drawn from an investigation of a population of rural adult learners, participating in a one-time, legislatively mandated, educational program. Centered around the seven research questions in Chapter 1, the conclusions are substantiated by the descriptive and statistical findings of the study.

Conclusions

- (1) Receiving up-to-date information in the safe use of pesticides is more important to pesticide applicators than the question of voluntary or mandatory participation.

Descriptive data analysis indicates that 68% of the 592 respondents would have participated voluntarily in the pesticide education program. From general discussion and comments volunteered in writing by applicators, however, the major concern expressed was not one of being mandated to attend the program, but one of necessity in receiving the most up-to-date information relevant to pesticide safety. The results of the present study, however, concur with numerous occupational studies and recommendations indicating positive participant attitude toward voluntary continuing education (Edwards & Green, 1983;

Egelston, 1974; Larocco & Polit, 1978; Mathews & Schumacher, 1979; Mattson, 1974; Whitis, 1972).

- (2) The question of the legitimacy of mandatory pesticide education is not considered to be a positive or a negative issue by the participants in the pesticide recertification program.

The findings of the present study indicate that 45% of the 588 respondents were in agreement with the concept of mandated pesticide education, while 37% were in disagreement with the concept, indicating no clear distinction by participants in favor of or against mandatory education. These findings are similar to other occupational studies, however, recognizing the issue of mandatory continuing education (American Hospital Association, 1979; Arneson, 1985; Brenner & Strawser, 1972; Ellyson et al., 1985; Hunt, 1987; Miller & Rea, 1977; Peay, 1979; Schoen, 1979). The minimal percentage difference between the two attitudes may, in fact, support the premise that the issue of MCE continues to be controversial.

- (3) Pesticide applicators did not favor one instructional strategy more than the other.

In the present study, lecture was not considered to be a more preferred mode of instruction than small group discussion. In total, 94% of the participants were favorable to the strategy they received. For the lecture group, 97% responded favorably to the strategy in comparison to 88% represented by the small group discussion. A key to the positive response may be in the overall design of the instruction, since both strategies represented the systematic diffusion of knowledge

for immediate application. By initial identification of the task, establishment of the goals and objectives, criterion referenced test, instructional strategy and instructional medium, the implementation of either instructional strategy became simply a part of the process. The strategies were contextually determined and provided for the fit of the instruction to the environmental setting.

The favorable attitude to the lecture strategy may also be an example of what Hovland, Janis, and Kelley (1953) and Weaver (1980) suggest as the greatest advantage of the lecture; that is, the presentation of a human model to a group. In effect, one is creating in an audience a sense of relationship between the model and the subject the model is presenting.

The presentation of the subject matter by the personality has an effective impact on the audience in that it will make direct association between the value of the information and the impressions it has of the speaker (Weaver, 1980, p. 7).

Sweeney and Reigeluth (1984) further suggest the lecture as an effective strategy when large numbers are involved, when the group is homogeneous, when information changes rapidly or frequently, and when there is a need to arouse interest in a subject.

The favorability of group discussion may be characterized again by the importance of the subject matter content. Wagner and Arnold (1965) note that some problems can be more accurately and efficiently solved by groups and that those who share in forming decisions are usually willing to support decisions afterward. In the instance of the safe use of agricultural chemicals, the role of experience, the need for decision-making regarding application and the immediate use of

information may have enhanced the favorable attitude toward the strategy. Brillhart (1982) suggests the strategy represents a mutually interdependent purpose with the success of each member contingent upon the success of the entire group in reaching the goal.

The pesticide applicator is seeking information and assistance in the safe use of pesticides. Information and sharing by the six or seven other group members, often experientially based, may contribute even more to the process. For the pesticide applicator, the case study format provided an opportunity to deepen and extend subject matter concepts, apply previous experiences, and consider application of subsequent learning in an area of high priority.

- (4) Learning outcome is not dependent on pesticide applicator attitude toward mandatory pesticide education or personal descriptors such as age or years in the recertification program.

The findings indicate that demonstrated performance on the measure of learning outcome is not dependent on pesticide applicator attitude toward mandatory pesticide education. Neither is learning outcome dependent on age, level of education completed, or years in the recertification program.

- (5) Pesticide applicators participating in the group receiving the lecture strategy performed better on the measure of learning outcome than the group participating in small group discussion.

In two instances, the statistical analyses indicate a significant difference for the main effect of instructional strategy on learning outcome. In both analyses, the higher mean score was found for the

group receiving the lecture strategy, indicating that lecture was a more effective instructional strategy for use with rural adult learners in the context of a legislatively mandated educational program. The findings substantiate earlier research by Rothman (1980), Slaten (1973), and Verner and Dickinson (1967) in the claim that lecture is better in assisting learners in the recall of facts. In addition, the results lend support to the suggestion by Weston and Cranton (1986) characterizing lecture as an effective strategy for the lower levels of the cognitive domain, in which the goal of instruction is to expose students to information. In the present study, dissemination of factual information represented the lower levels of the cognitive domain, identified as knowledge gained and skills learned.

Findings which suggest that variables such as the credibility of the lecturer, order of content presentation, emotionality of argument, meaningfulness of material, and use of supportive materials are relevant factors in determining the effectiveness of lecture, may also be contributors to the identified difference between the strategies (Hovland et al., 1953; Palmer & Verner, 1959; Verner & Dickinson, 1967). In the present study, the credibility of the lecturer, representing both the Department of Agriculture and the Extension Service, in combination with the element of emotionality of the topic, may have contributed significantly to the existing difference. The documented evidence of physical illness and death through misuse of pesticide chemicals may be close enough to the applicator's personal experience to encourage a stronger effort in responding to questions of factual and immediate recall. Also, the participant must constantly be

replacing old information with new in order to be current, thereby calling attention to the immediacy of the application of new information. The exposure to concise, structured information at a point in time when the applicator is in a captive situation may, in fact, enhance the learning outcome.

Verner and Dickinson (1967) also suggest that the use of instructional devices may increase the effectiveness of the lecture with adults. In the present study, the use of illustrative materials to augment the lecture may have contributed to the efficiency of the lecture and, in turn, the demonstrated higher mean score on learning outcome.

(6) Pesticide applicator attitude toward the instructional strategy received is positively related to performance on learning outcome.

With regard to the instructional strategies of lecture and small group discussion, immediate or delayed recall of factual information has been the basis for a large portion of the research relevant to measurement of learning achievement. In addition, studies have also been conducted investigating the superiority of one strategy over another in changing attitudes of behavior by individuals. Findings from the present study indicate that regardless of the instructional strategy implemented, those with a more positive attitude tended to achieve a higher learning outcome.

(7) Age is positively related to level of education completed and years in the pesticide recertification program.

In the study of adult learners, age is considered in terms of chronological age and biological age. Age, as described for the study population, is interpreted in the chronological sense and, as expected, is positively related with years of education completed and years of participation in the recertification program. Sixty percent of the applicators responding were included in the age category 31 to 55, lending support to the prediction by Cross (1981) that by the year 2000, the largest age group will be 30 to 44 years old, with a rise in the 45 to 64 year-old group. Twenty-six percent of the participants were 56 years of age or older.

- (8) Years of participation in the pesticide recertification program is positively related to years of education completed.

The positive relationship between years in the pesticide program and years of education is verified by a correlation coefficient of .2409. This finding suggests that participants with more years of education also see the value in the recertification program and demonstrate, through their participation, that belief. This conclusion is supported by the finding that 68% of the applicators would have participated voluntarily in the recertification program had it not been mandated.

- (9) Applicator attitude toward the instructional strategy received is positively related to attitude toward the mandated pesticide education program.

For the population of pesticide applicators involved in the study, both groups demonstrated a positive attitude toward the instructional

strategy received. Previous discussions provide a basis for the efficiency of both strategies with regard to the adult learner and the nature of the learning environment. The findings reiterate the importance of the fit of the strategy to the learning environment and to the learner, based on the selection of an appropriate instructional design model. In this instance, characteristics of the instructional systems model allow for a well-designed and well-executed educational experience, providing an opportunity to incorporate both pedagogical and andragogical methods, and the accompanying instructional strategies. The results suggest that either strategy, lecture or small group discussion, is appropriate for the task at hand.

With respect to attitude toward mandatory education, pesticide applicators appear to be cognizant of the knowledge explosion currently being experienced by society and are fully aware of the need for continued updating about the safe use of pesticides. In addition, participants appear to be aware of the penalty by law for misuse of restricted-use compounds, of operating without a license, and of the liability factor involved regarding use and application of chemicals. Pesticide applicators, therefore, may ideologically consider the need for educational information as an opportunity for "self-assessment," as noted by Buckner (1974).

(10) Attitude toward the instructional strategy received is an important contributing variable to the criterion variable of learning outcome.

Attitude toward instructional strategy was found to be positively related to the dependent variable of learning outcome, accounting for 58.4% of the variance. The addition of the five remaining independent variables accounted for an increase of .00533, bringing the total variance accounted for by the independent variables to .59029. The part played by the independent variable substantiates the conclusion that attitude toward the strategy received is an important variable to consider in the design, development, and implementation of instruction for adult learners.

- (11) When the learning outcome is defined as immediate recall of factual information, level of education completed serves as an acceptable index of performance.

A significant difference was found between participants having one to eight years of elementary school and one to four years of college. A significant difference was also found between participants having one to four years of high school and one to four years of college. These findings help to substantiate the part played by the learner's level of education, relevant to the selection of instructional strategies, and the resultant performance on measures of learning outcome (Cashin, 1985; Goldin, 1948; Harnack & Fest, 1964; Longest, 1964; Lowman, 1984; Potter & Anderson, 1976; Vernon, 1950, 1952). Education level, in other words, can serve as an indicator of performance on learning outcome when defined as immediate recall of factual information.

Recommendations

Based on the findings of this study, the following recommendations for future research and practice are made.

Recommendations for Future Research

- (1) The absence of significant interaction between the independent variables of instructional strategy, attitudes, and personal descriptors suggests the need for continued investigation of other factors which might combine to influence learning outcome. Such factors might include learning style, learning climate and/or learning environment. In addition, communication patterns, traditional and technological methodologies, and self-instructional strategies as compared to teacher-centered strategies might be areas for investigation.
- (2) A criticism of state government is the propensity of legislative statutes; a criticism by numerous adult educators is the use of law to force participation in learning activities. Pesticide applicator attitude suggests that a legislatively mandated program may not be necessary as applicators are willing to participate voluntarily in continuing education activities. In contrast, however, the question of legitimacy of the mandatory program was not considered to be a negative issue since nearly half of the respondents were in agreement with the concept. The question for investigation remains: Should the recertification program be legislatively mandated or should the decision to participate be

left to the pesticide applicator, based on voluntary participation in an acceptable alternative?

- (3) Minimal research was found in the literature relating attitude toward mandatory continuing education and performance. Although the findings from the present study indicate that attitude is related to performance, additional research is needed from other occupational groups to identify existing attitudes and the relationship of these attitudes to measures of performance.
- (4) Pesticide applicators did not express a more favorable attitude toward one instructional strategy over the other. Lecture was considered to be as effective as small group discussion. Educators of adults need to go one step further, however, and explore variations of the teacher-centered and collaborative/facilitative modes in order to accommodate for learner diversity, organizational climate, learner need, and instructor style. If, for example, the decision is made to implement a traditional strategy, then a comparison of the variations of the traditional lecture approach, feedback lecture, or reflective lecture would be of help in identifying the most appropriate instructional strategy for a specific learner in a particular learning environment.
- (5) Research studies need to be conducted comparing the effect of instructional strategies on learning outcome, as represented by the four domains of learning (Gagne', 1977). Lecture is identified in the present study as an effective strategy for the lower cognitive level representative of immediate recall of factual information. For the developer of instruction, however, it would

be helpful to know the effectiveness of strategies such as lecture and small group discussion in the higher cognitive levels of discrimination, rule learning, and problem solving. The nature of such a recommendation requires that the service provider design the measure of learning outcome to be representative of lower and higher cognitive levels. In the present study, only the lower cognitive level of knowledge gained was represented.

- (6) Although numerous studies have cited the superiority of one instructional strategy over another in changing attitudes of learners, the present study indicates that for non-traditional adult learners in a rural setting, this may not be the case. Additional research needs to be conducted investigating adult learner attitudes toward instructional strategies outside the traditional institutional classroom/course-for-credit setting. The issue of one-time, continuing education offerings to meet specific recertification needs presents a different set of instructional parameters, but also presents an area minimally investigated.
- (7) For the educational service provider, identification of age and level of education of clientele can be contributing factors in the selection of appropriate instructional strategies. The assumption underlying andragogy is that adults are less dependent and more self-directed in regard to learning activities, and collaborative/facilitative modes of instruction are more appropriate (Knowles, 1974). Based on the present study, however, the recommendation is to investigate the adult developmental stages with regard to

teacher-centered and facilitative/collaborative models of instruction to determine effect of method on learning outcome. Questions for investigation might include:

- (a) What are the differences in perception and preference between the middle adulthood developmental stage and the later maturity stage for instructional strategies representing pedagogical and andragogical models?
 - (b) How does the older learner perceive him/herself learning most effectively? What affects the learning?
 - (c) Under what environmental/organizational climate does the older learner process information most effectively? Does it make a difference who offers the educational activity? Is assistance necessary from an instructor or is the applicator inclined toward a "self-directing" approach?
- (8) In considering the assumption regarding adults as being self-directed in their learning activities as compared to being instructor-dependent, empirical research studies need to be continued ascertaining the effectiveness of alternative instructional models. Two such models include the learner-generative model and the instructional systems model, representing andragogical and pedagogical methodologies.

Recommendations for Practice

- (1) Encourage the educational service provider to incorporate into the staff development opportunities inservice training relevant to the adult learner and the instructional development process. The

assumption that the personnel providing the instruction have a working knowledge of the adult learner and the instructional development process may be somewhat limited. As was noted in the literature, the majority of educators practice methods and strategies with which they are familiar, as compared to that method or strategy most appropriate for the learner at hand. Recognition of the learning climate, a familiarity with the diversity of adult learners and learning styles, alternative instructional methods and strategies, and a familiarity with the instructional design process should be included as integral parts of the training sessions.

- (2) Historically, the Extension Service has been a provider of educational information to the "knowledge gained/skills learned" domain, as identified by Gagne'. However, due to the nature of the problems rural America is facing, perhaps the time is appropriate for a greater effort to be made toward viewing program efforts in a long-term mode, with an emphasis toward problem-solving and a higher level of instructional events.
- (3) Individuals involved in the program design process should be encouraged to incorporate the use of an instructional systems model as the basis for the development of the instructional event. This would help to assure some degree of effectiveness in the design, development, management, implementation, and evaluation of the instructional design process.
- (4) Gueulette (1976) has suggested that government control is encouraged in three ways: (a) by allowing additional legal and

financial controls to be implemented, (b) by accepting support that stipulates conditions, and (c) by permitting the government to impose more regulatory and licensing requirements. If the latter is true, agencies reviewing proposals requesting mandatory continuing education legislation for licensure renewal should consider the following:

- (a) What problems have created the justification for mandatory continuing education?
- (b) Is there documented evidence that actual performance deficiencies rather than inadequacies are responsible for unacceptable performance?
- (c) Are there existing mechanisms or methods that can be strengthened or improved, or new approaches that can be developed to solve identified problems? (For example, are valid examinations available for the professional that provide a means of measuring competence?)

Based on the conclusions and recommendations of the present study, in addition to a sincere desire to assist the rural, non-traditional adult learner, the researcher feels a strong commitment to the continued investigation of the teaching-learning transaction. The increasing numbers of adults participating in required learning situations are entitled to the same commitment and interest by the adult educators as those participating on a voluntary basis. It is toward that commitment that the researcher will direct future investigative endeavors, in order to contribute to the literature in the enhancement and improvement of instruction.

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APPENDICES

APPENDIX A

CORRESPONDENCE WITH COUNTY EXTENSION PERSONNEL



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TO: Kirk Barnette, Big Horn County Extension Office
Jim Rolleri, Sweet Grass County Extension Office
Darrel Krum, Carbon County Extension Office
Charles Egan, Stillwater County Extension Office
Ole Oiestad, Musselshell-Golden Valley County Extension Office

FROM: Barbara A. White, KELLOGG Fellow, Doctoral Candidate
Adult, Community and Higher Education
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RE: COUNTY PESTICIDE RECERTIFICATION PROGRAMS

DATE: January 28, 1987

Recently, I had the opportunity to attend the Pesticide Recertification Agent Training for District V held in Lewistown, at which time I visited with several of you regarding the use of instructional materials in your individual county recertification programs, designed specifically for the SAFETY criteria. Each of you that I visited with were very receptive to the idea and willing to work with me in this endeavor. I have since written and rewritten the proposal for my dissertation study, based on the ideas I shared with you. The proposal has been accepted and I am "on my way"; now, I am asking for your assistance as we previously discussed, and I would like to spend a few minutes with you, via this letter, confirming plans for the study. Before I identify the area of assistance that I am requesting from you, let me "set the stage" relevant to the purpose of the study.

During my "time" with the Cooperative Extension Service, I was asked repeatedly about strategies and methods for improving the teaching-learning process in which we are all involved, regardless of the subject matter being taught or disseminated. There was an attempt to answer some of those questions in the METHODS AND MEDIA HANDBOOK that Dr. Danny Cheatham and I assembled, but I still sense the need to look at our instructional approaches, our audience, our delivery and the need of the clientele in order to design and deliver instructional programs fulfilling the needs of the adult learner. Also, of considerable interest to me is the learning climate in which you and I deliver information and education. The Pesticide Recertification Program is a good example; it is a program mandated by the legislature for the commercial and private applicator to attend, and it is mandated that we

in the Extension Service provide the needed educational program resulting in the certification of our clientele. The question that exists is: To what extent does the mandated program affect the learning process based on the instructional strategy used by you, the County Extension Agent, delivering the program?

Based on my own personal interest in the instructional process, in addition to my keen desire to continue working with the professionals employed by the Montana Cooperative Extension Service, I have designed my dissertation proposal with the purpose of investigating two instructional strategies, lecture and small group discussion, within a mandatory setting identified as the Montana Pesticide Recertification Program. Each of the participating counties in District V will be assigned one of the two formats, based on the estimated number of participants (the counties projecting smaller enrollments will be assigned the small group discussion format). Your county is being asked to assist in the small group discussion format, necessitating that the total number of participants be divided into small groups of 8-10 people. All materials needed for presenting/participating in the 45 minute session on safety will be provided to you. **YOU WILL NOT HAVE TO PREPARE ANY INSTRUCTIONAL MATERIALS FOR THE SAFETY CRITERIA!** These materials include handouts, visuals, and any supportive materials necessary for the small group discussion format. Specifically, I am asking for your assistance in the following manner:

- (1) Incorporate into your planning for the county pesticide recertification program space consideration allowing for participants to divide into small groups. (Example: If you expect 100 participants, you would need space for approximately 10 groups; if a large fairground building were to be used, for instance, all groups could be in the same building.) The point is to be able to break into small groups in order to implement the small group format.
- (2) You, as the County Agent, would serve as a facilitator, moving among the groups, listening, providing feedback if necessary, but not being an integral part of the discussion. However, we do need to identify some individuals that you know are going to attend to serve in the capacity of a "group leader." If you estimate 10 groups, you would need 10 "assistants" or group leaders. The point is that in small group discussion, one individual takes the lead in initiating group discussion; to accomplish this task, could you do the following:
 - (a) Identify potential individuals in your community who will be attending the recertification program. You probably have a good idea of whom has to be recertified. Which of those would be willing to help in small group discussion?

- (b) Contact individuals and ask if they would be willing to participate in a "group leader role."
- (c) Coordinate a meeting of two hours where I might meet with individuals to explain materials, etc. This might be the night before the recertification program, the day before, a week before, etc., at their convenience. We will need to have them all together, or at least same day/evening since I will need to travel to your county to conduct the meeting.
- (d) Send to me the names and addresses of the individuals you have identified so that I might send them the materials they will need prior to our meeting.

I realize that preliminary estimates indicate some of you may have substantially more than 100 participants; for example, Carbon County might have closer to 190. In a case such as that, Darrel might plan to divide his participants in half . . . one group would receive lecture format and the other participants break into small groups, having a total of approximately nine or ten small groups. Darrel, or perhaps Merrylee, could present the lecture presentation; the identified group leaders would serve as "facilitators" for the small group discussions. You may ASSURE THE INDIVIDUALS YOU CONTACT THAT THEIR INVOLVEMENT WITH THE SMALL GROUP DISCUSSION WILL NOT MEAN THEY WILL "TEACH" THE GROUP; materials will be provided for them to use which involve presenting some specific questions relevant to a case study. The participants in each group will read a case study (an example of an applicator using a fumigant and a wood preservative, for instance) and then discuss the appropriate protective clothing and equipment based on their understanding of the pesticide label information and guidelines. I will be sending the case study, materials, etc., to the identified leaders ahead of our meeting, so there should be nothing threatening regarding the group leader role. It will be a discussion rather than a lecture.

I realize that it will take some time from your schedule to contact the potential group leaders, but your familiarity with the applicants makes a big difference in the selection of the individuals. If you have trouble identifying potential applicators to serve as group leaders, perhaps some of your Extension Homemakers or 4-H Leaders would be willing to help. The individuals do not need previous experience as such (I will have met with them and "trained" them to use procedure); however, the ultimate would be to have those individuals attending the recertification training serve as group leaders. TO "MAKE THE STUDY WORK," IT IS IMPERATIVE THAT WE BE ABLE TO COMPARE THE LECTURE APPROACH TO A SMALL GROUP DISCUSSION FORMAT. I DO APPRECIATE YOUR EFFORTS IN HELPING ACCOMPLISH THIS FACET OF THE STUDY!

Regarding the dates for upcoming county recertification training, I understand Big Horn County is set for February 25th and Sweet Grass for

possibly March 12th. I hope this request comes far enough in advance for you to be a part of the study. With only a limited number of counties involved in the recertification program this year, I am dependent, and certainly, indebted, to each of you. The Montana Cooperative Extension Service will receive all the information from the study, as will each of the participating counties, in a format that hopefully will be useful in planning and delivering programs in such a setting in the future. There is also the potential for replicating this approach in Utah and Colorado next fall, so you are really an important part of what may be a regional project. I sincerely appreciate your help and cooperation and hope that we can "carry this off." Please feel free to contact me with questions, etc.; my telephone number is 994-6417. I have enclosed my business card with address for future correspondence.

I am looking forward to hearing from you regarding your participation and your representatives. I will do my best to meet your group leaders' convenience in terms of individual county training meetings. Please let me know as soon as you know your tentative dates for county recertification so that we can work out the travel/training times. And again, thanks for your help.

APPENDIX B

MAP OF PESTICIDE RECERTIFICATION
PROGRAM BY DISTRICT

APPENDIX C

PESTICIDE RECERTIFICATION QUESTIONS: SAFETY

NAME _____

COUNTY _____

PESTICIDE RECERTIFICATION QUESTIONS: SAFETY

Answer each of the questions with a T for True or an F for False; place the letter of your choice in the blank to the left of the question.

- _____ 1. Fumigants are highly toxic to humans and require the use of specialized protective equipment, including respirators.
- _____ 2. When handling or applying pesticides, a hat with a fabric headband is usually the best choice.
- _____ 3. Wear a respirator during application of a structural fumigant gas and when entering the premise before the labeled re-entry period has expired.
- _____ 4. All pesticide labels will have directions for first-aid printed on them.
- _____ 5. Regular soap will remove pesticide residue on the skin and clothing as well as detergents will.
- _____ 6. Commercial eyewashes should not be used when pesticides have been splashed in the eyes, as they may intensify the injury.
- _____ 7. The Montana Pesticide Act authorizes the State Department of Agriculture to suspend or revoke the private applicator's license if the Department has reason to believe the pesticide is being misused or misapplied.
- _____ 8. The pesticide label is of little or no use for giving information pertinent to medical attention.
- _____ 9. Repeated exposure to small amounts of some pesticides may cause sudden, severe illness.
- _____ 10. Pesticide contaminated clothing may be washed with the family laundry.

Multiple Choice Questions: Please mark the correct answer(s) by circling your selection (s).

11. The most important factor to be considered when choosing applicator equipment is:
 - a. designed for the chemical formulations you plan to use
 - b. least expensive
 - c. fits the tractor
 - d. pest to be controlled.
12. The most important piece of protective clothing to wear when using wood preservative is:
 - a. clean coveralls
 - b. impermeable gloves
 - c. hard hat
 - d. goggles.

13. Pesticides can enter the body in which major ways:
- orally
 - dermally
 - by inhalation
 - all of the above.
14. When applying fumigants, a _____ respirator is the best choice to avoid severe injury or death.
- positive pre-sure
 - supplied-air
 - canister
 - cartridge
15. Steps taken when someone has been poisoned by a pesticide are as follows:
- make sure victim is breathing; decontaminate him/her; seek medical help
 - seek medical help
 - seek medical help, decontaminate victim, make sure he/she is breathing
 - decontaminate victim; seek medical help.
16. "Signal words" on the labels are:
- Danger-Poison
 - Warning
 - Caution
 - All of the above.
17. The first thing to do in case of accidental contamination with a chemical wood preservative is:
- call a physician
 - vigorously scrub the contaminated skin
 - remove contaminated clothing that is in contact with the skin
 - induce vomiting.
18. All pesticide labels carry the following statement(s):
- Danger-Poison
 - Warning
 - Caution
 - Keep out of the reach of Children.
19. Pesticides can enter the body in the following way(s):
- orally
 - through breathing
 - through wounds
 - through the skin
 - all of the above.
20. Factors that affect pesticide removal from clothing include:
- chemical class of pesticide
 - concentration of pesticide
 - laundering conditions
 - fabric weight
 - fiber content
 - all of the above.

APPENDIX D

ATTITUDE TOWARD MANDATORY PESTICIDE EDUCATION/
INSTRUCTIONAL STRATEGY SCALE (AMPE-ISS)

NAME _____

COUNTY _____

ATTITUDE TOWARD MANDATORY PESTICIDE
EDUCATION/INSTRUCTIONAL STRATEGY SCALE
(AMPE-ISS)

	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
1. Was the method of instruction (LECTURE or SMALL GROUP DISCUSSION) you received of help to you in understanding the information?					
2. Does your experience with pesticides eliminate the need for information relevant to the safe use of chemicals?					
3. If the pesticide education program had NOT been mandated by Montana law, would you have attended a program of this type voluntarily?					
4. Would you participate in another program using the same instructional strategy (LECTURE or SMALL GROUP DISCUSSION) as you received today?					
5. Based on the information received today in the SAFETY portion of the program, will you change the way you protect yourself and your environment when using pesticides in the future?					
6. Do you think you will use the handout materials in the future for reference in the safe use of pesticides?					
7. Did the person presenting the information do so in a clear, concise manner allowing for questions and interaction from the participants?					
8. Is the experience you bring to the pesticide education program sufficient to answer questions about the safe use of pesticides?					

cont. page 2	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
9. Would followup information provided on a regular basis in the form of a Fact Sheet or a newsletter, relevant to the safe handling of pesticides, be of help to you in the future?					
10. Do you think a pesticide education program such as you are participating in should be legislatively mandated?					
11. Would you rather receive pesticide education information from your peers, trained in the necessary subject-matter, rather than from the Department of Agriculture or the Cooperative Extension Service?					

Completion of the above requested information indicates to the researcher that you are willing to participate in the project.

APPENDIX E

GENERAL INFORMATION QUESTIONNAIRE (GIQ)

***GENERAL INFORMATION QUESTIONNAIRE**

NAME: _____ AGE _____

<u>LEVEL OF EDUCATION COMPLETED:</u>	<u>YEARS IN CERTIFICATION PROGRAM:</u>
One-to-Eight Years Elementary _____	One-to-Two Years _____
One-to-Four Years High School _____	Three-to-Four Years _____
One-to-Four Years College _____	Five-to-Six Years _____
Five Years College plus _____	Seven Years or More _____

Applicator Status: Commercial _____ Private _____ Other _____
 Applicator _____ Applicator _____

Years in Residence in County: One-to-Five Years _____
 Six-to-Ten Years _____
 Eleven-to-Fifteen Years _____

Do you believe a pesticide education program such as you are participating in should be legislatively mandated?

Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree

If the pesticide education program had NOT been mandated by Montana law, would you have attended voluntarily?

Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree

*Completion of the above requested information indicates to the researcher that you are willing to participate in the project.

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