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The effects of a guided discovery versus a deductive training method on supervisors' ability to solve problems and facilitate problem-solving skill of subordinates

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The Ohio State University, 1994
THE EFFECTS OF A GUIDED DISCOVERY VERSUS A DEDUCTIVE TRAINING METHOD ON SUPERVISORS' ABILITY TO SOLVE PROBLEMS AND FACILITATE PROBLEM-SOLVING SKILL OF SUBORDINATES

DISSERTATION

Presented in Partial Fulfillment of the Requirements for

the Degree Doctor of Philosophy in the Graduate School of The Ohio State University

By

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* * * * *

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In Loving Memory Of My Mother

Julie
ACKNOWLEDGMENTS

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CHAPTER I

INTRODUCTION

Organizations face new and difficult challenges in today's economy. Increasingly, they must cope with complex and uncertain environments, fierce global competition, and work that is more knowledge-based than ever before (Dixon, 1992; Drucker, 1988; Senge, 1993). These changes in organizations have impacted the job expectations of most employees. More and more, employees are expected to possess greater levels of knowledge and skill, to solve problems more effectively, and to communicate with others in more productive ways.

Supervisors are one group of employees that have experienced dramatic changes in their job expectations. One of these changes concerns how organizations expect supervisors to manage their employees. Immediately following World War Two, it was generally acknowledged that supervisors were expected to control the work that was done under them (Bittel, 1987). Supervisors accomplished this expectation by directing the behaviors of their employees (Bienvenu, 1976). A directive supervisory approach was consistent with the goals of organizations during this period of time, which were oriented toward high production and efficiency.

Organizations began to experience numerous changes in response to a new economy during the 1960s. An important outcome of these organizational changes was
that expectations for how supervisors did their jobs began to change (Bienvenu, 1976; Bittel, 1987; Goldstein & Sorcher, 1974). In 1965, F.J. Roethlisberger wrote that the modern supervisor "has to get results—turn out production, maintain quality, hold costs down, keep his employees satisfied—under a set of technical conditions, social relations, and logical abstractions far different from those which existed twenty-five years ago" (p. 24). Since Roethlisberger wrote that statement, many supervisor training experts have articulated similar beliefs about changing job expectations for supervisors (for example, see Bienvenu, 1976; Bittel, 1987; Gardner, 1980; Goldstein, 1974).

Today, most organizations recognize the need for supervisors to facilitate rather than direct the work of employees (Bramlette, 1984; Bittel, 1987; Wolfe, 1983). In contrast to a directive approach, a facilitative supervisory approach involves fostering a work environment that values the development of expertise, knowledge-seeking, and learning skills (Bienvenu, 1976; Bittel, 1987; Mahler & McLean, 1976). The facilitative supervisory approach requires that supervisors support the development of a knowledge-based, learning-oriented work environment. In turn, this type of work environment is able to accommodate the new and dynamic nature of work and the changing nature of those people who do the work. Clearly, these new job expectations for supervisors differ significantly from those of the past.

Changing expectations for supervisors are significant because this group of employees is becoming increasingly important to the effectiveness of organizations (Bittel, 1987; Kirkpatrick, 1993). Supervisors link business objectives and strategies to the actual work of the organization (Likert, 1970). Functioning in this role, supervisors transmit goals, policies, and procedures from management to front-line employees while at the same time are expected to facilitate the work of and handle the disturbances related to their employees. When organizations are faced with dynamic and uncertain environments
as those that presently exist, the linkage role of supervisors becomes critical to the effectiveness of organizations (Wolfe, 1983).

The change in supervisory job expectations has focused greater attention on how supervisors are developed, especially as the development involves formal training programs (Bittel, 1987; Bramlette, 1984; Gardner, 1980). Many organizations provide human resource development (HRD) programs for preparing supervisors. Traditionally, these programs have used a deductive instructional approach. A deductive approach is characterized by instructor-led presentations of content and principles. Follow-up group discussions and small-group activities are often used to practice and apply information that has been presented by the instructor (Holland, Holyoak, Nisbett, & Thagard, 1986; Newbert & Binko, 1992). In addition, most programs occur in a context away from the actual workplace and involve the interaction of peer supervisors at similar stages of development (Gardner, 1980).

The literature suggests that there are three major concerns with a deductive approach to supervisor training. First, training outcomes are not necessarily aligned with actual job expectations (Goldstein & Sorcher, 1974). While supervisors are expected to acquire more complex managerial skills during the training experience, the present approach seldom engages supervisors in thinking processes that are most associated with the development of those skills (Newbert & Binko, 1992). Specifically, as a result of the training experience supervisors are expected to develop reasoning and problem-solving skills. However, a deductive approach rarely engages trainees in activities that use or develop these types of skills.

A second concern with a deductive approach is that the development of and ability to use these types of complex managerial skills may be diminished because of the context in which the training occurs (Gardner, 1987). Most supervisor training takes place away from the job and involves the interaction of supervisors at similar stages of development.
As a result, trainees are removed from the influence of people and environments that provide rich opportunities for acquiring, transferring, and applying information.

A third concern is that a deductive approach to supervisor training may not account for the interaction between instructional methodology and content of training. Studies have found that certain instructional methods are more suited for particular content areas (Burke & Day, 1986; Gardner, 1980). For example, greater gains in interpersonal skill development have been found with the use of simulation methods, such as role-play, as compared to information presentation methods, such as lecture (Carroll, Paine & Ivancevich, 1972; Cetingok, 1988; Hess, 1977). Yet, the present training approach seems to rely on the continual use of certain instructional methods and techniques without considering whether other types of approaches may be better suited for specific content areas.

In contrast, guided discovery is a method of training that features a more inductive sequence of instructional events (for example, see Bruner, 1961a; Holland et al., 1986; Joyce & Weil, 1986; Newbert & Binko, 1992). An inductive training approach essentially involves trainees in three instructional activities: (a) gathering, organizing, and categorizing information; (b) identifying critical relationships among information and making inferences based on those relationships; and (c) testing those inferences by applying them to new situations.

Research has shown that inductive approaches, such as guided discovery, are more effective in developing reasoning skills and problem-solving skills, all the while accomplishing the same short-term training outcomes as deductive approaches (Joyce & Weil, 1986; Newbert & Binko, 1992; Vazquez-Abad & Winer, 1992). In addition, guided discovery involves experts as part of the learning process. Experts are individuals in the job setting who possess extensive amounts of technical knowledge and supervisory expertise. In guided discovery, experts serve as work-based resources for trainees during
the learning experience. In combination these features of guided discovery, an inductive instructional approach and the use of experts as learning resources, may enable the attainment of short-term training outcomes while also resulting in positive changes in supervisory job behaviors.

Problem Statement

Dramatic organizational changes have affected the job expectations of supervisors in organizations. Increasingly, organizations expect supervisors to facilitate the development of a responsive, knowledge-based, problem-solving work environment. Training is the primary way that organizations communicate these changing expectations to supervisors.

Previous research suggests that instructional outcomes are determined by both the content of the instruction and the way the content was delivered. That is, attainment of specified training outcomes and changes in job behaviors and performance are contingent upon both the content taught and the instructional method used during the training experience. The appropriateness of the training method may be especially important given that supervisor training programs are emphasizing more problem solving, critical thinking, and learning skills. Historically, supervisor training programs have relied upon methods that are more deductive in nature, which do not necessarily require the use of these types of higher-level cognitive skills. In contrast, an inductive method, such as guided discovery, is believed to be more consistent with developing these types of skills.

However, there is a lack of empirical evidence regarding the effects of using an inductive instructional approach for training. A review of the related studies and writings in the fields of HRD, educational psychology, and cognitive psychology has found two gaps in the present literature related to training methodology and design. First, there
appears to be little information in the literature regarding the use of inductive instructional approaches for training. Most of the theoretical writings and empirical studies regarding inductive approaches appear in the educational psychology and cognitive psychology literature. As a consequence, present theoretical writings focus on the use of inductive approaches for academic purposes and are based on empirical studies that have been conducted in academic or laboratory settings. Second, the preponderance of empirical studies have used children or college students rather than adults as subjects. Interestingly, no studies were found that investigated the use of inductive approaches for training in organizational settings. Thus, it is not known whether the results of studies investigating the use of inductive approaches in educational settings with children and college populations also hold true for adults involved in training activities.

It is proposed that if training is a formal way that organizations communicate job expectations to supervisors, and if the training method can affect training and job outcomes, then it is likely that trainees receiving the same training content will demonstrate different training and job outcomes, because of the training method used to present the content. Specifically, it is expected that the initial learning and subsequent job behaviors of supervisors receiving the guided discovery method will differ from those receiving the deductive method.

The purpose of this study was to determine the effects of a guided discovery versus a deductive training method on supervisors' attainment of the training objectives, ability to solve problems in their jobs, and ability to facilitate problem-solving skill of their subordinates. The specific research question that was investigated was:

Does the use of a guided discovery method result in significantly greater levels of concept acquisition, concept application, supervisors' self-reported problem-solving skill and facilitated problem-solving skill than the use of a deductive method for training supervisors?
Research Hypotheses

This study investigated differences in levels of concept acquisition, concept application, and problem-solving skill for supervisors who were trained using either a guided discovery method or a deductive method. The following four hypotheses were tested in the study:

(1) Supervisors who are trained using a guided discovery method will acquire greater mastery of the concept taught during training than those trained using a deductive method.

(2) Supervisors who are trained using a guided discovery method will demonstrate greater ability to apply the concept taught during training to a task in their job setting than those who are trained using a deductive method.

(3) Supervisors who are trained using a guided discovery method will demonstrate greater levels of problem-solving skill in their job setting than those trained using a deductive method.

(4) Subordinates of supervisors who are trained using the guided discovery method will report that their supervisors expected them to demonstrate greater levels of problem-solving skill when learning the concept taught during training than will the subordinates of supervisors trained using a deductive method.

Significance of the Study

The study contributed to the theory and practice of HRD in several ways. First, the study began a line of investigation regarding the use of inductive approaches to training. Specifically, results from the study improved theoretical understandings of how
inductive and deductive instructional approaches impact short-term training outcomes and job behaviors.

Further, the study heightened present understandings about the transfer of learning. Specifically, more insight was developed about how aspects of the training experience and factors in the organization influence a trainee's ability to apply knowledge and skills acquired during training to job tasks.

In addition to theoretical contributions, the study was important to HRD practitioners. The results of the study provide information about how a guided discovery method and a deductive method of training impact short-term training outcomes and changes in job behaviors. Practitioners can use this information to ensure that they select a method of training which will best assist them in meeting their organization's training needs.

Definition of Terms

Attributes

Those characteristics or properties that are relevant to a given concept (Gagne, 1985; Holland et al., 1986).

Concept

A set of objects, conditions, events, or processes that can be grouped together based on one or more common attributes that are connected by a rule (Gagne, 1985; Newbert & Binko, 1992).

Concept Acquisition

The ability to identify a concept as measured by the ability to generate a unique example of a specified concept and provide a rationale for selecting the example by identifying its operational definition, which contains the critical attributes of the concept.
and rule(s) governing the relationship(s) among the attributes (Gagne, 1985; Newbert & Binko, 1992).

**Concept Application**

The ability to use a concept in the job setting, as measured by the ability to generate an example of a specified concept that the trainee has experienced since training and provide a rationale for selecting the example by identifying its operational definition, which contains the critical attributes of the concept and rule(s) governing the relationship(s) among the attributes (Gagne, 1985; Newbert & Binko, 1992).

**Deductive Approach**

An instructional approach in which a concept is acquired through the reception of a generalization and the subsequent analysis of the generalization in relation to its ability to accommodate examples and nonexamples of a given class (Dansereau, 1974; Glaser, 1966; Newbert & Binko, 1992).

**Guided Discovery Method**

A method of instruction which uses learning resources in and away from the job setting to guide trainees through a process of collecting, organizing, and categorizing information; examining relationships among the information and making inferences based on suspected relationships among information; and testing inferences by applying them to new situations (Bruner, 1961a; Glaser, 1966; Joyce & Weil, 1986; Klauer, 1989; Newbert & Binko, 1992; Taba, 1966, 1967).

**Inductive Approach**

An instructional approach in which a concept is learned through the examination of information and examples, which permits the learner to generalize among specific instances of a class and to discriminate between examples and nonexamples of a class (Glaser, 1966; Holland et al., 1986; Newbert & Binko, 1992).
Operational Definition

A generalization or statement that specifies all the essential attributes of a concept and the rule that specifies the relationship among the attributes (Gagne, 1985; Newbert & Binko, 1992).

Present Role of Supervisors

To facilitate the work of their employees by fostering a work environment that values the development of expertise, knowledge-seeking, and learning skills (Bienvenu, 1976; Bittel, 1987; Bramlette, 1984; Mahler & McLean, 1976).

Problem-Solving Skill

The ability to deal with a challenging task or situation in one's job by independently gathering information related to the task or situation, interpreting the meaning of this information to the task or situation, and applying the meaning to the task or situation to test its validity and usability (Joyce & Weil, 1986; Newbert & Binko, 1992; Shulman & Keislar, 1966; Taba, 1966, 1967).

Supervisors

Those people whose major function is working with and through management and non-management employees to meet the objectives of the organization and needs of the employees (Bittel, 1987).

Limitations

Limitations are factors which cannot be adequately controlled in the design of the study and which cannot be accounted for when analyzing, interpreting and generalizing the data. The following were considered limitations of this study:

1. The lack of control over selecting subjects from the population of supervisors to attend training.
2. This study was concerned with the acquisition of learning, application of learning, and problem-solving skills that were demonstrated by supervisors and reported by a selection of their subordinates. It did not address other types of job behaviors or cognitive skills.

3. The nature of the quantitative paradigm and the experimental design which the study is employing do not account for qualitative differences other than the specified criteria that may result from the two instructional approaches.

Assumptions

For this study assumptions were statements which served to delineate the scope of the investigation within its prescribed boundaries. The following were assumptions of this study:

1. The study concerned supervisors, not other levels of management or non-management employees.

2. The study investigated the use of a guided discovery method and a deductive method of training.

3. Trainees in one supervisor training session of an organization were used as subjects for this study.

Organization of the Study

This study is organized in five chapters. The first chapter introduces the study, presents the statement of the problem and states the significance of the study. The second chapter reviews the literature related to the problem in the study. Specifically, theory and empirical research in the areas of the changing role of supervisors, developing supervisory
expertise, and deductive and inductive instructional approaches is reviewed. The third chapter discusses the research design and methodology of the study. The fourth chapter presents the results of the study. The fifth chapter discusses conclusions and implications of the study, which are based on the results reported in Chapter IV. In addition, Chapter V presents suggestions for future research. References for sources used in this study and appendices of the materials used in the study are included at the end of the document.
CHAPTER II

REVIEW OF LITERATURE

This chapter is divided into five sections. The first section reviews literature regarding the changing role of supervisors. The second section reviews related literature concerning the development of supervisory expertise. Respectively, the third and fourth sections review related literature concerning a deductive instructional approach and an inductive instructional approach. The fifth section presents a theoretical framework for the information in the review of literature. In this section, information in the first four sections is summarized and synthesized. In addition, a theoretical model for explaining the relationships between method of training and training and job outcomes is presented.

The Changing Role of Supervisors

This section of the literature review is divided into four parts: (a) the definition of a supervisor, (b) organizational changes that have impacted the supervisory role, (c) a historical overview of the supervisory role, and (d) competencies that are presently required for the supervisory role.

Definition of a Supervisor

Many different terms are used to refer to the group of employees called supervisors. Phrases that are commonly used interchangeably for supervisor include
foreman, group leader, team coordinator, process manager, resource person, and boundary manager (Bramlette, 1984).

Many definitions of the term supervisor exist. In a guide to supervisory development, the federal government defines a supervisor as "the member of the management team who is in actual and constant contact with the non-supervisory workforce, who is responsible for their production output and who plans, assigns, and evaluates their work in accordance with directions given by the supervisor's superiors" (Department of the Army, 1962, p. 15).

A supervisory development guide for special education supervisors defines a supervisor as "one whose primary assignment is to work with teachers and others on instructional matters" (The University of Texas at Austin, 1975, p. 11). Interestingly, the guide also defines the supervisor's role as one of a change agent in which the individual is supposed to bring about change in behaviors, responsibilities, or structures in order to improve performance.

A more straightforward definition provided by the International Labor Office defines supervisors as "usually first-line managers whose major function is working with and through non-management employees to meet the objectives of the organization and needs of the employees" (Prokopenko & Bittel, 1981, p. 142). The Opinion Research Corporation (1970) modified the International Labor Office's definition by distinguishing between first and second levels of supervision. This distinction specifies that first-level supervisors manage only non-management employees whereas second-level supervisors manage other supervisors in addition to non-management employees.

Organizational Changes Impacting the Supervisory Role

Many supervision experts, for example Bittel (1987) and Bramlette (1984), believe that changing supervisory expectations can be attributed to certain recent organizational
changes. Three of those changes are the nature of work, the nature of people who do the work and the structure of organizations.

The nature of work. One of the organizational changes that has influenced the role of supervisors is the nature of work (Goldstein & Sorcher, 1974; Roethlisberger, 1965). The nature of work during the post-World War II years was predominately physical, functional, task-oriented, and repetitive (Bienvenu, 1976). A directive supervisory approach suited the nature of work during this time period because of its orientation to regimentation and control.

However, changes began to appear in the nature of work during the 1960's with the advent of the information age. Work began to be more mental than physical, more conceptual than functional, more systems-oriented than task-oriented, and more varied than repetitive. As time has progressed, the nature of work has continued to evolve in this complex and specialized way (Bittel, 1987; Drucker, 1988). Supervision experts believe that a command and control management style which characterizes the directive supervisory approach is not well suited to the changing nature of work in organizations.

The nature of people in organizations. A second organizational change that has impacted the supervisory role is the nature of people in organizations. The attributes and expectations of employees in today's workforce are dramatically different that those of employees in past years (Watkins & Marsick, 1993). Employees in today's organizations possess stronger needs for independence, self-respect, and learning opportunities and less tolerance for authoritarian control, organizational constraints, and closed information systems (Drucker, 1988; Goldstein, 1974). As a consequence, supervisory behaviors and approaches that had been successful in the past have become increasingly out of phase with the needs of the present day workforce.

The changing structure of organizations. A third organizational change that has influenced the supervisory role is the structure of organizations. In present economic
conditions, organizations face the challenge of how to do better with less. One of the ways that organizations are addressing this challenge is by restructuring the way that the organization is organized (Bennett, 1991; Perry & Salem, 1993). Many of these restructuring activities focus on the flattening of the hierarchical structure of the organization and, as a consequence, the removal of middle layers of management and supervision. This restructuring process has impacted supervisory expectations in two important ways. First, the removal of middle layers of management has shifted managerial responsibility to lower levels of organizations (Stewart, 1992). As a result, supervisors are expected to perform the tasks that were once assigned to middle-level managers. Second, the flattening of the organizational structure has influenced the nature of jobs at all levels of the organization. For example, a traditional function of middle-level management has been to transmit information, such as organizational goals and policies and employee feedback, to the different functions in the organization. With the removal of this level of management, other individuals at differing levels and in different parts of the organization are required to perform these activities to ensure that communication continues to flow through the organization.

**Historical Overview of the Supervisory Role**

For a number of reasons, the challenges and situations that supervisors face in their jobs have been changing during the past twenty years (Bramlette, 1984; Bittel, 1987; Wolfe, 1983). As a result, expectations for how supervisors do their jobs have also been changing during this period of time.

**Past supervisory role.** Supervisors began to emerge as an integral component of the organizational structure in the years following World War Two (Bittel, 1987). During this time period, organizations were challenged to keep up with the demand of the marketplace in a strengthening economy. In order to meet this challenge, organizational
goals typically focused on production and efficiency. Accordingly, supervisors were expected to fulfill production requirements by directing the work of their employees.

Supervisors traditionally accomplished this expectation by using a directive supervisory approach (Bienvenu, 1976). A directive approach involved managing the work of employees by controlling their actions and behaviors. Since a directive supervisory approach appeared to be aligned with the achievement of efficiency and production goals, it was the predominant method of supervision used by organizations during the years immediately following World War Two in the United States.

Present supervisory role. As the country moved into the information age during the 1960's organizations realized that a directive supervisory approach was not meeting their needs (Bittel, 1987). In a retrospective commentary of a seminal article about supervisors which he originally wrote in 1945, Roethlisberger (1965) states that the modern supervisor "has to get results—turn out production, maintain quality, hold costs down, keep his employees satisfied—under a set of technical conditions, social relations, and logical abstractions far different from those which existed twenty-five years ago" (p. 24). Consistent with Roethlisberger's beliefs, many supervisor training experts have continued to voice their concerns about the changing nature of the supervisor's role in organizations (see Bramlette, 1984; Gardner, 1980; Kirkpatrick, 1993).

While there is agreement that a directive supervisory approach does not presently meeting the needs of organizations, there is still some debate about what the expectations of supervisors are or should be. For example, Wolfe (1983) states that "we are not sure what the supervisor should be doing, nor are we able to be very specific about how and why he or she should be doing it" (p. 28). Recognizing that there is some uncertainty about the nature of the supervisory role, four supervisor training scholars attempt to provide some clarification about present expectations for this group of employees.
Wolfe (1983) believes that supervisors are presently expected to handle disturbances that jeopardize production. The primary responsibility of a supervisor in this role is to ensure that the workflow is maintained and that events which threaten to disrupt the stability or efficiency of the work unit are minimized. Although this role is extremely important to the organization, it has little prestige or formal managerial authority. As a result, supervisors are forced to rely on nonformal types of power and influence to get the job done.

Bittel (1987) reports that supervisors are presently expected to act as leaders and resource people. A leadership role is a progression from an authoritative style of supervision to a more consultative style. In the consultative style, supervisors act as resources to guide and facilitate the work of their subordinates. According to Bittel, this type of activity consists of "influencing people to cooperate toward some common goal" (p. 15) and ultimately results in satisfying the needs of an organization as well as the needs of people in an organization.

Using a more concrete approach, Goldstein & Sorcher (1974) describe job expectations of supervisors as consisting of three overlapping sets of responsibilities: technical, administrative, and interpersonal. These authors state that although technical expertise may not be as important to a supervisor's performance now as it was in the past, the ability to handle technical problems and tasks is still an important component of a supervisor's job. Further, supervisors are responsible for doing the administrative work that is required to keep a work unit functioning. The administrative role includes such activities as performance appraisal, payroll administration, and new employee orientation and training. Through the interpersonal responsibility, supervisors attempt to influence or motivate others and thereby bring about change in on-the-job behaviors. According to Goldstein and Sorcher, effective supervisors must be able to demonstrate competency in all three of the responsibility categories.
Bramlette (1984) has constructed a developmental model of the supervisor's role. The model explains supervisory job expectations in relation to the maturation of a work group. Six stages of supervision are identified in the model: leadman, one-on-one supervisor, subgroup supervisor, team/group leader, team coordinator, team boundary manager, and team resource person. As a work group progresses through each stage and on to the next, the model proposes that the corresponding job expectations of supervisors change. Analysis of Bramlette's model suggests that a directive supervisory approach works fairly well in the first stage of supervision. However, as work groups evolve supervisors require more consultative styles of supervision and more human relation skills to achieve results through others. It is interesting to note that the work group designs that require more consultative supervisory roles are those that organizations are using with increased frequency.

While there are differences in the emphasis and focus of each model's perception of the supervisory role, there appears to be consensus among the models that supervisors are expected to use a more facilitative supervisory approach to manage their employees. A facilitative supervisory approach requires that supervisors facilitate the work of their employees by fostering a work environment that values the development of knowledge, skill, and learning ability. This type of supervisory approach is consistent with the changing nature of work, the people who do the work, and the environment in which work gets done.

There is concern among scholars and practitioners that a facilitative supervisory role is a dichotomous and conflicting one for supervisors (Hurley, 1983; Wolfe, 1983). On the one hand, supervisors are held accountable for communicating the goals, standards, policies, rules, and regulations of senior-level management to their employees as well as are expected to make sure that their employees respond to the information in appropriate ways. On the other hand, supervisors are not given any formal power or
authority to get the job done (Hurley, 1983). Now more than ever, supervisors are expected to act in a consultative fashion to obtain the cooperation and participation of their employees. This conflict between what is expected and how it is expected to be accomplished causes a great deal of discomfort for supervisors. A national survey of supervisors found that 20 percent of the respondents felt inefficient functioning in a facilitative role (Bittel, 1987).

In essence, the technical and administrative skills upon which supervisors have historically relied to manage their employees are no longer sufficient for meeting the changing expectations of their role (Hurley, 1983; Kirkpatrick, 1993; Wolfe, 1983). Increasingly, supervisors require additional types of higher-level managerial skills to successfully function in a facilitative supervisory role.

Competencies Presently Required for the Role of Supervisor

A critical outcome of the changing nature of the supervisory role is that the competencies for effective supervisory performance have also changed. According to Wolfe (1983), "the skills that made for effectiveness in past years have been overlaid by a demand for skills in areas other than technical and routine administrative work, and the demand is growing" (p. 29).

While there is agreement that critical competencies exist for the role of supervisor, training experts differ in the way they describe and categorize these competencies. Three methods that seem to reflect the categorization schemes found in the literature are those that identify competencies in terms of groups to which supervisors are responsible, supervisory attributes and behavioral skills.

Groups to which supervisors are responsible. Carrol and Anthony (1986) identify five main groups to which supervisors are responsible: (a) higher management, (b) employees, (c) coworkers, (d) staff departments, and (e) labor groups. Within each of
these responsibility groups, supervisors have specific technical, administrative, and managerial duties and tasks. This model stands out because it recognizes the interpersonal nature of a supervisor's job. In addition, it emphasizes the interdependency of the supervisory role and other performers and functions in organizations. However, the model appears to lack specificity as to how supervisors fulfill their responsibilities to each of the five identified groups. Moreover, it seems to have overlooked a responsibility group that is of utmost import, an organization's external customers.

Supervisory attributes. The second method used to categorize supervisory competencies is by identification of personal attributes that are required for the supervisory role. Pedler, Burgoyne and Boydell (1978) have developed a set of 11 personal attributes that organizations expect supervisors to possess:

1. Command of basic facts
2. Relevant professional knowledge
3. Continuing sensitivity to events
4. Problem-solving, analytical, and decision/judgment-making skills
5. Social skills and abilities
6. Emotional resilience
7. Proactivity and inclination to respond purposefully to events
8. Creativity
9. Mental Agility
10. Balanced learning habits and skills
11. Self-knowledge

Similar to Carrol and Anthony's model, the specified competencies in this list seem more abstract than concrete in nature. This competency list appears consistent with the perspective of a facilitative supervisory role in that the identified competencies imply that supervisors require a variety of higher-level managerial skills such as problem solving and judgment-making to do their jobs.

A second model that identifies supervisory competencies in terms of attributes is the Supervisory Selection Tool (ASSET). ASSET was developed by the Life Office Management Association for use in the insurance and financial services industry (Arnold &
The dual purpose of ASSET is to assess supervisory skills and to provide information for the supervisory selection process. ASSET identifies nine critical competencies of supervisory performance:

1. Planning and organizing
2. Personal work habits
3. Leadership
4. Personnel administration
5. Dealing with others
6. Problem solving
7. Communication skills
8. Monitoring and evaluating activities
9. Guiding and developing employees

Although several of the nine competencies focus on demonstrable skills, the ASSET list appears to predominantly consist of personal attributes which may later manifest themselves through the demonstration of a particular skill.

Consistent with the competencies identified in ASSET, Byham (1985) reports that assessment centers most often focus on supervisory attributes during the supervisory selection process. Attributes most often measured include: creativity, impact, leadership, sensitivity, independence, initiative, problem analysis, planning and organizing, judgment, delegation, flexibility, control, and risk taking. Clearly, assessment centers focus on higher-level cognitive skills as critical dimensions of supervisory performance.

Behavioral skills. Supervisory competencies are also identified in terms of behavioral skills. Carnarius (1976) identifies eight competencies as necessary supervisory skills:

1. Leading skills: Those involved with motivating and directing people to get the work done
2. Communicating skills: Using information in proactive ways
3. Getting along with coworkers informally
4. Resolving conflicts
5. Managing resources
6. Making decisions in ambiguous situations
7. Finding ways to improve situations or processes by searching for problems and opportunities
8. Developing themselves

Similar to previous models, this group of competencies de-emphasizes the importance of technical and administrative skills while it emphasizes the importance of higher-level managerial skills for effective supervisory performance. In contrast to the preceding models, the competencies identified by Camarius appear to more descriptively identify what types of behaviors are expected of a supervisor.

The management of a General Electric facility in Columbia, Maryland identify seven skills as essential supervisory competencies: ability to develop a plan for achieving goals, ability to deal with a superior, communications ability, technical knowledge, administrative skills, capacity for dealing with people outside the work unit and outside the organization, and ability to deal with subordinates ("What's Ahead in Personnel", 1978).

Similarly, in a comprehensive study of expert supervisors AT&T identified 14 main tasks of supervision (MacDonald, 1982):

1. Controlling the work
2. Problem solving
3. Planning the work
4. Informal oral communication
5. Formal oral communication
6. Providing performance feedback
7. Coaching a subordinate
8. Written communication/documentation
9. Create/maintain motivative atmosphere
10. Time management
11. Meetings
12. Self-development
13. Career counseling a subordinate
14. Representing the company

Interestingly, supervisory competencies such as the ones identified by General Electric reflect the worth that organizations attach to the administrative and technical skills that
supervisors require to do their jobs. Yet, AT&T's competencies appear to reflect the valuing of intangible, higher-level managerial skills such as problem solving and facilitating a motivating work environment in addition to the practical tasks of daily supervision.

Synthesis of the Literature Regarding Supervisory Competencies

There are fundamental similarities among the competency models in regard to the nature of the identified competencies and their relative importance to the supervisory role. To begin with, an analysis of the models suggests that supervisors require technical expertise, administrative skill, and managerial skill. While competence in all three skill areas is required, higher-level managerial skills such as facilitative skill and problem solving skill appear to be increasingly important to the effective performance of the supervisory role (MacDonald, 1982; Wolfe, 1983).

In addition, an analysis of the models suggests that the supervisory role is clearly becoming more important to the effectiveness of organizations (Boyd & Scanlan, 1976; Kirkpatrick, 1993). Supervisors carry out more managerial responsibilities than in the past and their levels of influence on employee attitudes and behaviors continues to escalate. What is troubling is that while levels of supervisory responsibility and influence continue to grow, many organizations do not believe that supervisors have the skills and abilities to meet these new challenges (Wood, 1976). For example, research conducted at the University of Wisconsin's Management Institute found that supervisors are only 50 to 65 percent effective as evaluated by middle-level and senior-level managers (Kirkpatrick, 1993). Thus, there is a disparity between present expectations for supervisors and present skills and abilities possessed by supervisors.
Developing Supervisory Expertise

This section of the review of literature is divided into three parts. The first part discusses past beliefs regarding the development of supervisory expertise. The second part discusses present beliefs regarding the nature of supervisory expertise. Lastly, implications for developing supervisory expertise are presented.

Past Beliefs Regarding the Development of Supervisory Expertise

Supervisory job expectations have dramatically changed during the past thirty years. Correspondingly, beliefs about the criteria that define and the experiences that contribute to developing supervisory expertise have also changed in important ways.

Past characteristics of supervisory expertise. In the past, two important characteristics that have been associated with effective supervisors were technical expertise and a directive supervisory approach. To begin with, effective supervisors were perceived as those people who possessed large amounts of knowledge and skill in their particular area of expertise (Bittel, 1987; Roethlisberger, 1965; Wolfe, 1983). It was commonly believed that those individuals with the most technical expertise in a specific domain would make the most effective supervisors. As a result, technical expertise was often used as a primary criterion for supervisory selection and promotion.

In addition, effective supervisors were perceived to be those that used a directive supervisory approach to manage the work of their employees (Wolfe, 1983). By using a directive approach, supervisors were able to control and direct their subordinates' work. Thus, supervisors in past times were perceived to be individuals with the highest level of technical expertise in their task area who used a directive approach to control the work of their employees.
Past methods for developing supervisory expertise. In the past, few developmental experiences were provided by organizations for developing supervisory expertise (Bittel, 1987). People that had been selected for supervisory positions were assumed to already possess the technical expertise and managerial skill that they required to be successful supervisors (Wolfe, 1983). Since the selection process was essentially based on technical expertise, it was assumed that new supervisors already possessed extensive technical knowledge in their specific task area. Furthermore, it was believed that new supervisors already possessed the managerial skills that they required to supervise employees. Similar to the belief that teachers teach as they were taught, supervisors were expected to be able to effectively direct the work of their employees because this type of management style was the same one that was used to manage them as line employees.

Therefore, organizations believed that supervisors already possessed the characteristics required for effective performance when they were selected for supervisory positions. Consistent with this belief, organizations generally did not perceive that supervisors had any significant developmental needs and, as a result, provided few activities for their professional development.

Although the predominant belief was that individuals promoted to supervisory positions inherently possessed adequate supervisory skills, one series of programs that began to address the developmental needs of supervisors was the Training Within Industry Programs (Bittel, 1987). Established during World War Two, these programs focused on the development of three supervisory skills: job instruction training, job methods training, and job relations training. While job instruction training still exists in a similar form today, the other two skill sets have largely been forgotten. However, Bittel (1987) states that job methods training may have been the precursor of present courses in job design, although "its emphasis was upon the technical rather than the self-determinant aspects of an employee's work" (p. 4). Furthermore, job relations training probably was the predecessor
of present human relations skills training. Aside from the use of these programs and on-the-job experiential learning, few developmental experiences were provided for supervisors until approximately the 1960's.

Present Beliefs Regarding the Nature of Supervisory Expertise

During the past 30 years, organizations have experienced dramatic changes. The knowledge level of front-line employees is higher, the work is more complex and sophisticated, and the organizational structure is flatter and leaner. To change to meet the changing needs of organizations, the role of supervisors has shifted from a directive to a facilitative approach and, as a result, the corresponding requirements for supervisory expertise have also changed (Bittel, 1987; Kirkpatrick, 1993; Wolfe, 1983).

Present characteristics of supervisory expertise. Increasingly, supervisors must possess and be able to use a combination of technical expertise, administrative ability, and managerial skill. As in the past, supervisors still require technical expertise in their task area. However, because other human and technological resources are more available in the workplace the present belief is that technical expertise is not as important to the supervisory role as it once was. Yet, supervision experts recognize that supervisors still require technical competency in their task area (Bittel, 1987; MacDonald, 1982). In addition to technical expertise, supervisors require administrative ability. Supervisors must be able to perform necessary administrative functions such as payroll administration and performance evaluation to effectively manage their employees. Thirdly, and perhaps most importantly, effective supervisor performance is dependent upon the use of managerial skills (Gardner, 1987; Wolfe, 1983). Increasingly, to achieve desired outcomes supervisors must be able to fulfill the dual responsibility of transmitting organizational goals, objectives, and strategies to employees all the while meeting the needs of employees in the workplace. As a result, supervisors require higher-level
managerial skills such as the ability to solve problems, to make decisions, and to facilitate the learning of others in order to meet the challenges of their present role.

Realizing that the requirements of supervisors' expertise have changed, organizations have begun to recognize that they must provide different types of developmental experiences to better assist this group of employees in developing their abilities. A primary challenge that organizations face is identifying the types of developmental experiences that are best suited for developing the types of skills that supervisors require. A field that provides direction for better understanding and addressing this challenge is the study of expertise.

The nature of expertise. The study of expertise is deeply rooted in cognitive psychology (Shuell, 1986). Theories and research in cognitive psychology attempt to understand expertise by studying people's minds and how they function. Most of the research on expertise has been done with children, college students, and artificial intelligence; as such, relatively few studies have been conducted with adults (Resnick, 1983). Through these studies, greater understanding has begun to emerge about the how expertise develops and can possibly be facilitated.

A review of the expertise literature has found three main characteristics that comprise expertise: technical expertise, organization of knowledge in the cognitive structure, and use of cognitive strategies. The nature of these characteristics appears to be interdependent and complementary (Gagne, 1985; Glaser, 1984). That is, the development of each of the characteristics is dependent on the concurrent development of the other characteristics. Individuals that possess high levels of the three characteristics are generally referred to as experts and those that demonstrate low levels are referred to as novices. While the nature of these categories appears to be dichotomous, expertise is often conceptualized as a continuum with novice and expert as theoretical endpoints (Benner, 1984).
The first characteristic of expertise is a body of knowledge and experience in a specific domain (Palumbo, 1990). Many authors suggest that people possess two distinct types of knowledge, declarative and procedural (Cantor & Showers, 1985; Gagne, 1985; Merriam & Caffarella; 1991). Declarative knowledge is what one knows about things and is often represented as facts or specific information. An additional discrimination about declarative knowledge made by Gagne (1985) is that declarative knowledge is verbal; that is, it is information that a person can express. On the other hand, procedural knowledge is what a person knows about how to do things. This type of knowledge is typically represented by performance of skills and tasks.

The body of knowledge differs for experts and novices. Experts tend to have extensive amounts of knowledge and experience in their areas of specialization (Cantor & Showers, 1985). In contrast, novices tend to possess low levels of knowledge and experience in their domains of expertise. As is found with experts, high levels of declarative and procedural knowledge have been associated with the ability to make unusually fine discriminations among stimuli in a given domain. Further, expertise theorists speculate that large amounts of both types of knowledge contribute to the ability to identify and to solve problems in a specific domain (Gagne, 1985; Glaser, 1984; Palumbo, 1990).

Organization of knowledge in the cognitive structure is the second characteristic of expertise (Cantor & Showers, 1985). Schemata theory is often used to describe how people organize information in their minds (Glaser, 1984; Merriam & Caffarella, 1991). Schemata development refers to the continuous creation of increasingly complex structures of mental organization. Taba (1966) suggests that people develop schemata to effectively cope and interact with their environment. Faced with new and changing stimuli in the environment, people develop mental competencies which extend their grasp and
control of the world by increasing the cognitive structure's ability to understand and control the situation.

Two types of scheme arrangements that describe how knowledge is organized in the cognitive structure are hierarchical and cluster. Educational theorists such as Robert Gagne, Jerome Bruner, and David Ausubel have developed models of learning that utilize hierarchical arrangements of knowledge. Gagne (1985) describes the hierarchical arrangement of knowledge as a "learning hierarchy" (p. 272). In ascending order, Gagne identifies discriminations, concrete concepts, defined concepts, rules, and higher-order rules or problem solving as abilities required for intellectual skill development. Similar to Gagne, Bruner (1961a) and Ausubel (1968) describe schemata as a hierarchical arrangement of knowledge. According to these educational theorists, cognitive structures are composed of concepts at varying levels of generality. General concepts contain more inclusive, abstract concepts and rules while more specific concepts contain detailed, specific information.

Hierarchical cognitive models imply that knowledge is acquired, organized, and stored in a sequential manner. Gagne (1985) explains this phenomenon by suggesting that learning is a cumulative process. That is, intellectual skills must be learned hierarchically to mirror how the mind is organizing and storing knowledge. The cumulative nature of learning implies that prior knowledge and skills about certain subordinate intellectual skills must be present before a person is able to learn new intellectual skills. As a result, knowledge of subordinate rules or set of rules is required before a person is able to acquire a higher-order rule or concept. Similar to Gagne, Bruner and Ausubel propose that people learn something by relating new knowledge to present knowledge thereby integrating the new knowledge into the existing cognitive structure. This integration process often involves modification of the new knowledge, the existing cognitive structure or both.
In addition to hierarchical models, expertise theorists describe the organization of information as clusters of knowledge in a specific domain (Gick, 1986; Isenberg, 1984). Also referred to as schemata, clusters contain information about problem goals, problem constraints, and solution procedures most useful for particular types of problems.

Similar to Gick and Isenberg, Palumbo (1990) describes schemata in terms of the task environment. He describes schemata as a concise, easily-remembered overview of the task environment, which includes a set of knowledge, information, facts, and relationships required to solve a problem. Experts tend to use information in their schemata to generate a qualitative analysis of the problem at hand.

Based on hierarchical and cluster models of the structure of knowledge, expertise theorists have come to believe that experts and novices differ on the complexity and type of schemata that they possess (for example, see Cantor & Showers, 1985; Glaser, 1984; Gick, 1986). Experts tend to have cognitive structures which contain highly abstract and complex concepts and rules and tend to possess sophisticated schemata that are related to particular problems and corresponding solutions in their domains of expertise. In contrast, novices tend to have cognitive structures that contain simple, basic concepts and rules. Their schemata tend to be based on superficial similarities of information and, as a result, are rarely related to particular problem types and rarely contain solution procedures.

Many studies have confirmed that experts and novices organize knowledge in different ways. Glaser and his associates (Chi, Glaser, & Rees, 1982; Lesgold, Feltovich, Glaser, & Wang, 1981) studied how the organization of knowledge in complex knowledge domains contributes to the observed thinking of experts and novices. Adelson (1981) investigated similar issues in a study of how the knowledge of novices and experts is structured, accessed, and used. Examining how knowledge is organized, Isenberg (1984) studied 12 senior managers who were considered exemplary performers. Similarly, Hinsley, Hayes, and Simon (1977) studied how experts and novices utilize different types
of schemata in solving algebraic word problems. Essentially, these studies found that knowledge is hierarchically organized in one's cognitive structure and that individuals utilize this information to develop clusters of knowledge called schemata, which represent their views of events and objects in their environment. Furthermore, evidence suggests that experts and novices differ in terms of the complexity and sophistication of the cognitive structure and schemata relevant to particular domains with experts demonstrating higher levels of both features.

A third characteristic of expertise is the use of cognitive strategies to access information in one's cognitive structure (Gick, 1986). Much attention has been directed to the use of cognitive strategies during problem solving. A common way of conceptualizing the problem-solving process is that a learner generates a representation of a problem and then searches through the problem space for an appropriate solution to the problem (Glaser, 1984). Individuals use different types of cognitive strategies during the problem identification and the problem resolution stages of the problem-solving process (Gick, 1986; Palumbo, 1990). These types of strategies can be classified as either schema-driven or general search.

Studies have found that experts tend to use schema-driven strategies to solve problems in their domains of expertise (Chi, Feltovich, & Glaser, 1981; Larkin, McDermott, Simon & Simon, 1980). Also referred to as working forward strategies, schema-driven strategies are processes in which schemata containing information about typical problem goals, types, and constraints and solution procedures are activated to solve a problem (Gick, 1986; Palumbo, 1990). If appropriate schemata are activated during the identification of a problem, an individual can proceed directly to implementation of solution strategies. Since a scheme contains potential solution procedures, a person is able to work forward directly to implementation of solution strategies.
However, novices are not able to use schema-driven cognitive strategies since they lack developed schemata in their given domains (Cantor & Showers, 1985). As a result, they rely on less effective cognitive strategies for solving problems called general search strategies. Although novices rely on a variety of general search strategies such as superficial analogy and planning to solve problems, the primary type of general search strategy that they use during problem-solving is means-ends analysis. A means-end analysis involves a comparison of problem states to goal states. In contrast to the working forward process found in schema-driven strategies, means-end analysis is referred to as working backward process (Gick, 1986). An individual proceeds through an iterative process of setting subgoals to find unknowns and generating appropriate procedures to obtain the subgoals until the terminal goal is actually obtained.

Although both experts and novices have been found to use general search strategies, it appears that only experts have control over which type of strategy to use when solving problems (Cantor & Showers, 1985; Gick, 1986; Glaser, 1984). Experts have been found to use more actively-controlled, general search strategies, such as worked examples and analogies by solution procedures, in situations in which accuracy of interpretation, precise recall, and effortful processing are valued. However, experts have been found to use more passive, automatic strategies such as schema-activation when efficiency and quickness are valued. These findings imply that experts control a trade-off between efficiency and accuracy as it relates to problem solving. The choice of which type of strategy to use appears to be dependent on which outcome the expert perceives as being of greater value, speed or accuracy.

In contrast, novices do not have the ability to choose which strategy to employ (Gick, 1986). Schemata are not present and, therefore, can not be used to automatically derive solution procedures. As a result, novices rely on less efficient and more actively-controlled general search strategies for solving problems.
In summary, the development of expertise is a complex process involving the development and use of technical expertise in a given domain, highly organized and complex cognitive structures and schemata relevant to a given domain, and cognitive strategies that access and utilize information in one's cognitive structure.

Implications of the nature of expertise for how people learn. One reason for investigating the nature of expertise is to develop greater insight about how people learn. Specifically, knowledge gained from the study of expertise provides greater understanding of the context in which learning takes place, the nature of the learning process and the transfer of learning.

The nature of expertise suggests that optimal learning occurs in a context that allows for the interaction and simultaneous development of one's technical knowledge, cognitive structure, and cognitive strategies (Glaser, 1984; Gagne, 1985). For example, Chi et al. (1982) found that experts access and use knowledge specific to a task domain during problem-solving activities to guide the problem identification and resolution process. Furthermore, experts have been found to use schema-driven cognitive strategies that are grounded in specific task domains to assist them in the problem-solving process. These findings imply that learning takes place through the use of knowledge within the context of a specific domain of expertise (Glaser, 1984). In a discussion of the relationship between the acquisition of higher-order cognitive skills and learning in the context of a specific domain, Glaser (1984) states that the:

... abilities to think and reason will be attained when these [higher-level] cognitive activities are taught not as subsequent add-ons to what we have learned, but rather are explicitly developed in the process of acquiring the knowledge and skills that we consider the objectives of education and training. (p. 93)
Thus, theory and research suggest that learning that occurs within the context of a specific domain supports the simultaneous development of the three components of expertise.

The nature of expertise also suggests that learning is a cumulative process (Shuell, 1986). People during learning activities attempt to understand, think about, and solve problems by accessing, modifying, and extending their cognitive structures (Glaser, 1984). Some theorists, such as Gagne (1985), propose that the ability to learn new knowledge is dependent upon the presence of certain relevant subordinate intellectual skills. That is, learners must possess certain types and amounts of knowledge before they can successfully learn the next concept or rule. As such, new learning builds upon and develops from existing knowledge in one's cognitive structure.

The cumulative nature of the learning process implies that the context in which learning occurs may impact learning outcomes. An aspect of the cumulative nature of learning is that the development of higher-level concepts and rules requires that learners possess subordinate procedural and declarative knowledge related to a specific content area (Glaser, 1984). This requirement suggests that the development of higher-order cognitive skills and content knowledge can most effectively be attained during learning activities that take place in the context of a specific task domain (Gagne, 1985).

Furthermore, the cumulative nature of learning implies that learners have an active and challenging role during the learning process (Gagne, 1984; Glaser, 1984). Learners must monitor and assess how their representations of knowledge are consistent or inconsistent with the way that knowledge actually exists in the environment (Glaser, 1985). Through this active process, learners determine how new knowledge fits into their current representation of knowledge and take whatever action is deemed appropriate based on that determination. For example, a model of expertise in clinical nursing practice is based upon the belief that expertise develops from the continual testing and refining of propositions, hypotheses, and principle-based expectations in actual work situations.
(Benner, 1984). Through this type of experiential process, nurses continually develop more complex and sophisticated cognitive ways of viewing situations and problems in their domains. This model illustrates the proposition that learners modify, revise, and develop their cognitive structures in a cumulative fashion through active learning experiences in their area of expertise (Shuell, 1986).

The nature of expertise also suggests that the ability to transfer learning from the training environment to job tasks is contingent upon the degree to which the learning experience actively involves the use of the three characteristics of expertise. For the first characteristic, researchers report that transfer of learning is dependent on the type and level of knowledge learned (Gagne, 1985; Gick, 1986; Glaser, 1986; Palumbo, 1990). Specifically, technical knowledge appears to be domain specific (Holland et al., 1986; Palumbo, 1990). That is, technical knowledge in one specific domain seems to have fairly high levels of transfer to problems and tasks in similar task domains and much lower levels of transfer to problems and tasks outside that particular task domain.

Secondly, the issue of whether schemata transfer to situations outside one's area of expertise remains unclear (Palumbo, 1990). Studies have found that novices with fairly simple schemata based on superficial similarities demonstrate a lack of ability to use schemata in problems or situations outside their specific domain. However, there is evidence that more highly developed schemata may have greater transfer to problems outside an individual's area of expertise. For example, Holland et al. (1986) found that expert athletes and actors were able to use schema-driven strategies based on solution procedures to solve a daily living problem outside their area of expertise, whereas novices preferred using strategies that relied on simple anecdotal explanations. The researchers concluded that experts have more abstract categories in their cognitive structures that contain inclusive sets of information. These categories are less domain-specific and have extremely general sets of rules that enable learners to see general similarities of class
membership without attending to discriminating attributes of more specific categories. Thus, higher levels of generalized and abstract knowledge enable experts to solve problems in or outside a particular area of expertise more effectively than novices. Similarly, Gagne (1985) proposes that learning involves the acquisition of rules and concepts that are increasingly general in their applicability. According to Gagne, this aspect of learning and intellectual development makes it possible for individuals to solve a great variety of new and novel problems. Although theory and some limited empirical studies propose that advanced and complex schemata have higher levels of transfer to tasks outside the originating domain, the proposition still remains relatively untested.

Thirdly, the transfer of cognitive strategies to areas outside the person's domain of expertise seems to be dependent upon the type of strategy under investigation (Palumbo, 1990). Low levels of transfer have been found for general search strategies. Transfer of these types of strategies appears to be limited to situations in which the task environments of the learning domain and destination domain are highly similar. On the other hand, it is unclear to what degree schema-driven strategies transfer to situations or problems outside the person's area of expertise. Cognitive theorists, such as Gagne (1985) and Holland et al. (1986), propose that schema-driven strategies should be able to be used to solve problems outside one's domain of expertise. However, few empirical studies have found evidence to support this proposition.

**Implications for Developing Supervisory Expertise**

Many organizations provide developmental experiences for supervisors. Knowledge acquired from the study of expertise has implications for developing supervisory expertise. Five implications are discussed.

**Outcomes of the training experience.** The development of technical knowledge and cognitive skill must both be valued as outcomes of the training experience since they
are integral components of supervisory expertise. Research and practice in supervisor training has traditionally focused on the acquisition, retention, and application of content knowledge and technical skill. Much less attention has been given to the development of higher-level cognitive skills. However, knowledge about the nature of expertise explains that both of these elements, technical expertise and cognitive skill, are essential components of expertise and must be developed in combination during the learning process.

**Methods of training.** The development of technical knowledge and cognitive skill is in part contingent upon the instructional methods used to deliver training (Shuell, 1986). Numerous authors, for example Glaser (1984), Gagne (1985), and Bruner (1961a), have written about the varying impact of certain instructional methods on the development of different types of technical knowledge and cognitive skills. In general, these authors suggest that the development of these attributes is facilitated through the use of instructional methods that allow learners to actively explore, think about, and apply what they are learning. Moreover, instructional methods that provide opportunities for relating new learning to existing knowledge and the testing of hypotheses about these relationships are also believed to be related to the development of higher-level cognitive skills. Interestingly, while many empirical studies of training methods have investigated the effects of various instruction methods on the development of technical knowledge, few studies have investigated the effects of instructional methods on the development of higher-level cognitive skills. For example, in a review of management development programs, Campbell, Dunnette, Lawler, and Weick (1970) found that only 4 out of 73 studies used training programs that included higher-level cognitive skill development as an objective. Thus, while theory suggests that methods of training influence the concurrent development of technical knowledge and cognitive skill, few studies have investigated the proposition.
Context in which training occurs. The context in which supervisory training occurs must also be considered in terms of its ability to support the development of supervisory expertise. Two contexts that are typically used for training in organizations are at the job site or away from the job site. Advocates of training at the job site contend that this form of training provides trainees with opportunities for immediate practice and application of concepts and skills in realistic situations (Gardner, 1987; Jacobs & McGiffin, 1987). Although training programs conducted away from the job site often include activities designed to practice and apply learning, they typically use contrived or simulated situations. As a result, trainees often fail to retain or transfer content taught during training. Moreover, while there has been a fair amount of empirical research on the effects of the training setting in terms of the development of technical skill, few studies have investigated the influence of the training context on the development of higher-level cognitive skills. Theory suggests that certain contexts would be more likely to support the development of supervisory expertise. However, sufficient research has not been conducted to specify with a high degree of certainty what types of training contexts are most likely to result in the development of certain characteristics of expertise.

Transfer of learning. The design and implementation of supervisory training activities must also consider the ability of those activities to support the transfer of learning from the training environment to the workplace. Studies have shown that task environments have to be highly similar in order for the transfer of technical knowledge to take place. This is a concerning finding since many training programs take place away from the workplace and often include instruction in general content areas. Further, studies have found that novices are often only able to transfer their simple types of schemata and cognitive strategies to situations that are highly similar to the originating task environment. Therefore, to improve learning transfer it appears that HRD professionals must decide whether to use training methods that focus on developing
higher-level schemata and cognitive strategies, to increase the similarity of the learning environment and the task environment during the training experience or to attempt to use a combination of both of these strategies.

Learning resources. The role of learning resources in developing supervisory expertise should also be considered. Studies of learning in the workplace show that people utilize other individuals with whom they work to acquire the knowledge and skills that they need to do their jobs (Comer, 1991; Levine & Moreland, 1991). Yet, people in training environments are typically involved in controlled interactions with others at similar stages of development and with a trainer. This lack of access to human resources in the workplace may limit the ability of trainees to interact with and learn from other people who provide rich sources of knowledge and experience.

Nonhuman resources are another important source of information for people during learning activities (Merriam and Caffarella, 1991). Supervisor training programs typically use prepared learning aids and activities, such as prepared case studies and hypothetical role-plays, to support instruction. These types of resources serve as tools for analyzing and practicing the content and skills taught during training. Interestingly, trainees seldom access nonhuman resources located in the workplace during their training experiences. In general, the empirical study of the role of human and nonhuman resources in developing supervisory expertise has been virtually ignored.
Deductive Instructional Approach

This section of the review of literature is divided into three parts. The first part describes the nature of a deductive instructional approach. The second part defines deductive training methods and discusses each of their strengths and limitations. The third part presents empirical studies of deductive methods used to train supervisors.

The Nature of a Deductive Instructional Approach

A deductive approach to training is a form of instruction in which the meaning of the content is presented by a trainer and then individualized and/or group learning activities are used to support the learning process (Newbert & Binko, 1992). In this approach, trainers are typically responsible for defining and presenting the content in a final form to trainees. Trainees are generally involved in the reception of information from trainers and independent and/or group practice and application activities. Training outcomes most commonly associated with a deductive approach are the acquisition and retention of knowledge (Dansereau, 1974; Glaser, 1966).

A review of the human resource development (HRD) literature found that most supervisor training programs use a deductive approach. Programs often combine two or more specific instructional methods to achieve different types of training objectives that are associated with individual methods and to overcome limitations that may be inherent in the sole use of one method (Burke & Day, 1986).

Deductive Training Methods

Training experts use various types of classification schemes to categorize deductive methods (see Campbell et al., 1970; Harrison, 1992; Kirkpatrick, 1993). Kirkpatrick (1993) divides methods of training into six categories: on-the-job
development, classroom training, external conferences, workshops/seminars, educational assistant programs, independent reading, and computer-based training. Utilizing a more cognitive approach, Harrison (1992) divides methods into two categories, cognitive information presentation approaches and experiential approaches. Campbell et al. (1970) divide training methods into three categories: information presentation, simulation, and on-the-job training (OJT). This categorization scheme seems descriptive of the nature of the training methods within each category, simple to use and contains a minimal number of overlapping categories. Hence, it is used as the categorization scheme for the present review of deductive training methods. The following section describes specific types of information presentation, simulation, and OJT methods and discusses their strengths and limitations for training in organizational settings.

**Information presentation methods.** Lecture, group discussion and programmed instruction are information presentation methods that are commonly used in training programs. Although these methods result in similar types of training outcomes, each method utilizes different instructional techniques.

Lecture is the most extensively used method of training in organizational settings (Goldstein, 1974). The method utilizes an instructional sequence characterized by the presentation of a rule, an example of the rule and then an incomplete example of a rule (Glaser, 1966). The role of a trainer in the lecture method is to generate, organize and impart the content of training to trainees. Conversely, the role of trainees is to receive information that is sent from the trainer and reproduce that information through application or practice exercises (Newbert & Binko, 1992). Training outcomes commonly associated with the lecture method are the acquisition and retention of knowledge.

The lecture method has several distinct advantages. The presentation of rules is reported to be an effective and efficient way of transmitting knowledge. Some learning theorists, for example Ausubel (1968), believe that the presentation of rules followed by
examples and incomplete examples facilitates the learning of new material by insuring that learners have inclusive concepts which permit them to subsume new information under those concepts. Moreover, some experts suggest that the recall of rules is also facilitated with the lecture method because rules and principles are presented first.

However, some education and training experts are critical of the lecture method (Goldstein, 1974; Newbert & Binko, 1992; Taba, 1966). Main disadvantages associated with a lecture method are that trainees are passive recipients of information, that trainees are reproducers rather than producers of knowledge, and that lecture does not require trainees to use higher-level cognitive skills such as inductive thinking or reasoning. As a result, Newbert and Binko (1992) contend that trainees seldom have opportunities to develop confidence in their ability to learn and think independently. Further, trainees may not be able to apply new knowledge to situations other than the context in which it was learned because new knowledge has not been actively connected to existing knowledge in the learner's cognitive structure. Other limitations of the lecture method include its insensitivity to individual differences, its limited ability to provide immediate feedback to trainees and its low popularity rating among trainees and training staff (Carroll et al., 1972).

Group discussion is a variation of the lecture method. In group discussion, trainees have the opportunity to interact with the presenter of information and/or with other participants during the training experience (Campbell et al., 1970). Two types of group discussion are regularly used in training. Large group discussions occur when a trainer facilitates or guides a whole class discussion. Small group discussions occur when trainees are divided into smaller groups and each of the groups is asked to address specific issues or problems. Training outcomes commonly associated with group discussion are the acquisition and retention of knowledge.
Two main advantages are present with group discussion. Trainees tend to be more active and thus have greater opportunities for connecting new information to their own representations of knowledge with group discussion than with the lecture method. In addition, trainees are able to access human resources other than the trainer during the training experience. These aspects of group discussion may improve the acquisition and retention of learning.

Yet, certain inherent aspects of group discussion limit its ability to achieve desired outcomes. Although there is a greater degree of active participation for some trainees with group discussion, the method does not ensure that all trainees are actively participating. In fact, many HRD practitioners report that often times a few trainees are the ones who are participating in the discussions while the rest of the trainees remain fairly passive. Similar to the lecture method, many trainees may be expected to acquire new knowledge without actively assimilating it into their own body of knowledge.

Programmed instruction involves the systematic presentation of information to trainees (Goldstein, 1974). Programmed instruction is characterized by the establishment of trainee objectives, active participation of trainees, immediate knowledge of results, self-pacing of learning and presentation of content in small chunks. Training outcomes commonly associated with the programmed instruction are the acquisition and retention of knowledge.

Strengths associated with programmed instruction relate to time and cost efficiencies. Trainees using programmed instruction have been found to learn faster than with lecture or group methods. Furthermore, training costs are fairly low with this method as compared to other methods since a minimum amount of contact time between trainees and trainers is required.

However, several factors limit the usefulness of programmed instruction for training purposes. As with lecture and group discussion, programmed instruction does not
involve trainees in the collection, organization, and generalization of information. As a result, the likelihood that trainees will assimilate the new learning into their cognitive structures and ultimately be able to apply it to situations that differ significantly from the learning environment is diminished. In addition, since most of the programmed instruction programs have fairly rigid structures which present material one chunk at a time, trainees tend to become bored fairly quickly. Moreover, the programmed instruction format does not appear to be suitable for content areas that involve the development of human relations, managerial and interpersonal skills.

**Simulation methods.** Simulations are training activities that reproduce behavioral processes necessary for performing a task or solving a problem (Goldstein, 1974). Three types of simulation methods used in training programs are case study, role-play, and behavior modeling.

The case study method is often used to analyze or practice content that has been presented during the training program via another method such as lecture or group discussion (Bobele & Buchanan, 1976). In the case study method, trainees are presented with a history of an organization or a situation within a work system and are asked to analyze the problem or situation, develop alternative ways of dealing with the problem and decide upon a course of action. The role of trainers in the case study method is to guide trainees through the analysis steps. Conversely, trainees are responsible for analyzing the case, identifying alternatives for resolving the problem in the case and selecting the best alternative for problem resolution. Training outcomes associated with the case study method include acquisition and retention of learning (Goldstein, 1974), application of learning (Bobele & Buchanan, 1976), and development of problem-solving skill and decision-making skill (Bobele & Buchanan, 1976).

Proponents of the case study method suggest that the inherent nature of the method results in an active, creative learning process. Specifically, the method forces
learners to actively engage themselves in the content being presented (Bobele & Buchanan, 1976). This active involvement contributes to the ability of trainees to retain and apply content that is learned. Moreover, the self-discovery that occurs during training sessions is likely to lead to longer retention of principles generated by trainees (Goldstein, 1974).

However, critics of the case study method disagree with some of the advantages cited in the literature. Goldstein (1974) believes that a lack of guided instruction, which generally characterizes the case study method, is detrimental to the development of content learning and cognitive skill. Moreover, while the case study method places heavy emphasis on convergent thinking processes, relatively little emphasis is placed on divergent thinking processes. Both types of thinking processes have been found to be essential to the development of higher-level cognitive skills. Thus, some training experts believe that while the use of case studies may improve one's ability to apply content knowledge, transfer of that knowledge may be limited to domains that are highly similar to the training environment (Bobele & Buchanan, 1976).

Role-play is described as a situation in which an individual, or a group of individuals, is asked to take a role that is not normally his or her own; or, if it is his or her own, is in a setting not normal for the enactment of the role (Kirkpatrick, 1993). Participants other than those actively participating in the role-play often observe the role-play, critique the behaviors of those in the role-play and provide feedback to the players after the role-play is finished. Trainers are responsible for introducing the role-play to the participants and facilitating the critique of the role-play afterward.

The role-play method is characterized by the active analysis of personal values and behaviors (Joyce & Weil, 1986). Goldstein & Sorcher (1974) believe that these aspects of the method have the potential to result in effective attitudinal and behavioral changes on-the-job. Successful applications of the role-play method have been found in management
and supervisor training, salesman training, labor management, conflict training, and communication training.

However, there are concerns about the ability of role-play to result in sustained attitudinal or behavioral changes. Goldstein & Sorcher (1974) report that role-plays often lack clarity about the individual steps required to perform specific tasks. As a result, participants are left unsure about what specific types of behaviors are most effective in particular situations. Further, these authors report that role-play is often used to provide trainees with some insight into their supervisor style rather than to provide practice with specific behaviors necessary for handling work-related problems. Thus, training experts disagree about the content areas or types of training outcomes for which the role-play method is best suited.

Behavior modeling is a third type of simulation method. Behavior modeling involves a three-step process (Goldstein & Sorcher, 1974). First, small groups of supervisory trainees observe as supervisor and employee models effectively interact during a problem situation. Second, trainees take part in role-plays to practice the specific behaviors demonstrated by the models. And third, reinforcement and feedback is provided by trainees and trainers to the participants in the role-plays. Objectives of behavioral modeling are accomplished through attention to key behaviors in the first step, retention of key behaviors in the second step and reproduction of the behaviors under similar conditions on-the-job through the continual use of the third step. As such, training outcomes frequently associated with this approach are the development, retention and application of content knowledge and skill.

Behavior modeling has clear advantages for teaching concrete behaviors and for the transfer of learning (Tannenbaum & Yukl, 1992). Behavior modeling has been found to be effective in teaching concrete behaviors which are necessary for performing a specific task. For instance, behavior modeling has been used to effectively develop
management and human relation skills such as teaching a new job, counseling a dissatisfied employee and conducting a performance evaluation session (Bittel & Ramsey, 1983).

Since the steps in the behavior modeling method are designed to mirror tasks or situations in the work environment, use of the method tends to facilitate the transfer of skills from the learning environment to the job setting (Goldstein & Sorcher, 1974).

Limitations of behavior modeling arise from its strong behavioral orientation (Tannenbaum & Yukl, 1992). The behaviors that are acquired as a result of training appear to be highly domain specific. As a result, the learning and job environment must be highly similar in order for the knowledge and skills acquired during training to transfer to situations in the job setting. Relatively little is known about how the use of behavior modeling influences the development of higher-level cognitive skills.

On-the-job training methods. Three main types of methods are used for on-the-job training: unstructured on-the-job training (OJT), structured on-the-job training (SOJT) and self-development programs (Jacobs, Jones, & Neil, 1992; Rothwell & Kazanas, 1990; Kur & Pedler, 1983).

OJT is a method that is often used to prepare people for a variety of jobs (Jacobs, Jones, & Neil, 1992). It is characterized by unplanned and unstructured learning activities in which a knowledgeable person demonstrates a job task to a trainee and guided practice is provided to reinforce the learning (Jacobs & McGiffin, 1987). This process of demonstration and practice is repeated over a period of time until competence is attained in all job tasks. The role of the trainer in OJT involves the planning, implementation, and evaluation of learning, although the degree to which each of these steps occurs varies with each training situation. The role of the trainee is fairly active since the training method is typically a one-on-one process in which trainees are involved in the reception and practice of knowledge and skills.
Although OJT has been identified by many as the conventional method for training employees in the work place, there are concerns associated with its use. Jacobs and McGiffin (1987) state that the "concerns about the use of OJT include its inefficient use of time, unpredictable and inconsistent performance outcomes, and over-dependence on the communications skills of the supervisor." (p. 8). As a result of these concerns, training outcomes associated with OJT tend to be unpredictable and vary widely.

An alternative to OJT that has surfaced in recent HRD literature is SOJT (Jacobs & McGiffin, 1987; Rothwell & Kazanas, 1990). Jacobs (1992) describes SOJT as the "one-on-one process of providing the knowledge and skills necessary to perform a specific task within a job" (p. 1) and is characterized by training that occurs in the workplace and uses qualified trainers, training guides, a training process, and a systems approach. Five main steps are identified for the SOJT process: (1) the trainer prepares him or herself, (2) the trainer prepares the trainee, (3) the trainer presents the task, (4) the trainee repeats the task, and (5) the trainer assesses and reinforces learning.

Although empirical studies of SOJT is somewhat limited, evidence suggests that SOJT can achieve the same outcomes of methods that take place away from the job setting. In addition, SOJT may increase the retention and transfer of learning to job tasks in the job setting (Rothwell & Kazanas, 1990). Further study of this method is required to assess its ability to support retention and transfer of learning with different types of content and in different contexts.

Some HRD experts believe that the greatest improvement in supervisory performance can occur through self-development programs (Kur & Pedler, 1983). This method has been perceived as the most complex and difficult form of learning but also believed to be the one that results in the greatest development of higher-level cognitive skills. Self-development generally occurs in three stages: (1) trainees acquire the knowledge and skills that are specified by the organization in which they are a part, (2)
trainees then identify their own learning needs, resources available to meet those needs, and how to evaluate and monitor their own learning, and (3) they learn to manage through participative and consultative means. These stages of development occur through structured developmental experiences. Specific types of self-development activities identified in the literature are coaching, mentors and experiential groups such as T-groups and sensitivity training. Clearly, the role of a trainee in a self-development program is an active manager and facilitator of one's own learning. Conversely, the role of trainers is one of a resource person for a trainee during the various stages of the learning process.

A distinct advantage associated with this approach is the development of higher-level cognitive skills (Kur & Pedler, 1983). The development of skills such as autonomous learning, independent thinking, reasoning and problem solving are associated with self-development methods of training. Interestingly, this method is one of the few training methods in which the development of these types of higher-level cognitive skills is an explicitly stated training outcome.

On the other hand, the relationship between the use of a self-development training method and the development of content knowledge and technical skill is unclear. Further investigation of this area is required.

**Empirical Studies of Deductive Methods Used to Train Supervisors**

In general, the empirical investigation of instructional methods used for supervisor training has been neither rigorous nor comprehensive. Many studies lack proper research design and methodology. For example, eight of the thirteen supervisor training studies analyzed in this review made few attempts to control variables that might confound the outcomes of the study or had no control group built into the study.

In addition to design concerns, the study of instructional methods used for supervisor training has not been comprehensive. While it is common to find studies that
have measured reaction and learning outcomes, relatively few studies have investigated the
effects of particular methods on changes in job behaviors or on individual or
organizational performance (Burke & Day, 1986; Kirkpatrick, 1993). Furthermore,
although many studies have investigated the impact of methods on technical knowledge
and skill, few studies have investigated how training methods influence the development of
higher-level cognitive skills (Tannenbaum & Yukl, 1992).

In accordance with a categorization scheme used by Campbell et al. (1970), a
matrix was developed and used in this review of literature to classify the empirical studies
of instructional methods used for training supervisors. As shown in Figure 1, the resulting
2 by 5 matrix classifies studies by training outcome and training method. Training
outcomes are classified as internal or external. Internal criteria refer to measures of
attitude and learning that result from training. In contrast, external criteria refer to
measures of behavioral changes on-the-job or impact on the organization that result from
the training program. Five categories of training methods are used to group the studies.
The first three categories (information presentation, simulation, and on-the-job) contain
studies that investigated the use of one particular method and may or may not have used a
control group. The combination methods category contains studies that used a
combination of two or more methods of training as one level of a treatment.
The comparative analysis category contains studies that have compared the use of two or
more types of methods of training.

Information presentation methods. No empirical studies were found that examined
the specific use of information presentation methods for training supervisors. Training
experts such as Goldstein (1974) have noted this deficiency in the empirical literature.
While information presentation methods have been studied in combination with other
approaches, it remains unknown in what way and to what degree information presentation
methods contribute to the attainment of identified training outcomes.
### Figure 1

**Empirical Studies of Deductive Methods Used to Train Supervisors**

<table>
<thead>
<tr>
<th>Type of Method</th>
<th>Information Presentation</th>
<th>Simulation</th>
<th>On-The-Job Training</th>
<th>Combination</th>
<th>Comparative Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal</td>
<td>None</td>
<td>Maier (1953)</td>
<td>Lawshe, Bolda, Brune (1958, 1959)</td>
<td>Carter (1951) - lecture &amp; small group discussion</td>
<td>Carroll, Paine, Ivancevich (1972) - perceived effectiveness of 9 methods</td>
</tr>
<tr>
<td>External</td>
<td>None</td>
<td>Burnaska (1976)</td>
<td>Hess (1977)</td>
<td>McGehee &amp; Gardner (1955) - group discussion &amp; role-play</td>
<td>Levine &amp; Butler (1952) - lecture vs. group discussion</td>
</tr>
</tbody>
</table>

|                |                          |             | McKeon (1981) - compared three general types of methods | Harrison (1992) - programmed instruction vs. behavior modeling |             |
Simulation methods. Five studies examined the use of simulation methods for training supervisors. While three of the five studies, Maier (1953), Lawshe, Bolda, and Brune (1959), and Cetingok (1988), used internal criteria to evaluate the effectiveness of the training method, the other two studies, Burnaska (1976) and Hess (1977) used external criteria to evaluate training effectiveness.

To begin with, Maier (1953) examined the use of the role-play method in a human relations training program for 176 first-level and middle managers. The experimental group experienced the role-play method and the control group received a one-half hour lecture. Criteria as measured by a posttest role-play of a hypothetical situation were acceptance of change and percentages of subordinate roles that subjects perceived as a problem subsequent to the role-play. Results found that 50 percent of the control group and 59 percent of the experimental group were acceptive of change. Further, approximately 11 percent of the experimental group and 25 percent of the control group perceived the subordinate roles as a problem. The researcher concluded that role-play was superior to the control on the criteria under study. Several methodological concerns about this study should be noted. Total training time for the experimental group was eight hours whereas total training time for the control group was only one-half hour. In addition, no pretest measure was taken of the two groups to determine whether there were preexisting differences among the groups that may have influenced the results. Consequently, a conclusion about the superiority of role-play should be accepted with some degree of caution.

Lawshe et al. (1959) conducted a series of five studies to investigate the effects of various role-play conditions and role assignments on employee orientation to supervisory problems and sensitivity to the reasons why people behave as they do. The participants in the series of studies were 26 school custodians, 27 staff supervisors, 16 male staff supervisors, and 29 supervisors enrolled in a five-week human relations program.
Instructional events such as feedback and practice varied among the groups. Dependent variable measures consisted of trainees viewing a videotaped case problem and responding to two questions regarding employee orientation and sensitivity. The researchers found that although all groups except for the first showed significant improvements in sensitivity as a result of the training, only one of the groups showed significant improvement on employee orientation to supervisory problems. It was concluded that role-play is an effective method for increasing sensitivity and employee orientation, so long as an aspect of training which was called impact is present. Impact was described as a developmental process involving self-assessment and performance feedback. Although the explanation of the results appears unsubstantiated and rather unclear, the principal value of this series of studies is that an attempt was made to discern aspects of the role-play method that influence specified training outcomes.

In an academic setting, Cetingok (1988) investigated whether a role-play method in which students simulated roles identified in interpersonal skills case problems would result in increased levels of creativity and communication, management of self, peer relations and administrative function. Six students in the social welfare department were used as subjects for the study. An adapted version of the time series design was used as the design of the study. Using a Simulation Self-Assessment Tool to measure the five specified criteria, the researcher found no significant differences or changes in the five dependent variables over six time measurements. Cetingok concluded that (a) simulations support high levels of preexisting interpersonal skills because the subjects had high levels of those skills entering the training experience and the data did not reflect that their skills decreased as a result of the training, and (b) the subjects may have an unrealistically high perception of their own interpersonal skills. This study was reviewed because the participants were considered to be candidates for future supervisory positions in social welfare departments. A strength of the study is that it attempts to measure the effects of
role-play on the development of higher-level cognitive skills such as creativity and management of self. However, limitations of the study, such as the small number of subjects in the sample and the lack of a control group, suggest that further study should be conducted to confirm the findings that role-play is an effective method for maintaining and developing interpersonal skills.

Burnaska (1976) attempted to determine if behavior modeling influenced the interpersonal skills that first-level supervisors and middle-level managers use on-the-job. Subjects were divided into a behavior modeling group and a control group (N=124). The behavior modeling group observed experts role-play situations in which interpersonal skills were demonstrated, practiced specific interpersonal skills and received feedback on their learning. Subjects in the control group did not receive any training. Interpersonal skills were assessed by a trained observer who observed subjects communicating with others on-the-job and by subordinate ratings of supervisors' interpersonal skills. Measures taken one month and four months after training found that interpersonal skills had significantly improved for the experimental group. The researcher concluded that behavior modeling had effectively improved the interpersonal skills of subjects. Although these findings seem to support the use of behavior modeling for the development of interpersonal skills, it should be noted that improvements in interpersonal skill were found only with the first type of measure, expert judges' evaluation of the role-play. Data on the external criteria measure, employees' perceptions of managers interpersonal skills, showed only slight improvement for the experimental group.

Hess (1977) provides an anecdotal report of a supervisor training program that utilized role-play for the development of interpersonal skills. Supervisor trainees at the Fort Wayne State Hospital and Training Center were videotaped as they role-played a hypothetical situation and then the videotaped role-play was critiqued by a group of trainees. To determine the effects of the training program, Hess surveyed past participants
of the training program and assessed turnover percentages and grievances in departments in which the training had been focused in past years. Results of the survey found that supervisors perceived that the training experience had helped their ability to communicate with employees. In terms of impact, the researcher found that turnover percentages and grievances in the departments in which supervisors have received role-play training had decreased in significantly greater percentages than in the company as a whole. While there are methodological concerns in this study about instrumentation design and data collection, one of its strengths is that a genuine attempt was made to assess the worth and value of the training program in terms of its impact on the organization.

OJT methods. One empirical study, Kernan (1964), was found that examined the use of an OJT method for training supervisors. This study used internal criteria to investigate training outcomes.

Kernan (1964) studied possible attitude changes resulting from T-group training. Attitude changes on two dimensions were measured using a self-assessment instrument that had been developed and tested in a previous study. Sixty engineering supervisors from one organization were divided into an experimental group of 40 subjects and a control group of 20 subjects. The treatment consisted of a three-day laboratory training program. No significant differences were found for either group on either of the attitude dimensions. Although self-development methods such sensitivity training continue to receive attention in the literature, results from empirical studies such as this often do not support the positive outcomes attributed to the methods.

Although no empirical studies were found that used SOJT to train supervisors, interesting results are being found in the study of this type of training method. For example, Jacobs and McGiffin (1987) investigated the use of SOJT for training laboratory technicians in a manufacturing company. The researchers were able to determine the projected impact of using SOJT by measuring the training time required to reach criterion
and average turnover rates. Clearly, this type of research is attempting to demonstrably show how certain types of training can impact job behaviors as well as individual and organizational performance.

Combination of training methods. Three studies were found that investigated the use of a combination of two or more methods on various types of training outcomes. Carter (1951) investigated the use of lecture and small group discussion for achieving internal types of training outcomes. McGehee and Gardner (1955) and Anderson (1971) investigated combinations of methods for achieving external types of training outcomes.

Carter (1951) investigated the use of lecture and small group discussion in a twenty-hour human relations program. The program was implemented in three large insurance organizations with 18 supervisors; 18 additional supervisors were matched with those in the study on attribute variables and served as a control group. Dependent variable measures were an achievement test, a logical reasoning test, a social judgment test and a questionnaire which assessed the degree to which participants recognized their subordinates' opinions. The researcher found that the experimental group had significantly greater levels of improvement on the achievement test and attitude toward human relations. No significant increases were found for either group on logical reasoning skill or social judgment. It was concluded that these results of no difference may be due to the passive nature of the lecture/group discussion method. In terms of acquisition of knowledge and attitude change, however, the findings did suggest that a lecture/small group discussion method results in improved interpersonal skill.

McGehee and Gardner (1955) studied the effects of a combination of large group discussion and role-play in teaching production supervisors how to handle supervisory problems related to time study procedures. Criteria consisted of an achievement test for acquisition of time study principles, an attitudinal scale designed to evaluate attitudes toward time study and ratings of supervisor performance in the handling of time study
problems. Twenty-one supervisors were assigned to either an experimental group or the control group. The treatment consisted of a 43-hour time study course which utilized large group discussion and role-play. While no significant changes in attitude were found for either group, the experimental group did show significant changes in achievement and performance rating measures whereas the control group did not. The researchers concluded that the use of a combination of group discussion and role-play results in the acquisition and application of skills.

Anderson (1971) studied the use of a combined lecture and role-play method for training supervisors in the allied health industry. The purpose of the study was to determine whether on-the-job training of allied health personnel could be improved by providing supervisors with training on instructional techniques. A twelve-hour training program utilizing lecture and role-play was given to 1,299 supervisors over a three year period. Program effectiveness was evaluated through a mailed questionnaire to participants. Of the 1,299 supervisors trained, 33 percent responded to the survey. The researcher found that over 80 percent of the respondents were satisfied with the training program and felt that it had contributed to improved health care. While a lack of follow-up with non-respondents and a low response rate raise concerns about the validity of the generalizations in this study, its strength is that it demonstrates one way to quantitatively measure the impact of training on resulting job behaviors and organizational performance. Furthermore, the results provide evidence to suggest that supervisors like, learn from, and use skills acquired during training programs which use a combination of lecture and role-play methods.

**Comparative analysis of training methods.** Four studies were found that compared the effectiveness of two or more types of training methods on training outcomes. The first three studies, Carroll, Paine and Ivancevich (1972), McKeon (1981), and Harrison (1992),
compared two or more training methods using internal criteria and Levine and Butler (1952) compared two training methods using external criteria.

Carroll et al. (1972) conducted a survey to determine the expert opinion of the relative effectiveness of different training methods for achieving identified training objectives. A mailed questionnaire was sent to the training directors of 200 companies on the Fortune 500 list. A response rate of 59 percent was achieved. Respondents indicated their perceptions about the relative effectiveness of nine different training methods for achieving six training objectives (knowledge acquisition, changing attitudes, problem-solving skills, interpersonal skills, participant acceptance and knowledge retention). The researchers found that programmed instruction was ranked as the most effective method for knowledge acquisition and retention and, interestingly, lecture with questions was ranked as the least effective method for knowledge acquisition and next to least effective for knowledge retention. Case study was perceived to be the most effective method for development of problem-solving skill with lecture being ranked least effective for the dimension. Sensitivity training and role-play were ranked as most effective and lecture was ranked as least effective for both interpersonal skill development and attitudinal change. For participant acceptance, training directors perceived that trainees most preferred the discussion method and the case study method and least preferred lecture methods. While the results of this study may have been biased due to a lack of follow-up with non-respondents and a low response rate, the information does provide greater insight about the usefulness of various training methods.

In a study of off-site meetings attended by supervisors, McKeon (1981) identified specific training methods that accounted for degrees of learning. The researcher found that information presentation methods such as lectures and discussions accounted for approximately 60 percent of the training time and yielded 43 percent of the perceived learning value of the activity. Simulation methods such as case studies accounted for
approximately 25 percent of the training time and yielded 27 percent of the perceived learning value. Independent learning activities such as required reading accounted for 15 percent of the total training time and yielded 16 percent of the learning value. The author concluded that simulation and independent learning activities appear to be more effective on an hour for hour basis than formal presentation methods. It may be premature to conclude that one particular method is better than another as a result of this study since other factors such as training content, training objectives, and characteristics of trainees also contribute to the perceptions of trainees toward the training experience. Yet, the results do show that supervisors perceive that they obtain different learning value from different methods of training.

Harrison (1992) examined the effects of programmed instruction and behavior modeling on reaction to training and learning in a cross-cultural training program. Sixty-five civilian employees in a United States military agency who had volunteered to participate in the study were randomly assigned to one of six groups. One group was established for programmed instruction and one for behavior modeling, two groups were used as comparison groups for the two individual training methods, the fifth group used a combined programmed instruction and behavior modeling method and the last group served as a control group. Two criteria were evaluated. Reaction to training was measured using a rating instrument and learning was assessed with an achievement test and a role-play in which the performance of the participant was evaluated by a panel of expert judges. The researcher reported that all groups except the control group reacted positively to training. For learning, while all the groups performed significantly better on the achievement test than the control group and the combination group performed the best of all the groups, no significant differences were found among any of the experimental groups on the role-play measure. The researchers concluded that all groups may have been responding favorably to any type of training because of their high level of need for
the topic of the course. Further, they concluded that the data do not support theory which states that behavior modeling is required for behavioral learning to take place. Instead, the findings suggest that supervisor trainees can learn appropriate behaviors through modes such as videotapes or print without the other components of the behavior modeling method present.

Using a combination of two information presentation methods, Levine and Butler (1952) compared the effects of the lecture method versus the group discussion method on decreasing one particular type of error in performance evaluation ratings of subordinates. Twenty-nine first-level supervisors were divided into three groups: lecture, group discussion or control. The training program lasted one and one-half hours. The researchers found that only the discussion group showed any significant decrease in this type of rating error. Although it is perplexing that decreased errors were not found with the lecture group, one wonders why the researchers would not compare an information presentation method with other types of simulation methods since the latter are more commonly associated with the development of these types of behavioral skills.

Summary of empirical research. The general state of empirical research in the investigation of instructional methods for training supervisors is poor. There is a lack of empirical investigation of training outcomes associated with the use of specific types of information presentation methods, simulation methods and OJT methods. As a consequence, there is uncertainty about what types of training outcomes can be attributed specifically to the use of particular methods.

Given these limitations, some observations about the use of instructional methods for training supervisors can be made from the preceding review. To begin with, it appears that most methods of training result in some degree of knowledge acquisition. However, much less is known about long-term outcomes associated with the use of particular methods. Secondly, it appears that HRD researchers and practitioners perceive that the
use of two or more training methods in combination results in greater degrees of acquisition and application of learning. Experts appear to especially favor combination approaches which utilize two methods from different types of general categories such as information presentation and simulation. Interestingly, few studies have investigated the use of a combination approach as compared to a single method of training on specified training outcomes. As a result, the perception that combined training approaches are more effective than individual methods remains a virtually untested hypothesis. Lastly, research appears to support theoretical writings regarding the relationship between training methods and learning outcomes. Specifically, information presentation methods have been found to result in increased levels of knowledge acquisition and retention; simulation methods tend to result in behavioral and attitudinal changes, varying levels of acquisition and transfer of learning and some degrees of cognitive skill development; and depending on the nature of the specific method discussed, OJT methods have been found to result in varying levels of acquisition and application of knowledge and skill.
Inductive Instructional Approach

This section of the chapter is divided into three parts. The nature of an inductive instructional approach is discussed in the first part. Inductive instructional models are presented in the second part. Empirical studies of discovery learning methods are reviewed in the third part.

The Nature of an Inductive Instructional Approach

Unlike a deductive approach, an inductive instructional approach requires that trainees generate the meanings of concepts, rules, and principles during the training experience (Newbert & Binko, 1992). People involved in this type of training experience are using an inductive thinking process.

There is a rich historical precedent for the use of inductive thinking. Glaser (1966) notes that many great writers and teachers have used induction to teach or transmit knowledge. For example, LaFontaine taught a code of ethics through a series of allegorical fables. Shaw in the Adventures of the Black Girl in Her Search for God conveyed his message of what God is not through the presentation of noninstances in the form of Moses, Freud, and Pavlov. Shaw makes his point by providing a succession of specific instances that permit the reader to induce the general concept.

Writers and educators throughout history have used inductive thinking as a means of teaching because it enables learners to acquire the knowledge of the lesson as well as develop their ability to think and reason (Glaser, 1966; Taba, 1966). Dansereau (1974) captures the essential value that can be derived from the use of inductive thinking through an adaptation of a well-known adage, "Give a man some clean, cooked fish, and you feed him for a day. Teach a man the art of acquiring, cleaning, storing, and cooking fish and you feed him for a lifetime" (p. 7). Dansereau believes that this adage can also explain the
benefits of alternative types of learning. That is, he believes that the primary value of learning activities that improve learning and thinking skills is their potential to positively impact an individual's ability to function as an independent and productive learner.

One way that learning and thinking skills can be enhanced is through inductive thinking (Tannenbaum & Yukl, 1992). There is evidence that suggests inductive thinking can be taught and that learning of content knowledge can be facilitated by integrating aspects of the inductive thinking process into training experiences (Joyce & Weil, 1986; Newbert & Binko, 1992). However, the application and study of inductive approaches has been primarily limited to academic settings with either children or college students. Yet, its potential for application in organizational settings should not be overlooked considering that the types of higher-level cognitive skills most associated with an inductive approach are similar to those that organizations increasingly expect employees to possess.

Theoretical writings about inductive thinking processes are found in the cognitive psychology, educational psychology, and information processing literature. While cognitive and educational psychologists have focused on inductive thinking processes in relation to how people learn, information processing theorists has focused on induction in relation to the development of expert systems (Holland et al., 1986). Although differences exist among experts in these fields in regard to the use of terminology and certain concepts, they generally conceptualize the inductive thinking process in a similar way.

The process of inductive thinking is conceptualized as the recognition of general rules for classifying objects and events by identifying similarities and differences with respect to attributes of objects within a certain class and the relationships between objects of various classes (Klauer, 1989). This description suggests that individuals group their knowledge and experiences into categories based on objects and events that share similar attributes (Gagne, 1985). Groups of objects and events that share similar attributes are often referred to as concepts or categories. Existing at varying levels of generality,
concepts are often categorized as being either concrete or abstract (Bruner, 1961b; Gagne, 1985). Concrete concepts are relationships that can be observed. In contrast, abstract concepts are unobservable, more complex relationships that must be learned by definition. Concepts are defined by rules. Analogous to an operational definition, rules are statements which specify all the essential attributes in a concept and the relationship that exists among the attributes of a concept (Bruner, Goodnow & Austin, 1967).

Concept formation has instrumental importance in a person's life (Newbert & Binko, 1992; Bruner, 1961a). By grouping as equivalent different events and objects, people decrease the complexity of their environment. This feature of concept formation enables people to efficiently discriminate and respond to stimuli in the environment rather than treating each encounter as if it were a unique situation. Moreover, concept formation permits the development of concept systems that order and relate classes of objects and events. This feature explains how people give meaning to new information and experiences. As individuals develop increasingly abstract and complex concepts and rules, they become able to apply them to multiple situations based on existing guidelines for classification. Gagne (1985) refers to this feature of concept formation as rule-governed behavior. The primary benefit of rule-governed behavior is that it reduces the need for constant learning. In fact, Gagne proposes that rule-governed behavior is probably the major organizing factor, if not the primary one, in intellectual functioning.

Theoretical beliefs about how concepts and rules are used to classify knowledge have implications for how knowledge is structured in the mind. Holland et al. (1986) describes the essential characteristics of the structure of knowledge in the following way:

1. Knowledge can be represented by condition-action rules that range in their degree of complexity.
2. Rules can represent both time sequences and associations and recategorizations of categories, and the two types of rules act together to generate inferences and solutions to problems.
3. Higher-order knowledge structures such as categories correspond to implicit and explicit clusters of rules with similar conditions.

4. Super-subordinate relationships form a default hierarchy overridden by specific information.

5. A set of rules organized in a default hierarchy gives rise to an emergent mental model that guides behavior and serves to generate inferences.

6. Rules compete with, act simultaneously and complement each other to arrive at a conclusion.

7. Induction involves two basic classes of mechanisms: mechanisms for revising parameters such as strength of existing rules and mechanisms for generating plausible new rules.

8. People use rules for making inferences which consist of clusters of inferential rules that characterize relations over general classes of objects, event relationships and problem goals.

9. Mechanisms for generating new rules are constrained by conditions that ensure new rules are likely to be useful.

10. Induction is guided by background knowledge and experience about the variability of classes of objects and events. (p. 21)

Using an information processing approach, Holland and his associates propose that knowledge is organized within a default hierarchy. The hierarchy is comprised of rules and concepts at various levels of the hierarchy. Rules are described as conditions for including or excluding information in the set and are used as guides for including knowledge in concepts and for inferring and developing relationships among concepts at varying levels of the hierarchy. Concepts are located at increasingly higher levels of the hierarchy and are described as clusters of rules that provide a set of explanations taken to be true only until they are contradicted by more specific information. As such, the default hierarchy contain knowledge organized by default expectations based on superordinate/subordinate relationships among concepts.

Similar to a default hierarchy, many educational psychologists conceptualize knowledge as a progressively enlarging hierarchical structure (for example, see Bruner, 1961a; Gagne, 1985; Glaser, 1984; Taba, 1966). Concepts and rules develop in a manner that is increasingly abstract and complex in nature. As one's cognitive structure enlarges and broadens, it develops higher-level categories that are increasingly complex and
abstract. Correspondingly, rules defining membership in higher-level categories and defining relationships with other categories become more sophisticated and complex.

The thinking process that is used to access one's hierarchical structure of knowledge is considered to be a dynamic process (Gagne, 1985; Glaser, 1984). Taba (1966) describes this cognitive process as an active transaction between the individual and information. That is, information becoming available to the learner when she or he performs certain cognitive operations on it. These operations include mental activities such as organizing information into conceptual systems, relating information to other information, making inferences from known facts to hypotheses and testing hypotheses and predictions. People are able to make meaning and cope with their environments as a result of these types of mental operations.

In addition to its dynamic nature, Gagne (1985) and Taba (1966) suggest that a hierarchical knowledge structure implies that thinking and learning are sequential and cumulative processes. As such, people must acquire certain subordinate concepts or rules before they are able to learn superordinate concepts. This aspect of learning is what Gagne (1985) refers to as readiness to learn. According to Gagne, readiness to learn is the possession of certain subordinate rules and concepts that enable one to master the superordinate concepts and rules.

These characteristics of how knowledge is structured and accessed in the cognitive structure have significant implications for methods used to facilitate learning. Specifically, the proposition that learning occurs in a sequential and hierarchical manner has given rise to the development of inductive instructional models (Bruner, 1961a; Gagne, 1985; Taba, 1966).
Inductive Instructional Models

The primary objectives of an inductive instructional approach are to develop people's inductive thinking and learning skills while teaching the content of a discipline or an area (Glaser, 1966; Newbert & Binko, 1992). These objectives are accomplished by actively involving learners in the use of their own thinking and reasoning skills while they are learning the content of a lesson. Advocates of an inductive approach report that its use results in the development of higher-level cognitive skills (Holland et al., 1986; Newbert & Binko, 1992). According to Joyce and Weil (1986), an inductive approach "causes students to collect information and examine it closely, to organize it into concepts, and to learn to manipulate those concepts. Used regularly, the strategy increases the students' abilities to form concepts efficiently" (p. 52). Learning outcomes that are commonly associated with the use of an inductive approach are increased levels of independent thinking skills, learning skills, confidence in one's ability to learn and reason, problem-solving ability, productive and creative thinking ability, knowledge acquisition, knowledge retention, and transfer of learning (Bruner, 1961a; Joyce and Weil, 1986; Newbert & Binko, 1992).

In summarizing the value of using an inductive instructional approach, Newbert and Binko (1992) state that since life experiences require that people gather their own information and arrive at their own conclusions, the use of an inductive instructional approach assists in developing "lifelong strategies for thinking systematically and independently" (p. 21). Development of these types of thinking and learning skills frees people from relying on others to tell them what to do and, ultimately, guides them toward becoming lifelong learners.

However, concerns regarding inefficient use of instructional time and varying degrees of effectiveness for differing ability levels have raised concerns about the usefulness of an inductive instructional approach (Joyce and Weil, 1986; Newbert and
Binko, 1992). The most significant deterrent to the use of an inductive approach has been the amount of instructional time that educators perceive the approach requires. Educators report that they are willing to use inductive methods if they feel that they have the time; otherwise, they rely on exposing learners to concepts and principles via an information presentation approach (Newbert & Binko, 1992). In addition, learning outcomes that have been attributed to the use of an inductive approach may vary for learners with differing ability levels. Some educators believe that low-achieving learners may not be ready for and, as a result, may not be able to learn with an inductive approach. While the validity of both of these concerns continues to be debated in the literature and in practice, they must be seriously considered since they have deterred practitioners from using the approach.

An inductive instructional approach is often referred to as discovery learning (Glaser, 1966; Wittrock, 1966). The term discovery learning has been used for an inductive method of instruction because learners are required to discover information and important relationships among pieces of information through the instructional process. The proposition that individuals can learn by discovery was originally proposed in the early 1960's and remains a fertile area of study. The primary impetus for the investigation of discovery learning emanated from Jerome Bruner. Bruner (1961a) stated a hypothesis about discovery learning that sparked numerous studies of the field:

It is, if you will, a necessary condition for learning the variety of techniques of problem solving, of transforming information for better use, indeed for learning how to go about the very task of learning. Practice in discovering for oneself teaches one to acquire information in a way that makes that information more readily viable in problem solving. So goes the hypothesis. It is still in need of testing. But is an hypothesis of such important human implications that we cannot afford not to test. (p.26)

Thirty years ago, Bruner acknowledged that learning by discovery is an hypothesis in need of investigation. Since that time, the hypothesis has remained virtually untested
Discovery learning is described as the learning of concepts, rules, and principles by the presentation of specific instances that permits the learner to generalize among specific instances of a class and to discriminate between instances and noninstances of a class (Glaser, 1966; Gagne, 1966). This learning process has two fundamental characteristics, induction and errorful learning. Induction occurs when the learner makes inferences from the specific instances of the concept, rule or principle to generalizations about the concept, rule or principle. Errorful learning describes the trial and error process that learners use during organizing, generalizing and testing activities.

Discovery learning consists of three essential activities: (a) gathering, organizing and categorizing information, (b) identifying critical relationships among information and making inferences based on those relationships, and (c) testing those inferences by applying them to new situations (Taba, 1966; Bruner, 1961a; Joyce & Weil, 1986; Newbert & Binko, 1992). Different types of instructional programs vary the level and type of guidance that is provided to learners during learning activities. Based on the level of guidance provided, discovery learning methods have been categorized as being pure or guided discovery.

**Pure discovery.** Pure discovery learning is learning that takes place when learners are required to organize, form and use information themselves (Bruner, 1961a). Specifically, learners using discovery learning are required to gather data about a particular situation or topic, induce hypotheses about the relationships among information from existing data, and then test their hypotheses against further data to confirm or disconfirm their hypotheses. This process enables learners to discover the relationships that exist among objects and, as a result, form or enhance existing categories or coding systems in their cognitive structures.
Bruner states that there are four conditions that facilitate discovery learning: set, need state, mastery of specifics and diversity of training. Set is the predisposition of learners to react in certain ways. Instructions that guide learners through the discovery process may help learners successfully proceed through the learning experience. Need state is the level of arousal or alertness of the learner. Bruner advocates creating an environment that elicits moderate levels of learner arousal. Mastery of specifics refers to the extent of relevant, specific information that learners possess. Successful discovery is more likely to occur when learners are well prepared and have high levels of mastery of specifics. Diversity of training occurs when learners are exposed to information in wide varieties of circumstances. This exposure will encourage the development of coding systems that more effectively organize information. The premise for these conditions of discovery learning is that learners who are well prepared, motivated, and informed will be more likely to succeed in learning and transferring knowledge.

The discovery learning method requires that learners and instructors actively participate in the learning process. This method is characterized as a cooperative learning process in which the development and exchange of ideas and information are promoted. Consequently, learners actively participate in the formulation, implementation and evaluation of their own learning. The role of instructors in the discovery learning method is very different than it is in more deductive methods. In general, behaviors of instructors using discovery learning are:

1. Instructors rarely tells learners what they think the learners ought to know.
2. Instructors use questioning as their basic mode of discourse.
3. Instructors generally do not accept a single statement as an answer to a question.
4. Instructors encourage interaction among trainees as opposed to trainee-instructor interaction.
5. Instructors avoid acting as mediators or judges of the quality of ideas expressed.
6. Instructors rarely summarize the positions taken by learners on the learning that occurs; recognizes that the act of summary or closure tends to have the effect of ending further thought.
7. Instructors develop lessons from the responses of trainees and not from a previously determined structure; the lessons pose problems for students to solve through defining, questioning, observing, classifying, generalizing, and applying activities.

8. Instructors spend more time listening to trainees rather than talking at them.

Bruner believes that discovery learning enables learners to attain their highest levels of intellectual growth. This level of growth occurs when the instructional process engages learners in discovery experiences which assist in developing the complexity and extensiveness of their cognitive structures. Clearly, there are significant benefits that can be derived from the use of discovery learning. However, concerns about the amount of time that the method requires and its varying degrees of effectiveness with learners of differing ability levels have caused educational theorists to propose other more guided approaches to the discovery learning process (Bruner, 1961a; Glaser, 1966; Taba, 1966, 1967).

Guided discovery. Similar to pure discovery, guided discovery is a method of instruction that features an inductive sequence of instructional events and errorful learning (see Bruner, 1961a; Dansereau, 1974; Gagne, 1966; Holland et al., 1986; Joyce & Weil, 1986; Newbert & Binko, 1992; Shulman & Keislar, 1966). However, a fundamental aspect of guided discovery that distinguishes it from pure discovery is that guidance is provided for learners during various stages of instruction (Bruner, 1961a; Newbert & Binko, 1992; Taba, 1966, 1967). The purpose of guidance is to reduce the distraction of errors during learning, decrease the time necessary for discovering generalizations, and to increase the accuracy of the generalizations that are made.

In guided discovery, guidance is provided to learners throughout the instructional process. Two groups of people are responsible for providing guidance, instructors and experts. Instructors are responsible for designing, planning and implementing the instructional events (Glaser, 1966; Newbert & Binko, 1992; Taba, 1966, 1967). Experts
in the trainee's job setting serve as job-based learning resources for trainees during various phases of the learning process (Bittel, 1987).

Two frequently cited guided discovery instructional models are Jerome Bruner's Concept Attainment Model and Hilda Taba's Concept Formation Model (Joyce & Weil, 1986). Concept formation consists of three inductive thinking tasks: concept formation, interpretation of data, and application of principles (Taba, 1966, 1967). These tasks are assumed to be hierarchical in nature and therefore have to be completed in sequential order. Further, these models assume that three activities occur during the completion of each task: (1) learners overtly manipulate information, (2) learners perform covert mental operations on the information, and (3) instructors provide guidance to support the overt and covert activities of learners. The following identifies the tasks, the overt activities, and the covert operations that must occur during guided discovery for learning to take place.

In the first task, learners organize groups of information. The objective of this task is for learners to interrelate and organize discrete bits of information. Specific overt activities required to accomplish this objective include enumerating and listing information, grouping information, and labeling, categorizing, and subsuming information. Covert mental operations that coincide with the overt activities include differentiating items from each other, identifying common properties among information, and determining hierarchical, superordinate/subordinate relationships of items.

The second task involves interpreting the data. The objective of this task is to induce generalizations and principles from the processing of concrete data. Overt activities involved in this task are the selection of important points, exploration of relationships among items of information, and the generation of inferences. Respective covert mental operations required for these overt activities are differentiating and distinguishing relevant from nonrelevant information, relating points to each other,
establishing functional relationships among information, generating inferences based on suspected relationships, and making conclusions based on inferences.

The last task involves applying generalizations or principles. The purpose of this task is for learners to use their knowledge to explain new phenomena, to make predictions, and to formulate hypotheses. Overt activities involved in the application process are predicting or hypothesizing, explaining or supporting the predictions or hypotheses, and verifying the predictions or hypotheses. Corresponding covert mental operations are an analysis of the problem or situation, the retrieval of relevant knowledge about the problem, identification of causal links leading from the discovered condition to the hypothesis or prediction, and the use of logical reasoning or factual knowledge to determine necessary and sufficient conditions.

In sum, the guided discovery method involves the examination of information and examples relevant to the concepts and principles being taught, interaction with instructors and other experts for the purpose of guidance and support, the generation of inferences about the meaning of concepts or principles, and the application of inferences to a new group of facts or situation. The principal value of guided discovery is that learners have an opportunity to acquire, retain, and transfer the content being taught while also develop higher-level cognitive skills that may be transferable to other tasks and situations (Kagan, 1966; Klauer, 1989; Taba, 1966; Wittrock, 1966).

**Empirical Studies of Discovery Learning Methods**

The vast majority of the empirical studies of discovery learning have taken place in academic settings and with children. A large number of these studies have been criticized as lacking in appropriate principles of research design and methodology (Cronbach, 1966; Holland et al., 1986). Specific methodological problems in the studies include inadequate statistical analysis, use of arbitrary and meaningless tasks as criteria for learning, lack of
replicability of treatments, and inappropriate extrapolation of results. Consequently, conclusions generated from the empirical study of this area are made with a fair amount of caution.

In general, studies of discovery learning methods have investigated three questions: (a) Can people learn inductive thinking processes?, (b) What are the effects of inductive teaching methods on the acquisition of information and concepts?, and (c) What aspects of inductive methods account for attainment of specified learning outcomes? (Joyce & Weil, 1986).

A number of studies have investigated the first question (for example, see Klauer, 1989; Taba, 1966, 1967). Using different age groups and content areas, researchers have concluded that people can learn inductive thinking strategies through the use of discovery learning methods. In terms of the second question, studies have found that the use of discovery learning results in improved levels of knowledge acquisition and retention as compared to conventional methods of instruction such as lecture or drill-and-practice (Taba, 1966; Worthen, 1968). In general, studies investigating the third question have focused on how the role of verbal guidance, in the form of eliciting questions and instructions, and structured guidance, in the form of instructional aids, impacts the learning process (Craig, 1956; Kittle, 1957; Wittrock, 1963a, 1963b). Findings from these studies indicate that increased levels of verbal and structured guidance result in improved levels of knowledge acquisition and retention, greater transfer of learning, and improved inductive thinking and problem-solving skill.

In conclusion, empirical evidence supports the theoretical proposition that the use of inductive instructional methods, such as guided discovery, can result in the learning and transfer of technical knowledge and skill as well as the development of higher-level cognitive skills.
Theoretical Framework

This final section of the literature review is divided into three parts. The first part summarizes the literature presented in each of the four preceding sections of the chapter. The second part provides a synthesis of that literature. In the third part of this section, the researcher proposes a theoretical model of the relationships between method of training and training and job outcomes, which is based on the synthesis of literature.

Summary of the Sections in the Review of Literature

The first section of the review of literature dealt with the changing nature of the supervisory role. Three main organizational changes are believed to be responsible for the changing role of supervisors: the nature of work, the nature of the people who do the work, and the structure of organizations. In the past, supervisors were expected to direct the work of their employees. However, present job expectations require that supervisors facilitate rather than direct the work of their employees. This new expectation requires that supervisors foster a work environment that values the development of expertise and learning skills. To meet the demands of the changing role, supervisors must possess technical expertise, administrative ability and managerial skill. While supervisors require competence in all three skill areas, supervisors increasingly require higher-level managerial skills to perform their jobs.

The second section of the review of literature focused on developing supervisory expertise. In past times, technical expertise and a directive supervisory approach were considered to be two of the primary characteristics of supervisory expertise. Since organizations often used technical expertise as a criterion for the supervisory selection process, few developmental experiences were provided for new supervisors. However, beliefs about the nature of expertise and what facilitates its development have changed in
recent years. Presently, it is believed that technical expertise, administrative ability, and managerial skill are three prime components of supervisory expertise. A review of the expertise literature suggests that five aspects of the learning process should be considered to facilitate the development of supervisory expertise. First, technical knowledge and cognitive skill must both be valued as important outcomes of developmental experiences since they are integral components of expertise. Second, the development of technical knowledge and cognitive skill is in part contingent upon the instructional methods that are used to deliver training. Third, the context in which training occurs must be considered in terms of its ability to support the development of supervisory expertise. Fourth, the development of supervisory expertise is in part contingent upon the ability of the developmental experience to support the transfer of learning from the training environment to the job setting. And lastly, although they have not been utilized to a great degree, human and nonhuman resources in the workplace can contribute to developing supervisory expertise.

The third section reviewed the literature regarding a deductive instructional approach to training. Three categories of deductive training methods were identified: information presentation, simulation and, on-the-job training. Information presentation methods are generally associated with the acquisition of and, to some degree, the retention of knowledge and skill. Simulation methods are most frequently associated with behavioral and attitudinal changes, varying levels of learning transfer, and some degree of cognitive skill development. Learning outcomes vary widely with OJT methods depending on which specific method is under investigation.

The fourth section reviewed the literature regarding an inductive approach to training. An inductive approach, such as guided discovery, involves learners in: the examination of information and examples relevant to the concepts and principles being taught; interaction with trainers, trainees, and experts; the generation of inferences about
the meaning of concepts; and the application of those inferences to new situations. The principal value of the inductive approach is that it provides learners with opportunities for acquiring, retaining, and transferring the content being taught while also developing higher-level cognitive skills that may be transferable to other tasks and situations.

Synthesis of Information in the Review of Literature

A review of the literature regarding the changing nature of the supervisory role, developing supervisory expertise, and deductive and inductive instructional approaches to training has provided greater insight about present beliefs regarding what defines supervisory expertise, what is presently being done to develop supervisory expertise, and possible methods for more effectively facilitating the development process.

Supervisors require technical expertise, administrative ability, and managerial skill to meet present job expectations. While all three of these skill areas are important to a supervisor's effectiveness, supervision experts report that managerial skill is becoming the defining characteristic of effective supervisory performance.

The expertise literature explains that learning is a complex process involving the simultaneous development and use of technical knowledge, schemata relevant to a particular task domain, and schema-driven cognitive strategies. An outcome of this explanation is a deepening understanding of aspects of the training experience that may support the development of supervisory expertise. Specifically, the expertise literature suggests that learning is enhanced when learning activities focus on the concurrent development of technical and cognitive skill, when the context in which learning occurs is highly similar to the task environment, and when learners are actively involved in all phases of the learning process.

Interestingly, a review of the training literature found that methods presently used in supervisor training seldom incorporate aspects of the learning process that are identified
in the expertise literature as critical to the development of expertise in a given field. While most of the supervisor training methods focus on the development of technical knowledge, few methods focus on the concurrent development of technical knowledge and cognitive skill. In addition, present training activities typically occur in a context away from the workplace and involve the interaction of trainees at similar stages of development. Furthermore, while trainees are often involved in applying content during these training activities, they are seldom involved in information gathering or interpretation activities. Seemingly, gaps exist between theoretical propositions regarding and current practices for developing supervisory expertise.

An instructional method that holds some promise for attending to the concurrent development of technical expertise and cognitive skill is guided discovery. Using an inductive sequence of instructional events and experts as resources during the learning process, the primary objectives of guided discovery are to teach the content of an area while at the same time develop a person's reasoning and thinking skills. However, the use of this method has yet to be empirically tested with adults in training programs.

Theoretical Model

Based on the synthesis of information presented in this literature review, a theoretical model of the relationships between method of training and training and job outcomes has been developed. As shown in Figure 2, it is proposed that a method of training impacts training outcomes such as attainment of the training objectives and attitudes of trainees toward the training experience. Moreover, it is proposed that a method of training influences different types of job outcomes, including job behaviors and job performance. This model suggests that different training and job outcomes result from the use of different methods of training. Accordingly, a primary selection criterion for
using a specific method of training is its ability to support desired training and job outcomes.

Figure 2

Theoretical Model of the Proposed Relationships Between Method of Training and Training and Job Outcomes
This chapter is divided into eight sections. The first section will discuss the design of the study, including a description of the internal and external validity concerns in the study and the methods used to minimize those concerns given the limitations of the study. The second section describes the subject selection process. The third section presents the outcome measures in the study. The fourth section identifies the independent variables in the study. The fifth section describes the conditions of testing. The sixth section identifies the hypotheses tested in the study. The seventh section describes the data analysis techniques. The eighth section presents the time line for the research study.

Research Design

As shown in Figure 3, this was an experimental type of study utilizing the post-test only control group design for the main independent variable (Campbell & Stanley, 1963).

\[
\begin{align*}
R & \quad X_1 & \quad O \\
R & \quad X_2 & \quad O
\end{align*}
\]

Figure 3

Design Configuration
In this design, subjects scheduled to attend a supervisor skills training program were randomly assigned to one of the two levels of the independent variable for one of the instructional units of the supervisor training program. The treatment was administered and posttest measures were taken immediately following the treatment and three weeks after the completion of the treatment. This design is considered one of the strongest designs in social science research (Kerlinger, 1964). It enables the researcher to compare a control group to an experimental group. Further, according to assumptions of probability randomization assures that the groups are equal on any variables that might be related to the dependent variable(s). Therefore, differences observed in the dependent variable(s) can be attributed to the treatment rather than to other causes.

**Internal Validity**

The internal validity of this design is generally considered to be quite strong (Kerlinger, 1964). Although the design controls for most internal validity concerns, one area in which the design is weaker than other experimental designs is experimental mortality. Experimental mortality is a concern if the rate of drop-out in the groups is different, with a greater number dropping out of one group than another. This concern was minimized in the study through the use of two techniques. First, the researcher attempted to proactively minimize subject drop-out. This was accomplished by notifying subjects through oral and written communication of the dates and times for training sessions and data collection activities. Second, data were collected on attribute variables related to the dependent variable. If experimental mortality was observed, this information would be used to identify characteristics that the drop-outs may have in common.
External Validity

Two main external validity concerns were addressed in this study; population and ecological.

Population validity. The first concern was the population validity of the study (Bracht & Glass, 1968). In order to determine what population of people could be expected to behave in the same way as did the subjects in the study each of the groups relevant to population validity was explicitly identified. The target population in this study was supervisors in organizations. The experimentally accessible population was supervisors that were employed by the organization under study. The sample was one group of supervisors who attended a supervisor training program from February 28 to March 4, 1994.

Identification of these groups revealed two issues relevant to population validity: (a) How representative is the sample of the experimentally accessible population? and (b) How representative is the experimentally accessible population of the target population?

Regarding the first issue, the subjects in the sample were compared on known characteristics to a statistical profile of supervisors in the organization in which they worked. As shown in Table 1, the majority of the supervisors in both the sample and the experimentally accessible population were female, ranged in age from 31 to 50, and had at least a college degree. However, some differences were found between the sample and the experimentally accessible population on function supervised, work experience with the organization, and supervisory experience. While the highest percentage of supervisors in both groups supervised production-oriented areas, the next most frequent area supervised for subjects in the sample was accounting/clerical. Yet, accounting/clerical was the least represented functional area supervised by supervisors in the experimentally accessible population. In addition, the majority of the supervisors in the sample were fairly new to the organization with less than five years of service whereas the majority of supervisors in
Table 1

**A Comparative Statistical Profile of Supervisors**

<table>
<thead>
<tr>
<th>Personological Attributes:</th>
<th>Sample</th>
<th>Experimentally</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>Accessible Population</td>
<td>Population</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>6</td>
<td>37</td>
<td>334</td>
</tr>
<tr>
<td>Female</td>
<td>10</td>
<td>63</td>
<td>581</td>
</tr>
<tr>
<td>Totals</td>
<td>16</td>
<td>100</td>
<td>915</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 and under</td>
<td>7</td>
<td>44</td>
<td>111</td>
</tr>
<tr>
<td>31 to 50</td>
<td>9</td>
<td>56</td>
<td>678</td>
</tr>
<tr>
<td>51 or older</td>
<td>0</td>
<td>0</td>
<td>126</td>
</tr>
<tr>
<td>Totals</td>
<td>16</td>
<td>100</td>
<td>915</td>
</tr>
<tr>
<td>Maximum education attained:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 yrs. (graduated HS)</td>
<td>2</td>
<td>13</td>
<td>342</td>
</tr>
<tr>
<td>13 to 15 yrs. (attended college)</td>
<td>2</td>
<td>13</td>
<td>195</td>
</tr>
<tr>
<td>16 yrs. or more (college degree or beyond)</td>
<td>12</td>
<td>74</td>
<td>378</td>
</tr>
<tr>
<td>Totals</td>
<td>16</td>
<td>100</td>
<td>915</td>
</tr>
<tr>
<td>Number of yrs. with present employer:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 5 yrs.</td>
<td>9</td>
<td>56</td>
<td>139</td>
</tr>
<tr>
<td>5 to 15 yrs.</td>
<td>5</td>
<td>31</td>
<td>434</td>
</tr>
<tr>
<td>More than 15 yrs.</td>
<td>2</td>
<td>13</td>
<td>342</td>
</tr>
<tr>
<td>Totals</td>
<td>16</td>
<td>100</td>
<td>915</td>
</tr>
<tr>
<td>Number of months a supervisor:</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Less than 6 months</td>
<td>7</td>
<td>44</td>
<td>81</td>
</tr>
<tr>
<td>6 to 12 months</td>
<td>1</td>
<td>6</td>
<td>98</td>
</tr>
<tr>
<td>13 to 18 months</td>
<td>2</td>
<td>13</td>
<td>84</td>
</tr>
<tr>
<td>More than 18 months</td>
<td>6</td>
<td>37</td>
<td>652</td>
</tr>
<tr>
<td>Totals</td>
<td>16</td>
<td>100</td>
<td>915</td>
</tr>
</tbody>
</table>

^b^ less than 5 yrs. = 53

^5 yrs. or more = 47
Table 1 (Continued)

A Comparative Statistical Profile of Supervisors

<table>
<thead>
<tr>
<th>Job-Related Attributes:</th>
<th>Sample</th>
<th></th>
<th>Experimentally Accessible Population</th>
<th></th>
<th>Target Population</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td></td>
<td>n</td>
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<tr>
<td><strong>Function supervised:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production-oriented area</td>
<td>5</td>
<td>31</td>
<td>636</td>
<td>69</td>
<td>39</td>
<td>16</td>
</tr>
<tr>
<td>Accounting/clerical area</td>
<td>5</td>
<td>31</td>
<td>27</td>
<td>3</td>
<td>22</td>
<td>19</td>
</tr>
<tr>
<td>Sales/marketing area</td>
<td>3</td>
<td>19</td>
<td>16</td>
<td>2</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>Engineering/technical area</td>
<td>3</td>
<td>19</td>
<td>146</td>
<td>16</td>
<td>6</td>
<td>19</td>
</tr>
<tr>
<td>Other areas</td>
<td>0</td>
<td>0</td>
<td>90</td>
<td>10</td>
<td>21</td>
<td>10</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
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<td>100</td>
<td>915</td>
<td>100</td>
<td>100</td>
<td>16</td>
</tr>
<tr>
<td><strong>Kinds of employees supervised:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professional</td>
<td>8</td>
<td>50</td>
<td></td>
<td></td>
<td>46</td>
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<tr>
<td>Non-Professional</td>
<td>6</td>
<td>37</td>
<td></td>
<td></td>
<td></td>
<td>45</td>
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<tr>
<td>Mixture of professional</td>
<td>2</td>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>and non-professional</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Not Available</td>
<td>100</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>16</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Number of employees supervised:</strong></td>
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<td></td>
<td></td>
<td>22</td>
</tr>
<tr>
<td>11 to 20</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
<td>Not Available</td>
<td>23</td>
</tr>
<tr>
<td>21 or more</td>
<td>16</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Level of supervision:</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First</td>
<td>15</td>
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<td>6</td>
<td></td>
<td></td>
<td></td>
<td>41</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>16</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Note. Data for the target population were adapted from *The Complete Guide to Supervisory Training and Development* (pp. 5-6) by Lester R. Bittel, 1987, Reading, MA: Addison-Wesley.

\(^a\)In some cases percentages are rounded to equal 100 percent.
\(^b\)Data reported for duration of time a supervisor for the target population are not on the same scale as the data collected for the experimentally accessible population and the sample.
\(^c\)Data could not be obtained for this variable.
the experimentally accessible population had five to fifteen years of service in this organization. Further, over half of the subjects in the sample had been a supervisor in the organization for 1 year or less while 71 percent of the experimentally accessible population has been a supervisor for more than 18 months. This comparison of the sample to the experimentally accessible population suggests that the groups are fairly similar with the exception that the sample contains newer supervisors who have less experience with the organization.

Secondly, the experimentally accessible population was compared to the target population on known characteristics. As identified in Table 1, the majority of supervisors in the experimentally accessible population and the target population ranged from 31 to 50 years of age, had worked for the organization for a moderate amount of time ranging from five to fifteen years, and supervised production-oriented areas. One attribute on which the experimentally accessible population and the target population differed was gender. While the ratio of females to males in the sample and the experimentally accessible population was identical at approximately two to one, just the opposite ratio was found in the target population. In the target population, male supervisors outnumbered female supervisors two to one. One possible explanation for this difference is that the majority of the organizations from which data were compiled for the target population were manufacturing organizations. Due to the nature of the work, the manufacturing industry may attract a higher percentage of males than other industries. In general, this comparison suggests that the sample, experimentally accessible population and target population are sufficiently similar to be able to cautiously generalize the results of the study to the target population. It is recognized, however, that replications of this research using other samples in different locations and under different conditions will be required to strengthen the validity of the generalizations made in this study.
**Ecological validity.** Ecological validity was a second external validity concern in the study (Bracht & Glass, 1968). The following identifies specific external validity concerns that were identified as relevant to the ecological validity of the study. Further, the actions that were taken to minimize those concerns given the limitations of the study are discussed.

The first ecological validity concern was the experimenter effect. The experimenter effect was minimized by using trainers from the HRD department to administer both levels of the treatment. In addition, audiotaped recordings rather than personal observations were used to document the implementation of the treatment.

A second ecological validity concern was the Hawthorne effect. Although subjects had knowledge that they were participating in a research study, the Hawthorne effect was minimized by informing the participants that the study was being conducted in affiliation with the HRD department of their organization. Since a normal function of the HRD department is to try different methods of training and to follow-up with their trainees after training is over, the tendency for the participant's behavior to be influenced by knowledge that they were participating in a research project may have been minimized.

A third ecological validity concern was interaction of history and treatment effects. Audiotapes and journals were used to monitor the events occurring at the time of the experiment. Audiotapes provided documentation of the oral events that occurred during administration of the supervisor training program. Daily journals kept by the trainers provided written documentation of any events that may have had an effect on the treatment.

A fourth ecological validity concern was the interaction of time of measurement and treatment effects. Measurement of the dependent variable was taken at two data collection points. The first measure was taken immediately following training. The second measure was taken three weeks after training. One purpose for conducting both of
these measurements was to determine whether effects observed immediately after the administration of the treatment were observed after three weeks.

A fifth ecological validity concern was multiple-treatment interference. A possible concern related to multiple-treatment interference was that the experimental unit was included in the administration of a week-long supervisor training program. To minimize this concern, the overlap of content taught in other units of the training program and the experimental unit of the program was controlled and monitored. This was accomplished by training the trainer who delivered the supervisor training program on the importance of and techniques for avoiding overlap of content. The trainer was instructed to document any occurrences during the week-long training sessions in which the content of the experimental unit was discussed. Because the treatment was embedded within an existing training program, the results may be most generalizable to similar situations in which the treatment is administered as part of a supervisor training program.

A sixth ecological validity concern was related to novelty and disruption effects. Similar to many other organizations, this organization conducts its supervisor training programs in settings away from the job setting. During these training experiences, trainees are required to work with different people than they normally do and to participate in learning activities which are different than what they normally do. As a result, most of the training experiences, whether they be experimental or conventional, seem different or new to trainees. Thus, the concern that the results of the study might be due partly to the enthusiasm or disruption generated by the newness of the treatment is, in all likelihood, diminished by recognizing that an inherent aspect of participating in most training experiences away from the job setting involves a degree of novelty and disruption.
Subject Selection

The study was conducted in a supervisor training program that ran from February 28 to March 4, 1994. The program was offered by the HRD department of a financial services organization. This organization is located in a large mid-west city of the United States and is large in size employing 15,526 people. Supervisors represent 5.9 percent of the organization's total employee population.

Nineteen supervisors were enrolled in the supervisor training program in which the study was conducted. Three of the nineteen supervisors did not attend the follow-up training session and were considered drop-outs of the study. As a result, the sixteen remaining supervisors served as the subjects in the study.

As shown in Figure 4, 63 percent of the sixteen supervisors were female (10 people) and 37 percent (6 people) were male. The average age of these supervisors was fairly young at 33.5 years with a standard deviation of 7.2. Further, the sample was highly educated with 74 percent of the supervisors having attained a college degree or higher and an equal number (13 percent) having completed some college work or graduated high school. The majority of the subjects (56 percent) had been employed by the organization for fewer than five years, 31 percent for five to fifteen years, and 13 percent for more than fifteen years. In terms of supervisory work experience, the majority of the subjects were new supervisors with 52 percent having one year or less supervisory experience.

In terms of job responsibilities, subjects supervised a variety of functional areas. Of the sixteen supervisors, an equal number (31 percent) supervised in a production-oriented area or in an accounting/clerical area. Similarly, an equal number (19 percent) supervised in a sales/marketing area or an engineering/technical area. Within these functional areas, half of the sixteen subjects supervised professional employees while 37 percent supervised non-professional employees and 13 percent supervised a mixture of
Note: EDUC LEVEL = Educational level; YRS IN ORG = Number of years worked in the organization; SUPRY EXPER = Number of months of supervisory experience; FUNCT = Functional area supervised; STAFF = Kinds of employees supervised; NO. OF EMPS = Number of subordinates; SUPRY LEVEL = Level of supervision.

Figure 4

Profile of Participants in the Supervisor Training Study on Selected Attribute Variables
professional and non-professional employees. The average number of employees that these subjects supervised was 5.4 with a standard deviation of 4.5. Lastly, all but one of the subjects were first-level supervisors who were responsible for overseeing the work of non-management employees.

Using a coin-toss method, subjects were randomly assigned to either the guided discovery method or a deductive method of training for one unit of a supervisor training program (Kerlinger, 1964). The content of the instructional unit in which the treatment was administered was giving constructive feedback about a job behavior. The unit was one of eleven instructional units presented in the week-long supervisor training program. The concept within this content area that was used as the referent for measurement of concept learning (concept acquisition and concept application) was the constructive feedback process as defined in the instructional unit.

Two locations were used for administering the treatment. A classroom in a training facility away from the job site served as the location for the training sessions. Subjects also used their own job site as a second location for completing training activities. Supervisors in the guided discovery group used the job site for gathering data about the constructive feedback process. Supervisors in the deductive group used the job site for practicing the content presented during training.

Outcome Measures

Four dependent variables were measured in this study. The first dependent variable, concept acquisition, was categorized as a training outcome. The remaining three variables, concept application, self-reported problem-solving skill of supervisors, and supervisors' facilitation of problem-solving skill of subordinates, were categorized as job outcomes.
Concept Acquisition

Concept acquisition was the first dependent variable. Concept acquisition was operationally defined as the ability to generate a unique example of a specified concept and to provide a rationale for selecting the example by identifying the concept's operational definition containing the critical attributes of the concept and the rule(s) governing the relationship(s) among the attributes (Newbert & Binko, 1992; Gagne, 1985).

Instrument development. A Concept Learning Rating Scale (CLRS), which assessed the written responses of subjects who took a short essay examination, was the instrument used to measure concept acquisition (Fraenkel and Wallen, 1990). According to research design and measurement experts such as Kerlinger (1964), rating scales are an appropriate technique for quantitatively analyzing the content of written responses. The CLRS was designed to measure cognitive learning at the application and analysis levels of Bloom's Cognitive Taxonomy (Goetz, Alexander, & Ash, 1992). See Appendix C for an example of the concept acquisition essay instructions that were given to the subjects and a copy of the CLRS.

The instructions for the concept acquisition essay asked subjects to generate a real or hypothetical example of a job-related situation in which constructive feedback is given and operationally define the concept by identifying the critical attributes of the concept and the rules governing the relationships among the attributes (Newbert & Binko, 1992; Gagne, 1985). An expert rater then evaluated the responses using the CLRS. A four-point response scale was used to measure the quality of the responses in relation to the degree to which they demonstrated each of the six defined steps in the constructive feedback process. The score for each of the six items was weighted according to its relative importance for acquiring the concept. After each of the six items on the CLRS was rated and weighted, a total score for concept acquisition was obtained by summing
the weighted scores. These scores were reported as interval data with a range of one to four.

Validity plan. A panel of experts and two field tests were used to assess the face and content validity of the instrument. First, a panel of experts was convened to assess the content validity of the instrument. The panel consisted of a subject matter expert and a population expert from the organization in which the study took place and a research expert. A description of the members, instructions provided to the panel and results of the session is provided in Appendix C. Revisions incorporating the recommendations of the panel were then made to the essay question and the rating instrument.

An additional step was taken at this point to validate the weightings for each of the items on the CLRS. There was a concern about the accuracy of the weights that had been generated by the three experts participating in the panel because there was a sizable range of responses. Hence, three additional experts were asked to weight the items on the instrument. The weights of all six of the experts were then averaged to derive the final weights for each of the items on the instruments.

Two field tests were conducted to assess the face and content validity of the CLRS. The members, activities, and results of the field tests are presented in Appendix C. Five supervisors who had completed the most recent supervisor training program participated in the first field test. This group reviewed the essay instructions, generated written responses for the essay, provided feedback about whether the essay looked like it measured acquisition of the specified concept and, in their opinion, actually did measure acquisition of the concept. Next, a research measurement expert evaluated the responses using the CLRS. This person provided recommendations for improving the clarity and usability of the instrument. Recommendations generated from the field test were then incorporated in both the essay instructions and the rating instrument.
The revisions to the instrument that resulted from this first field test were substantial. Consequently, a second field test was conducted to validate the revisions. Four more supervisors who had participated in a past supervisor training program participated in this activity. Feedback from the supervisors indicated that the revisions to the instrument were valid. The one recommendation that was suggested for improving the instructions of the essay activity was incorporated in the instrument. A second research measurement expert then evaluated the responses generated from the field test participants using the revised instrument. Improvements in the clarity and validity of the rating instrument and the essay question were made based on the recommendations of the second field test expert.

Reliability plan. A pilot test was used to determine the reliability of the instrument. Supervisors who attended a supervisor orientation program on February 7, 1994 who were not scheduled to attend the supervisor skills program in which the treatment was administered served as the pilot population (N=10). Subjects in both the pilot population and the sample came from the same experimentally accessible population. As a result, supervisors in the pilot group was judged to be representative of those in the sample.

Reliability of the CLRS was assessed in three ways. To begin with, reliability was determined through a test-retest. The essay was administered in person to the supervisors in the pilot group. Refer to Appendix C for a description of the instructions given to the supervisors in the pilot test. The responses and rating forms were coded so that the subsequent retest could be paired with the first test of the instrument. An expert rater used the CLRS to rate and score the responses. The rating forms were then separated from the responses and put in a sealed envelope. One week later, the same rater used the CLRS to rate and score the same responses. Test-retest reliability of the CLRS was determined to be very high with a coefficient of stability at .84.
Since the instrument was summated an internal measure of consistency was also assessed. A low reliability coefficient was obtained with the pilot test data (.32). After verifying the validity of the instrument once again with the panel of experts, it was believed that the low coefficient was due to a lack of variation on item scores on the instrument (most of the pilot group had little knowledge of most of the steps in the constructive feedback process) and because the group was relatively small in size (n=10). To validate this belief, a measure of internal consistency was calculated using the data from the participants in the study and a Cronbach's Alpha of .83 was obtained.

The third type of reliability that was assessed was inter-rater reliability. Four graduate students in the College of Education at The Ohio State University served as the raters. A one-hour training session was held to train the raters on the dimensions of the CLRS and how to use the instrument. The raters then used the CLRS to rate five randomly selected responses from the pilot test. A version of Kuder-Richardson formula 20 was used to measure the inter-rater reliability of the instrument (Ebel, 1979). Inter-rater reliability for the CLRS was very high at .93.

**Concept Application**

The second dependent variable in the study was concept application. Concept application was operationally defined as the ability to generate a job-related example of a specified concept that the trainee has experienced since training and operationally define the concept by identifying the critical attributes of the concept and the rules governing the relationships among the attributes (Newbert & Binko, 1992; Gagne, 1985). The purpose of measuring this criterion was to determine the degree to which supervisors were able to apply the concept that was acquired during training to job situations.

Similar to concept acquisition, the CLRS instrument was used to measure concept application. See Appendix C for the concept application essay instructions. Subjects were
asked to describe an example of a job situation that had occurred since the supervisor training program in which they had given constructive feedback. An expert rater then evaluated the responses using the CLRS. Refer to the section on concept acquisition for a description of the development of the instrument and its validity and reliability.

**Problem-Solving Skill**

The third and fourth dependent variables in this study evaluated different aspects of problem-solving skill. Problem-solving skill was defined as the ability to deal with a challenging task or situation in one's job by independently gathering information related to the task or situation, interpreting the meaning of this information to the task or situation and applying the meaning to the task or situation to test its validity and usability (Newbert & Binko, 1992; Joyce & Weil, 1986; Taba, 1966, 1967; Shulman & Keislar, 1966).

Two aspects of problem-solving skill (PSS) were of interest in this study. The first one was the level of PSS that supervisors demonstrated as they perform their jobs. Therefore, PSS$_d$ was operationalized as the self-reported ability to deal with a challenging task or situation in one's job by independently gathering information related to the task or situation, interpreting the meaning of the information in relation to the task or situation and applying the interpretations to the task or situation to test their validity and usability.

The second aspect that was of interest in this study was the level of problem-solving skill that supervisors expected their subordinates to demonstrate as they learned or acquired information. Therefore, PSS$_f$ was operationalized as the expectations that supervisors have of their subordinates to independently gather information related to a challenging task, to interpret the meaning of the information in relation to the task and to apply their interpretations to the task to test their validity and usability as reported by a sampling of each supervisor's subordinates.
Instrument development. An instrument was developed to measure: (a) the self-reported level of PSS that a supervisor demonstrates (PSS$_d$) and (b) the level of PSS that supervisors expect their subordinates to demonstrate as reported by subordinates (PSS$_f$).

As shown in Appendix C, a Problem Solving Rating Scale (PSRS) that assessed the written responses of subjects who took one of two short-answer essays was the instrument used to measure problem-solving skill. The PSRS uses a four-point Likert-type response scale to evaluate the level of evidence that is present in the response for each of nine problem-solving activities identified on the instrument. These activities had been identified in the literature review as critical aspects of problem-solving skill.

Different essay questions were used for supervisors and their subordinates (see Appendix C for these essay questions). Supervisors were given a short-answer essay in which they were asked to describe a recent challenging situation in their jobs. In this description, they were instructed to explain the mental and physical activities that they used to identify and resolve the challenging situation. Subordinates of supervisors were given a short-answer essay in which they were asked to describe how their superiors expected them to learn the meaning of constructive feedback. The PSRS was then used to evaluate the responses from the supervisors and the subordinates.

An expert rater used the PSRS instrument to evaluate and rate the responses on each of the nine problem-solving activities. After the response had been rated, a total score was obtained by summing the ratings for the nine items. These scores were categorized as interval data ranging from 0 to 27.

Validity plan. A panel of experts and two field tests were used to assess the instrument's content and face validity. A panel of experts was convened to assess the content validity of the instrument. The panel consisted of a subject matter expert and a population expert from the organization in which the study took place and a research expert. The members of the panel, instructions provided to the panel and results of the
session are identified in Appendix C. Revisions incorporating the recommendations of the panel were then made to the supervisor and subordinate short-answer essay question and the rating instrument.

Two field tests were conducted to assess the face and content validity of the PSRS. Refer to Appendix C for a description of the members, activities, and results of the field tests. Five supervisors who had completed the most recent supervisor training program participated in the first field test. This group reviewed the essay instructions, generated written responses for the essay, provided feedback about whether the essay looked like it measured acquisition of the specified concept and, in their opinion, actually did measure the acquisition of the concept. Next, a research measurement expert evaluated the responses using the PSRS. This person provided recommendations for improving the clarity and usability of the instrument. Recommendations generated from the field test were then incorporated in both the essay instructions and the rating instrument.

The revisions to the instrument that resulted from the first field test were substantial. Consequently, a second field test was conducted to validate the revisions. Four supervisors who had participated in a past supervisor training program participated in this activity. Feedback from the supervisors indicated that the revisions to the instrument were valid. The one recommendation that was suggested for improving the instructions of the essay activity was incorporated in the instrument. A second research measurement expert then evaluated the responses generated from the field test participants using the revised instrument. Improvements in the clarity and validity of the rating instrument and of the essay questions were made based on the recommendations of the second field test expert.

**Reliability plan.** A pilot test was used to determine the reliability of the instrument. Supervisors attending a supervisor orientation program on February 7, 1994 who were not
scheduled to attend the supervisor training program in which the treatment would be administered served as the pilot population (N= 10). The supervisors in both the pilot test and the sample came from the same experimentally accessible population. As a result, the pilot group was judged to be similar to the study sample.

Reliability of the PSRS was assessed in three ways. The first was that reliability was assessed was though a test-retest. The supervisor essay was administered to the pilot group in person. Refer to Appendix C for a description of the instructions given to supervisors in the pilot test. The responses and rating forms were coded so that the subsequent retest could be paired with the first test of the instrument. An expert rater used the PSRS to rate and score the responses. The rating forms were then separated from the responses and put in a sealed envelope. One week later, the same rater used the PSRS to rate and score the same responses for a second time. Test-retest reliability was determined to be very high with a coefficient of stability at .83.

Since the PSRS was a summated instrument, the second measure of reliability that was assessed was an internal measure of consistency. Internal consistency using a Cronbach's alpha was very high at .79.

The third measure of reliability that was assessed was inter-rater reliability. Four graduate students in the College of Education at The Ohio State University served as the raters. A one-hour training session was held to train the raters on the dimensions of the instrument and how to use the instrument. The raters then used the PSRS to rate five randomly selected responses from the pilot test. A version of Kuder-Richardson formula 20 was used to assess the inter-rater reliability of the instrument (Ebel, 1979). Inter-rater reliability for the PSRS was very high at .78.
Independent Variables

The study had one active independent variable and nine attribute variables. This section describes the active independent variable and how it was developed and implemented. Further, the section describes each attribute variable in terms of its type and number of levels.

Method of Training

Method of training was the active independent variable in this study. This variable is categorized as nominal data with two levels, guided discovery and deductive. Guided discovery is a method of training which uses learning resources in and away from the job setting to guide trainees through a process of collecting, organizing and categorizing information; examining relationships among the information; making inferences based on suspected relationships among information; and testing these inferences by applying them to new situations (Newbert & Binko, 1992; Glaser, 1966; Klauer, 1989; Taba, 1966, 1967; Joyce & Weil, 1986; Bruner, 1961a). In contrast, a deductive method of training takes place away from the job setting and involves the use of instructor-led presentation of content and learning activities designed to practice and apply new skills and information (Newbert & Binko, 1992; Gardner, 1980). Specific learning activities used in the deductive method were role-play, large group discussion, small group discussion, and an on-the-job application activity.

Preparation of the instructional units. The researcher developed the guided discovery unit and the deductive unit. The content for the unit was derived from the instructional unit entitled "Giving Constructive Feedback" in the Frontline Leadership training program published by Zenger-Miller, Inc. (1986). The content in both of the instructional units was validated by a subject matter expert and the instructional method in
each unit was validated by an instructional design expert. See Appendix A for a comparative overview of the instructional events used in the deductive and the guided discovery units.

Two experienced staff trainers in the HRD department of the organization delivered the instructional units. Separate training sessions were held for each of the two trainers. Each session was two hours in duration and covered the following topics:

1. Instructional theory underlying the method of training that the trainer would be using;
2. Strengths and limitations of using the specified method of training;
3. Role of trainer and trainee during training for the specified method;
4. Objectives for the instructional unit;
5. Instructions for implementing the unit;
6. Appropriate learning activities and resources for delivering the unit;
7. Instructions for evaluating concept acquisition at the end of the unit;
8. General guidelines for administering the unit and the other units of the supervisor training program.

Administration of the instructional units. The treatment was administered during two training sessions. Although the total amount of instructional time was constant for both groups (four hours), the format of the sessions varied with the level of treatment. For guided discovery, the first session was one hour long and included discussion of the training topic, training objectives, and procedures for collecting and organizing information. At the end of the session, trainees were given an assignment that involved collecting information about the constructive feedback process from relevant sources in their job setting. In contrast, the first session for the deductive group was three hours long. During this time, the topic and objectives of training were discussed, the content was presented, and the learning activities for applying and practicing the content were conducted. Lastly, trainees in the deductive group were given an assignment that involved applying the content to actual tasks in their job. Both groups had six working days to complete their respective assignments.
The second training session was held seven working days after the first one. The training session for the guided discovery group was three hours in duration. Information that the subjects had collected and organized was analyzed, categorized, interpreted and applied to new situations during this session. On the other hand, the second training session for the deductive group met for one hour during which time the content from the first session was reviewed and results of and reactions to the on-the-job training activity were shared.

At the end of the second session, supervisors were instructed to pass on the meaning of the concept that they had been taught during training to their subordinates within the next three weeks. That is, supervisors were asked to pass on the meaning of constructive feedback to their subordinates.

**Attribute Variables**

A review of the related literature found nine attribute variables that were considered important to the study. These variables were:

- **Gender.** Gender was categorized as nominal data with two categories, male and female.
- **Age.** Age was categorized as interval data; thus a mean and standard deviation were reported. For comparative purposes, age was also reported as ordinal data in the statistical profile of this study with three age groups: thirty years of age or younger, thirty-one to fifty years of age, and fifty-one or older.
- **Educational level.** Maximum educational level attained was categorized as ordinal data with three levels: twelve years (high school diploma), thirteen to fifteen years (some college work) and sixteen years or more of education (college graduate or higher).
**Number of years with present employer.** This variable was categorized as ordinal data with three levels: less than five years, five to fifteen years, and greater than fifteen years.

**Number of months a supervisor.** This variable was categorized as ordinal data with four levels: less than six months, six to twelve months, thirteen to eighteen months, and greater than eighteen months.

**Functional area supervised.** This variable was categorized as nominal data with five categories: production-oriented area, accounting/clerical area, sales/marketing area, engineering/technical area, and other functional areas (for example, shipping).

**Kinds of employees supervised.** This variable was categorized as nominal data with three categories: professional, non-professional, and mixture of professional and non-professional.

**Number of employees supervised.** This variable was categorized as ordinal data with three levels: ten or fewer employees, eleven to twenty employees, and greater than twenty employees.

**Level of supervision.** This variable was categorized as ordinal data with two levels: first and second.

Data for the attribute variables were collected from two sources. Data for gender, age, educational level, and number of years with present employer were collected from the systems department of the Human Resources division in the organization. Since the systems department did not have the means to tabulate data on the other five variables, data relating to number of months a supervisor, functional area supervised, kinds of employees supervised, number of employees supervised and level of supervision were obtained from a participant information sheet. In addition to these attribute variables, the participant information sheet requested that supervisors identify two of their subordinates to be included in a post-training follow-up activity. The subordinates that supervisors
identified on the information sheet later provided data for measuring the ability of supervisors to facilitate the development of problem-solving skill in their employees. Supervisors completed the participant information sheet at the end of the first training session (see Appendix C for a sample of the participant information sheet).

Conditions of Testing

This section describes the data gathering conditions that were present in the study. In addition, the directions provided to subjects during the data gathering activities and personnel used for data gathering are discussed.

Data were gathered over a period of four weeks at three collection points. Trainers asked all subjects to complete the participant information sheet at the end of the first training session. The information sheet was completed at this time to ensure that descriptive data were collected for subjects that might subsequently drop-out of the study.

The second data collection point occurred immediately following the second training session. Trainers distributed the concept acquisition essay instructions to trainees at this time. After the essay instructions were distributed, the trainers reviewed the instructions with the trainees.

The third data collection point was three weeks after the second training session. A one-hour data collection session was scheduled for the supervisors on the morning of April 5, 1994. A meeting reminder notice was sent via the organization's electronic mail system to the supervisors one week prior to the date of the meeting. In addition to reminding supervisors of the meeting, the memorandum reminded supervisors that they were expected to pass on the meaning of constructive feedback to their subordinates (see Appendix B for samples of communications sent to participants in the research study).
During this data collection session, data were collected on concept application and self-reported problem-solving skill of supervisors.

A separate data collection session was held on April 5, 1994 for those subordinates participating in the study. A letter was sent to this group of employees notifying them of their session one month prior to their meeting (the week following the first supervisor training session). In addition, a reminder notice was sent to this group of subordinates two days prior to the meeting. Data on facilitated problem-solving skill was collected at this session.

Similar administrative procedures were used in both the supervisor and subordinate data collection sessions. Subjects picked up their coded essay activities as they entered the meeting. Once all of the participants arrived, the researcher explained the purpose of the activity and the procedures for completing the activity. Subjects were then given one hour to complete the activity. Refreshments were provided for the subjects to encourage them to relax and take their time with their responses.

Separate data collection make-up sessions were held the following Monday for the three supervisors and ten subordinates who were not able to attend the first session. Two supervisors and five subordinates attended the make-up session. The procedures for collecting the data at these sessions were the same as for the first session.

Packets containing the activity and instructions for completing the activity were sent to the one supervisor and five subordinates who were unable to attend the make-up session. They were given one week to complete the activity and return it to the researcher. The researcher telephoned participants whose packets had not been received at the end of one week's time to determine when they would be completing the activity. All packets were received within two weeks of the telephone calls.
The researcher served as the expert rater in this study. The expert rater evaluated the responses using the rating instruments developed to measure each variable. All responses were coded to ensure confidentiality and lack of bias on the part of the rater.

Hypotheses

Four statistical hypotheses were tested in this study:

**Hypothesis #1**

There will be no significant difference between supervisors who are trained using the guided discovery method and those being trained using a deductive method on concept acquisition.

**Hypothesis #2**

There will be no significant difference between supervisors who are trained using the guided discovery method and those being trained using a deductive method on concept application.

**Hypothesis #3**

There will be no significant difference between supervisors who are trained using the guided discovery method and those being trained using a deductive method on self-reported levels of problem-solving skill.

**Hypothesis #4**

There will be no significant difference between the subordinates of supervisors who are trained using the guided discovery method and the subordinates of supervisors being trained using a deductive method on their reports of the level of problem-solving skill that their supervisors expected them to use when learning the constructive feedback process.
Data Analysis Techniques

A three-stage plan was used to analyze the data. First, the data would be analyzed to determine if any of the attribute variables may have influenced the results of the study. This step involved determining relationships between: (a) the attribute variables and the main independent variable and (b) the attribute variables and the dependent variables. Second, the two groups were compared on each of the dependent variables. Analysis of covariance would be used to statistically analyze the data if any of the attribute variables were found to be related to both the independent variable and any of the dependent variables \((r \geq .35)\). If none of the attribute variables were found to be related to the independent variable and to any of the dependent variables, a t-test for independent groups with posttest scores for the dependent variables would be used to analyze the data. The third stage of the analysis involved analyzing additional information collected from subjects during the investigation that was relevant to the problem in the study.

Research Project Time Line

This study was conducted over a period of one year from June, 1993 to June, 1994. Specific activities and the chronological sequence in which they were completed are identified in Figure 5. This schedule for project completion required that multiple activities be conducted concurrently to ensure that the project was kept on schedule.
Event Identification

1. Start project
2. Identify researchable problem
3. Establish dissertation committee
4. Secure site for study
5. Begin planning study
6. Choose the design and methodology for the study
7. Complete review of literature
8. Complete research plan
9. Complete research proposal
10. Complete design of instructional units for the treatment
11. Complete design of instruments to measure dependent variables
11.5 Complete human subjects review process
12. Field test instruments
12.5 Pilot test instruments
13. Implement treatment
14. Design method for studying current supervisor training programs in organization
15. Investigate current supervisor training programs at organization
16. Collect trainee data
17. Analyze data
18. Develop conclusions, implications, and recommendations
19. Prepare final draft of dissertation
20. Complete oral defense
21. Complete written and oral reports of study for org.
22. Graduate

Figure 5

Timeline for Research Project
CHAPTER IV
RESULTS

This chapter is divided into four sections. An analysis of the attribute variables is reported in the first section. The descriptive statistics for the dependent variables are presented in the second section. The tests of the hypotheses are reported in the third section. Additional data relevant to the study are reported in the fourth section.

Analysis of the Attribute Variables

Nine attribute variables were identified in the study. To determine whether any of the attribute variables influenced the results of the study, correlations were obtained between each of the attribute variables and (a) the method of training and (b) each of the dependent variables. If any of the attribute variables were moderately correlated ($r \geq 0.35$) to both the active independent variable and any of the dependent variables, then there would be sufficient evidence to conclude that the attribute variable(s) may have influenced the results of the study (Fraenkel & Wallen, 1990). Any attribute variable found to be correlated with the treatment and any of the dependent variables would be used as a covariate in an analysis of covariance to adjust for group differences on that variable.

Relationships Between the Attribute Variables and the Method of Training

As shown in Table 2, relationships between each of the nine attribute variables and the method of training were determined. Five of the nine attribute variables were...
### Table 2

**Relationships Between Selected Attribute Variables and Instructional Groups**

<table>
<thead>
<tr>
<th>Attribute Variables</th>
<th>Instructional Group</th>
<th>Guided Deductive</th>
<th>Guided Discovery</th>
<th>$r_{pb}$ (point-biserial)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Age</td>
<td>n</td>
<td>8</td>
<td>8</td>
<td>-.07</td>
</tr>
<tr>
<td></td>
<td>$\bar{X}$</td>
<td>34.0</td>
<td>33.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>sd</td>
<td>6.72</td>
<td>8.00</td>
<td></td>
</tr>
<tr>
<td>(b) Educational level</td>
<td>n</td>
<td>8</td>
<td>8</td>
<td>.20</td>
</tr>
<tr>
<td></td>
<td>$\bar{X}$</td>
<td>15.3</td>
<td>16.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>sd</td>
<td>2.96</td>
<td>2.19</td>
<td></td>
</tr>
<tr>
<td>(c) Number of yrs. with present employer</td>
<td>n</td>
<td>8</td>
<td>8</td>
<td>*-.48</td>
</tr>
<tr>
<td></td>
<td>$\bar{X}$</td>
<td>9.1</td>
<td>3.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>sd</td>
<td>6.64</td>
<td>3.27</td>
<td></td>
</tr>
<tr>
<td>(d) Number of months a supervisor</td>
<td>n</td>
<td>8</td>
<td>8</td>
<td>.15</td>
</tr>
<tr>
<td></td>
<td>$\bar{X}$</td>
<td>12.8</td>
<td>16.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>sd</td>
<td>14.82</td>
<td>10.72</td>
<td></td>
</tr>
<tr>
<td>(e) Number of employees supervised</td>
<td>n</td>
<td>8</td>
<td>8</td>
<td>-.14</td>
</tr>
<tr>
<td></td>
<td>$\bar{X}$</td>
<td>6.0</td>
<td>4.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>sd</td>
<td>5.13</td>
<td>3.99</td>
<td></td>
</tr>
</tbody>
</table>
Table 2 (continued)

Relationships Between Selected Attribute Variables and Instructional Groups

<table>
<thead>
<tr>
<th>Nominal Attribute Variables</th>
<th>Instructional Group</th>
<th>Deductive</th>
<th>Guided Discovery</th>
<th>$a_r$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>(f) Level of supervision:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. First</td>
<td>8</td>
<td>100.0</td>
<td>7</td>
<td>87.5</td>
</tr>
<tr>
<td>2. Second</td>
<td>0</td>
<td>0.0</td>
<td>1</td>
<td>12.5</td>
</tr>
<tr>
<td>Total</td>
<td>8</td>
<td>100.0</td>
<td>8</td>
<td>100.0</td>
</tr>
<tr>
<td>(g) Function supervised:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Production-oriented area</td>
<td>3</td>
<td>37.5</td>
<td>2</td>
<td>25.0</td>
</tr>
<tr>
<td>2. Accounting/clerical area</td>
<td>3</td>
<td>37.5</td>
<td>2</td>
<td>25.0</td>
</tr>
<tr>
<td>3. Sales/marketing area</td>
<td>1</td>
<td>12.5</td>
<td>2</td>
<td>25.0</td>
</tr>
<tr>
<td>4. Eng./technical area</td>
<td>1</td>
<td>12.5</td>
<td>2</td>
<td>25.0</td>
</tr>
<tr>
<td>5. Other areas</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Total</td>
<td>8</td>
<td>100.0</td>
<td>8</td>
<td>100.0</td>
</tr>
<tr>
<td>(h) Gender:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Male</td>
<td>4</td>
<td>50.0</td>
<td>2</td>
<td>25.0</td>
</tr>
<tr>
<td>2. Female</td>
<td>4</td>
<td>50.0</td>
<td>6</td>
<td>75.0</td>
</tr>
<tr>
<td>Total</td>
<td>8</td>
<td>100.0</td>
<td>8</td>
<td>100.0</td>
</tr>
<tr>
<td>(i) Kinds of employees</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>supervised:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Professional</td>
<td>3</td>
<td>37.5</td>
<td>5</td>
<td>62.5</td>
</tr>
<tr>
<td>2. Non-Professional</td>
<td>4</td>
<td>50.0</td>
<td>2</td>
<td>25.0</td>
</tr>
<tr>
<td>3. Mixture of professional</td>
<td>1</td>
<td>12.5</td>
<td>1</td>
<td>12.5</td>
</tr>
<tr>
<td>and non-professional</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>8</td>
<td>100.0</td>
<td>8</td>
<td>100.0</td>
</tr>
</tbody>
</table>

$p_{ib}$ is reported for nominal variables with two levels; $a_{ib}$ is reported for nominal variables with more than two levels.

* $p < .10$
classified as interval data: age, educational level, number of years with present employer, supervisory experience with present employer and number of employees supervised. The remaining four attribute variables were classified as nominal data: level of supervision, function supervised, gender and kinds of employees supervised. Subjects experienced one of two methods of training in the study, deductive or guided discovery.

Correlation coefficients measuring associations between the attribute variables and instructional group ranged from -.48 to .26. Of the nine attribute variables, the only one that was at least moderately related to the method of training was the number of years with present employer. The relationship between number of years with present employer and instructional group was -.48.

Relationships Between the Attribute Variables and the Dependent Variables

The next step in the correlational analysis was to determine whether the attribute variable, number of years with present employer, was at least moderately related to any of the dependent variables. As shown in Table 3, letter c, this variable was found to be only negligibly related to any of the dependent variables.

The correlational analysis found none of the attribute variables to be at least moderately correlated with both the active independent variable and any of the dependent variables. It was therefore concluded that none of the attribute variables had influenced the results of the study and, as a result, they were not included in the statistical analysis as covariates. A t-test for independent groups with posttest scores for the dependent variables was used to analyze the data.
Table 3

Relationships Between the Selected Attribute Variables and the Dependent Variables

<table>
<thead>
<tr>
<th>Attribute Variables</th>
<th>CA</th>
<th>CT</th>
<th>PSS&lt;sub&gt;d&lt;/sub&gt;</th>
<th>PSS&lt;sub&gt;f&lt;/sub&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Age</td>
<td>-.28</td>
<td>-.23</td>
<td>-.25</td>
<td>-.17</td>
</tr>
<tr>
<td>(b) Educational level</td>
<td>.07</td>
<td>-.13</td>
<td>.00</td>
<td>.01</td>
</tr>
<tr>
<td>(c) Number of years with present employer</td>
<td>.01</td>
<td>.04</td>
<td>.09</td>
<td>-.17</td>
</tr>
<tr>
<td>(d) Number of months a supervisor</td>
<td>-.26</td>
<td>.32</td>
<td>-.19</td>
<td>-.24</td>
</tr>
<tr>
<td>(e) Number of employees supervised</td>
<td>.09</td>
<td>.26</td>
<td>-.17</td>
<td>.17</td>
</tr>
<tr>
<td>(f) Level of supervision</td>
<td>-.37</td>
<td>-.10</td>
<td>.22</td>
<td>.32</td>
</tr>
<tr>
<td>(g) Function supervised</td>
<td>-.07</td>
<td>-.44*</td>
<td>-.11</td>
<td>.19</td>
</tr>
<tr>
<td>(h) Gender</td>
<td>-.26</td>
<td>-.20</td>
<td>-.16</td>
<td>-.50*</td>
</tr>
<tr>
<td>(i) Kinds of employees supervised</td>
<td>-.10</td>
<td>.31</td>
<td>.09</td>
<td>-.17</td>
</tr>
</tbody>
</table>

Note: CA = Concept Acquisition; CT = Concept Application; PSS<sub>d</sub> = Self-Reported Problem-Solving Skill Demonstrated by Supervisors; PSS<sub>f</sub> = Facilitated Problem-Solving Skill as Reported by Supervisor's Subordinates.

* p < .10
Descriptive Statistics

Four dependent variables were investigated to determine the effects of the treatment in this study: concept acquisition, concept application, self-reported problem-solving skill of supervisors and facilitated problem-solving skill of supervisors. Ratings of responses generated by sixteen supervisors in the study and by a sampling of each of their subordinates provided the data for analyzing the dependent variables.

For concept acquisition, supervisors generated an example of the constructive feedback process immediately after the completion of training. Responses included a range of constructive feedback situations in which supervisors provided feedback to employees about such situations as poor organizational and time management skills, dressing inappropriately for the workplace, and conflict among work group members. The quality of the responses in relation to the degree to which they demonstrated the six established steps of the constructive feedback process was assessed. On a four-point scale with one as the low point and four as the high point, the mean score for all participants on ability to demonstrate the constructive feedback process was rated as good at 3.01 with a standard deviation of 0.76.

For concept application, three weeks after the completion of training supervisors generated an example of how they had recently used the constructive feedback process in a job situation. Responses included constructive feedback situations similar to those reported for concept acquisition. The quality of the responses in relation to their ability to apply the constructive feedback process was assessed. On a four-point scale with one as the low point and four as the high point, the mean score for all participants was rated as fair at 2.18 with a standard deviation of 0.68.

For self-reported problem-solving skill, supervisors generated examples of challenging situations that they had recently faced in their jobs. Responses included a
range of problems such as excessive employee absences and tardiness, unclear criteria for selection and hiring decisions, poor working relations with peers and sexual harassment. The level of problem-solving skill that was present in the responses was assessed. Out of a total possible score of 27 points, a mean score for all participants of 15.1 with a standard deviation of 6.00 showed that supervisors demonstrated some evidence of problem-solving skill.

For facilitated problem-solving skill, a sampling of each supervisor's subordinates reported how their supervisors expected them to learn about the constructive feedback process. Methods subordinates reported that their supervisors used to facilitate subordinate learning included activities such as distributing handouts about the constructive feedback process, conducting group discussions about the constructive feedback process, leading constructive feedback role-plays, facilitating guided discovery lessons and doing nothing. Subordinate responses were rated on the degree to which supervisors expected subordinates to demonstrate problem-solving skill when learning the constructive feedback process. Out of a total possible score of 27 points, a mean score for all participants of 1.7 and a standard deviation of 2.8 showed that the majority of the supervisors did not expect their subordinates to engage in problem-solving activities when learning about the constructive feedback process.

Tests of the Hypotheses

Hypothesis #1: Concept Acquisition

The first null hypothesis was that there will be no significant difference between supervisors who are trained using the guided discovery method and those trained using a deductive method on concept acquisition.
For concept acquisition, participant scores in the deductive group ranged from 2.22 to 4.00. The mean score for the deductive group was 3.31 with a standard deviation of .61. Participant scores in the guided discovery group ranged from 1.40 to 3.64. The mean score for the guided discovery group was 2.71 with a standard deviation of .82.

As shown in Table 4, a t-test was used to test the difference between the means of the concept acquisition scores for supervisors in each of the two instructional groups. At the .10 alpha level, the null hypothesis was accepted. There was no significant difference between the mean scores of the two groups for concept acquisition.

Table 4

<table>
<thead>
<tr>
<th>Group</th>
<th>n</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deductive</td>
<td>8</td>
<td>3.31</td>
<td>.61</td>
<td>1.67</td>
<td>0.118</td>
</tr>
<tr>
<td>Guided Discovery</td>
<td>8</td>
<td>2.71</td>
<td>.82</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Hypothesis #2: Concept Application

The second null hypothesis was that there will be no significant difference between supervisors who are trained using the guided discovery method and those trained using a deductive method on their ability to apply the concept that was taught during training to a task in their jobs.

For concept application, participant scores in the deductive group ranged from 1.73 to 3.66 with a mean score of 2.55 and a standard deviation of .66. Participant scores in the guided discovery group ranged from 1.00 to 2.62 with a mean score of 1.82 and a standard deviation of .52.
As shown in Table 5, a t-test was used to test the difference between the means of the concept application scores for supervisors in each of the two instructional groups. At the .10 alpha level, the null hypothesis was rejected. There was a significant difference between the mean scores of the two groups for concept application with the deductive group demonstrating greater ability to apply the constructive feedback process than the guided discovery group.

Table 5

Mean Concept Application Scores for Supervisors in the Two Instructional Groups

<table>
<thead>
<tr>
<th>Group</th>
<th>n</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deductive</td>
<td>8</td>
<td>2.55</td>
<td>.66</td>
<td>2.46</td>
<td>0.027</td>
</tr>
<tr>
<td>Guided Discovery</td>
<td>8</td>
<td>1.82</td>
<td>.52</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Further, Figure 6 shows that while supervisors in both groups realized a decreased ability to apply the constructive feedback process to a task on-the-job, the deductive group consistently scored higher on both concept acquisition and concept application than the guided discovery group.

Hypothesis #3: Self-Reported Problem-Solving Skill of Supervisors

The third null hypothesis was that there will be no significant difference between supervisors who are trained using the guided discovery method and those trained using a deductive method on self-reported problem-solving skill.
Participant Mean Scores on Concept Acquisition and Concept Application

Note: CAS = Concept Acquisition; CTS = Concept Application; DED = Deductive Group; GD = Guided Discovery Group

Figure 6

Participant Mean Scores on Concept Acquisition and Concept Application
For self-reported problem-solving skill, scores of supervisors in the deductive group ranged from 10 to 26 with a mean score of 16.6 and a standard deviation of 5.76. Scores of supervisors in the guided discovery group ranged from 4 to 20 with a mean score of 13.6 and a standard deviation of 6.14.

As shown in Table 6, a t-test was used to test the difference between the means of the problem-solving scores for supervisors in each of the two instructional groups. At the .10 alpha level, the null hypothesis was accepted. There was no significant difference between the mean scores of the two groups for self-reported problem-solving skill.

Table 6

<table>
<thead>
<tr>
<th>Group</th>
<th>n</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deductive</td>
<td>8</td>
<td>16.6</td>
<td>5.76</td>
<td>1.01</td>
<td>0.33</td>
</tr>
<tr>
<td>Guided Discovery</td>
<td>8</td>
<td>13.6</td>
<td>6.14</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Hypothesis #4: Facilitation of Problem-Solving Skill in Subordinates

The last null hypothesis was that there will be no significant difference between the subordinates of supervisors who are trained using the guided discovery method and the subordinates of supervisors who are trained using a deductive method on their reports of the level of problem-solving skill that their supervisors expected them to demonstrate when learning the constructive feedback process.
For facilitated problem-solving skill, scores of supervisors in the deductive group ranged from 0 to 8 with a mean score of 1.9 and a standard deviation of 2.70. Scores of supervisors in the guided discovery group ranged from 0 to 10 with a mean score of 2.5 and a standard deviation of 3.70.

As shown in Table 7, a t-test was used to test the differences between the means of the facilitated problem-solving skill scores for supervisors in each of the two instructional groups. At the .10 alpha level, the null hypothesis was accepted. There was no significant difference between the mean scores of the two groups for facilitated problem-solving skill.

Table 7

Mean Facilitated Problem-Solving Scores of Supervisors in the Two Instructional Groups

<table>
<thead>
<tr>
<th>Group</th>
<th>n</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deductive</td>
<td>8</td>
<td>1.9</td>
<td>2.70</td>
<td>-.386</td>
<td>.71</td>
</tr>
<tr>
<td>Guided Discovery</td>
<td>8</td>
<td>2.5</td>
<td>3.70</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Additional Data

Additional information regarding problem-solving skill and attitudes of trainees toward the training experience were believed to be important to the study.

Problem-Solving Skill

Although the statistical analysis found no difference between the two groups on self-reported and facilitated problem-solving skill, a review of the responses generated by the supervisors and by their subordinates provided additional information for interpreting
the results. As depicted in Figure 7, supervisors in the deductive group demonstrated somewhat greater levels of self-reported problem-solving skill. However, supervisors in the guided discovery group expected their subordinates to demonstrate higher levels of problem-solving skill when acquiring the concept of constructive feedback.

Moreover, a review of the subordinate responses found some differences between the two instructional groups on the methods used to facilitate problem-solving skill. Approximately half of the supervisors in each group did not attempt to facilitate the development of problem-solving skill in their employees by passing on the meaning of constructive feedback as was instructed. However, a review of those subordinate responses indicating that their supervisors had passed on the meaning of constructive feedback found that the nature of the methods that supervisors used to facilitate subordinate development was different for the two groups. All five of the supervisors in the deductive group who completed the assignment used a deductive method, in the form of individual or group discussion or role play, to pass on the meaning of constructive feedback to their subordinates. Conversely, while four out of the six supervisors in the guided discovery group used a combination of discussion and handouts to pass on the meaning of constructive feedback to their subordinates, two supervisors used variations of the guided discovery method. Thus, while the statistical analysis found that the majority of the supervisors in the study did not facilitate the development of problem-solving skill in their subordinates, a review of the subordinate responses found that supervisors in the guided discovery group tended to use more inductive methods to facilitate the development of their subordinates than those in the deductive group.

Attitudes of Supervisors Toward the Training Experience

Supervisors completed an attitude survey immediately following the completion of the second training session. As shown in Appendix C, the survey was composed of two
Figure 7
Mean Scores of Supervisors in the Instructional Groups on Self-Reported Problem-Solving Skill and Facilitation of Problem-Solving Skill in Subordinates

Note: PSsupr = Self-Reported Problem-Solving Skill of Supervisors; PSsub = Facilitation of Problem-Solving Skill in Subordinates
sections. The first section assessed participants' attitudes toward the objectives, content, and topic of the training program and the materials used during training. A five-point agreement scale ranging from strongly disagree (one) to strongly agree (five) was used for items in this section. The second section assessed participants' perceptions of the quality of four training activities and participants' overall reaction to the training experience. A five-point Likert-type scale ranging from one (poor) to five (excellent) was used to measure the perceived quality of the training activities identified in Section II.

As shown in Table 8, the attitudes of participants in the instructional groups toward each of the aspects of the training program measured in Section I of the survey were fairly similar. In general, participants agreed with each of the items in Section I with mean scores for all participants ranging from 3.8 to 4.3. Only two of the six items were found to be moderately correlated with method of instruction. A .38 correlation coefficient was found between participants' attitudes toward the balance of learning activities in the training sessions and method of training with participants in the guided discovery group perceiving that there was a better balance of learning activities than those in the deductive group. Furthermore, a .41 correlation coefficient was found between the degree to which participants felt the topic of the training sessions was relevant to their jobs and method of training with supervisors in the guided discovery group perceiving that the topic of the training sessions was more relevant to their jobs than the supervisors in the deductive group. Although these two correlations were moderate in strength, they were not significant at an alpha level of .10.

In Section II of the survey, participants rated the quality of four training activities and the overall training experience. As shown in Table 9, participants perceived that the quality of the four types of training activities and the overall training experience was good to excellent with mean scores ranging from 3.3 for the large group discussion and the skills practice activities to 3.6 for the small group activities.
Table 8

Attitudes of Participants in the Two Instructional Groups Toward Selected Characteristics of the Training Experience

<table>
<thead>
<tr>
<th>Survey Items in Section I</th>
<th>Instructional Group</th>
<th>Tpb</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Deductive</td>
<td>Guided Discovery</td>
</tr>
<tr>
<td>(a) The objectives of the program were clear.</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>n</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>$\bar{X}$</td>
<td>3.6</td>
<td>3.9</td>
</tr>
<tr>
<td>sd</td>
<td>.92</td>
<td>.64</td>
</tr>
<tr>
<td>(b) The content of the course covered the objectives identified in the training program.</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>n</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>$\bar{X}$</td>
<td>3.9</td>
<td>3.9</td>
</tr>
<tr>
<td>sd</td>
<td>.35</td>
<td>.64</td>
</tr>
<tr>
<td>(c) There was an appropriate balance of different types of learning activities in the training sessions.</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>n</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>$\bar{X}$</td>
<td>3.8</td>
<td>4.0</td>
</tr>
<tr>
<td>sd</td>
<td>N/A$^a$</td>
<td>N/A$^a$</td>
</tr>
<tr>
<td>(d) The topic of the training sessions was relevant to the participant's job.</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>n</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>$\bar{X}$</td>
<td>4.1</td>
<td>4.5</td>
</tr>
<tr>
<td>sd</td>
<td>.35</td>
<td>.54</td>
</tr>
<tr>
<td>(e) Course materials were a useful resource for learning.</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>n</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>$\bar{X}$</td>
<td>4.0</td>
<td>4.0</td>
</tr>
<tr>
<td>sd</td>
<td>N/A$^a$</td>
<td>N/A$^a$</td>
</tr>
<tr>
<td>(f) The participant expected to use what was learned during training on the job.</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>n</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>$\bar{X}$</td>
<td>4.3</td>
<td>4.4</td>
</tr>
<tr>
<td>sd</td>
<td>.46</td>
<td>.52</td>
</tr>
</tbody>
</table>

$^a$There is no value for standard deviation since all of the values were the same for one of the levels of the instructional group.
Table 9

**Attitudes of Participants in the Instructional Groups Toward Four Training Activities and the Overall Training Experience**

<table>
<thead>
<tr>
<th>Survey Items in Section II</th>
<th>Instructional Group</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Deductive</td>
<td>Guided</td>
<td>Discovery</td>
<td></td>
</tr>
<tr>
<td>(g) Large group discussions</td>
<td>n 8</td>
<td>8</td>
<td>X 3.0</td>
<td>3.6</td>
</tr>
<tr>
<td></td>
<td>sd .76</td>
<td>.52</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(h) Small group activities</td>
<td>n 8</td>
<td>8</td>
<td>X 3.5</td>
<td>3.6</td>
</tr>
<tr>
<td></td>
<td>sd .93</td>
<td>.74</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(i) Skills practice activities</td>
<td>n 8</td>
<td>8</td>
<td>X 3.0</td>
<td>3.6</td>
</tr>
<tr>
<td></td>
<td>sd .76</td>
<td>.52</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(j) On-the-job training activity</td>
<td>n 8</td>
<td>8</td>
<td>X 2.9</td>
<td>3.6</td>
</tr>
<tr>
<td></td>
<td>sd .84</td>
<td>.75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(k) Overall training experience</td>
<td>n 8</td>
<td>8</td>
<td>X 3.1</td>
<td>3.9</td>
</tr>
<tr>
<td></td>
<td>sd .35</td>
<td>.64</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .10
As illustrated in Figure 8, supervisors in the guided discovery group rated the quality of three out of the four training activities significantly higher than participants in the deductive group. Moderate correlations ranging from .45 to .46 were found between large group discussion, skills practice and on-the-job training activities and the method of training. These correlations were significant at an alpha level of .10. Moreover, a substantial correlation of .61 was found between the quality of the overall training experience and method of training with participants in the guided discovery group perceiving that the quality of the training experience was better than those in the deductive group.
Figure 8

Attitudes of Participants in the Instructional Groups Toward the Quality of Four Training Activities and the Overall Training Experience

Note: LG GRP DISC = Large group discussions; SM GRP ACTIV = Small group activities; ROLE-PLAY = Role-play activities; OJT = On-the-job training activities; O/A TRNG EXPER = Overall training experience.
CHAPTER V
SUMMARY, CONCLUSIONS, AND IMPLICATIONS

This chapter is divided into five sections. A summary of the study is presented in the first section. The summary includes a description of the methodology and the results of the study. The conclusions of the study are presented in the second section. A discussion of the findings, which explores rationales for explaining the findings of the study, is presented in the third section. Implications of the findings for theory, research and practice in HRD are discussed in the fourth section. Recommendations for future related research are presented in the fifth section.

Summary

This study was designed to determine the effects of a deductive versus a guided discovery training method on the ability of supervisors to solve problems and facilitate problem-solving skill in subordinates. Sixteen supervisors who attended a supervisor training program conducted by the HRD department of a large organization located in the midwest region of the United States served as the sample in this study. The subjects were randomly assigned to a deductive method or a guided discovery method of training for one of the instructional units in a week-long supervisor training program. The content of the instructional unit was the constructive feedback process. In addition to method of
training, nine attribute variables were investigated in the study: gender, age, educational level, number of years with present employer, number of months of supervisory experience, functional area supervised, kinds of employees supervised, number of employees supervised, and level of supervision. A correlational analysis was conducted to determine if any of the attribute variables had influenced the results of the study. The analysis found that none of the attribute variables were at least moderately related to both the method of instruction and any of the dependent variables.

The effects of the two methods of training were assessed on four dependent variables. Concept acquisition, a training outcome, was assessed by evaluating written examples of constructive feedback that were generated by the supervisors immediately following training. Job outcomes of supervisors were measured in three ways. First, concept application was measured by evaluating the written responses of supervisors in which they described recent job situations that had involved using the constructive feedback process. Second, self-reported problem-solving skill of supervisors was measured by evaluating the level of problem-solving skill that was evident in written responses of supervisors in which they described recent challenging situations in their jobs. These descriptions included supervisors' mental thoughts about how they identified and solved a problem and the physical actions that they used to handle the problem. The third job outcome, supervisors' facilitation of subordinate problem-solving skill, was measured by evaluating written responses from a sampling of each supervisor's subordinates in which the subordinates reported how their supervisors had expected them to learn about the constructive feedback process.

Two instruments were developed to rate the responses generated by the subjects. The Concept Learning Rating Scale measured the competency that supervisors demonstrated when generating an example of the constructive feedback process. The Problem Solving Rating Scale assessed the level of problem-solving skill that supervisors
demonstrated during a challenging job situation and the level of problem-solving skill that subordinates reported they were expected to demonstrate when learning about constructive feedback. A panel of experts and two field tests were convened to ensure the face and content validity of the instruments. In addition, a test-retest reliability coefficient, a measure of internal consistency and an inter-rater reliability coefficient were calculated for each instrument. Reliability coefficients for both instruments were very high ranging from .78 to .93.

Data were collected at three collection points. Data for attribute variables were collected during the first of two training sessions. The short-term training outcome, concept acquisition, was assessed immediately following the second training session. Participants also completed an attitude survey at the end of the second training session. Concept application, self-reported problem-solving skill and facilitated problem-solving skill were measured three weeks after training.

Since none of the nine attribute variables were found to be correlated with the treatment and any of the dependent variables, a t-test for independent groups with the post-test scores of the dependent variables was used to analyze the data. In addition, associations between the supervisors in the two groups on their perceptions toward the training experience were analyzed using point-biserial correlation coefficients.

Analysis of the data revealed the following results. No significant differences between the two methods of training were found for concept acquisition. A significant difference between the two methods of training was found for application of the concept to job situations with the deductive group demonstrating greater ability to apply the constructive feedback process than the guided discovery group. No significant differences were found between the two groups on either self-reported or facilitated problem-solving skill, although information in supervisor and subordinate responses suggests that supervisors in the guided discovery group may have used more inductive methods to
facilitate the development of their employees. Lastly, an analysis of the data from the attitude surveys found that participants in the guided discovery group rated the quality of the learning activities in which they engaged, the quality of the overall training experience and the relevance of the training experience to their jobs higher than did those in the deductive group.

Conclusions

The conclusions regarding the sample of this study were based upon the ratings of seventy-six written responses for the total sample over a period of three weeks following the training experience. Ratings were completed by an expert rater whose reliability had been determined to be very high. In addition, the conclusions were based on the data collected from attitude surveys which measured the perceptions of participants toward the training experience. Based on the results, it was concluded that:

1. Supervisors who experienced the guided discovery method and those who experienced the deductive method of training acquired similar levels of knowledge as a result of the training experience.

2. Supervisors who experienced the deductive method of training were able to apply the concept taught during training to a greater degree than supervisors who experienced the guided discovery method of training.

3. The guided discovery method and the deductive method of training did not differentially impact the self-reported problem-solving skill of supervisors.

4. The guided discovery method and the deductive method of training did not differentially impact the degree to which supervisors facilitated the development of problem-solving skill in their subordinates.
5. Trainees who experienced the guided discovery method of training perceived that the quality of the training experience and the relevance of the training experience to their jobs was higher than those who experienced the deductive method of training.

Some caution should be exercised in generalizing these conclusions to different populations and to different conditions than those in the study. This investigation focused on one population of employees in organizations, supervisors. Based on the characteristics of the sample, the generalizations of this study are most appropriate for first-level supervisors who predominately are female, fairly well educated with at least some college work, inexperienced with less than two years of supervisory experience and responsible for fairly small staffs.

Several other factors in addition to these attributes limit the scope of the generalizations in this study. To begin with, the treatment was embedded within a week-long supervisor training program. Further, the researcher did not have control over selection of subjects from the population of supervisors in the participating organization. Related to this factor, the researcher did not have control over the size of the sample. Although 27 supervisors initially registered for the training program, 8 had canceled their registrations by the time the program was offered. In consideration of these limitations, the generalizations are cautiously made with the understanding that they are most appropriate for those populations and situations which are similar to those in the study.

Discussion

Theory in educational and cognitive psychology has postulated that the guided discovery method enables the concomitant acquisition of learning objectives and development of critical thinking skills. Educational researchers have found some evidence
to confirm this proposition. However, the use of the guided discovery method for training in organizational settings has for the most part gone unexamined. This investigation attempted to fill that gap by studying the effects of using a guided discovery method of training as compared to a deductive method of training on the training outcomes and job behaviors of supervisors.

The model shown in Figure 9 was proposed in Chapter II of this study to explain existing relationships between method of training and training and job outcomes. An analysis of the findings disclosed that while the method of training appeared to impact certain job outcomes, it did not influence the attainment of specified training outcomes. Specifically, a statistical difference between the two instructional groups was found for concept application while no statistical difference between the two groups was found for concept acquisition. Furthermore, while no statistical differences were found for problem-solving skill, an analysis of the participant responses suggests that method of training did influence the nature of the methods that supervisors used to facilitate the development of problem-solving skill in their employees. Therefore, the findings suggest that while both a deductive and a guided discovery method of training result in similar training outcomes, differences between the two methods exist with regard to certain types of job outcomes. Since some aspects of the proposed model were confirmed by the findings of this study while others were not, the following discussion explores rationales which the researcher believes might most plausibly explain why these consistencies and inconsistencies occurred.

It was concluded that while the two methods of training resulted in similar levels of concept acquisition, the deductive method resulted in a greater level of concept application. These findings are somewhat inconsistent with previous research. For the findings on concept acquisition, training experts believe that training objectives can be
Figure 9

Theoretical Model of the Proposed Relationships Between Method of Training and Training and Job Outcomes
achieved through the use of either a deductive method of training (Goldstein & Sorcher, 1974; Kirkpatrick, 1993) or a guided discovery method of training (Newbert & Binko, 1992; Taba, 1966). Moreover, empirical studies conducted with deductive methods (see Anderson, 1971; Bumaska, 1976; Harrison, 1992; McGehee and Gardner, 1955) and with a guided discovery method (see Craig, 1956; Kittle, 1957; Wittrock, 1963a, 1963b; Worthen, 1968) confirm this study's findings that trainees are able to acquire mastery of the content through the use of either method of training.

Yet, the second conclusion, that the deductive method of training resulted in greater application of learning to the job than the guided discovery method, is somewhat inconsistent with existing theory and research. Educational theorists propose that high degrees of transfer are realized by the use of inductive methods (Bruner, 1961a; Joyce & Weil, 1986; Kagan, 1966; Newbert & Binko, 1992). The rationale underlying this theory is that inductive methods involve trainees in the examination of information and examples relevant to the concepts being taught, the generation of inferences about the meaning of concepts, and the application of inferences to new groups of information. As a result of these inductive thinking activities, trainees have the opportunity to integrate new knowledge into their present bodies of knowledge and to learn how to apply this new knowledge to novel situations. However, empirical research has found conflicting results for transfer of learning with inductive methods. Studies conducted by Taba (1966), Wittrock (1963a, 1963b) and Kittle (1957) found that moderate degrees of guidance during discovery learning often results in higher levels of transfer of learning than occurs with deductive methods. Yet, other studies conducted by Van Hout and Mettes (1976) and Craig (1953) found no significant differences in levels of transfer between deductive and inductive methods.

The literature in the field of expertise provides an additional perspective from which to consider these findings. According to expertise theorists, transfer of learning is
highly correlated with the level of similarity between the learning environment and the task environment (Gick, 1986; Holland et al., 1986; Palumbo, 1990). That is, if a training experience provides a variety of learning activities which are highly similar to the tasks or situations that trainees face in the work environment, the probability that trainees will be able to apply the knowledge and skills that they acquired during training to their jobs is much greater.

Consideration of this study's findings about concept application in relation to existing theory and research has resulted in the development of three rationales which may plausibly explain the results. The first way of viewing the reason for the findings is the apparent differences in the sequence and purpose of the instructional events used during training. In the deductive group, participants practiced applying the constructive feedback process in a role-play exercise and, afterward, applied the constructive feedback process to real situations during an on-the-job training activity. While trainees in the guided discovery group also participated in a role-play exercise and an on-the-job training activity, the sequence of the learning activities was reversed and the objective for both of the activities was concept formation rather than concept application. To explain, guided discovery group members collected information about the constructive feedback process from resident experts during their on-the-job training activity. After information had been collected, trainees made inferences about the components of the constructive feedback process and then tested those inferences during their role-play activity. A comparison of the differences in the sequence and purpose of these instructional events for the two groups suggests that the deductive group had greater opportunity to practice applying the constructive feedback process in its terminal form than did the guided discovery group. Accordingly, the conclusion that supervisors experiencing the deductive method were able to apply the concept to a greater degree may be explained by the fact that these trainees
had greater opportunity to practice the constructive feedback process in its final form under conditions that were highly similar to actual situations in their jobs.

Related to the instructional events of the training experience, a second way of viewing the reason for the findings regarding concept application is to consider the possibility that the limited amount of time allotted for the on-the-job training activity may have differentially impacted the two groups. For the on-the-job training activity, supervisors in the deductive group applied what they had learned about the constructive feedback process to situations in their jobs while supervisors in the guided discovery group gathered information about the constructive feedback process from resident experts. Unlike the deductive group, most supervisors in the guided discovery group had to schedule a meeting with another individual in order to complete their on-the-job training activity. Consequently, the limited amount of time that was allotted for the activity, six working days, may have differentially impacted the ability of supervisors in the two groups to complete the activity. Comments from participants in the guided discovery group indicated that some of them felt that they had not had adequate time to complete their assignment. The apparent time constraint for the on-the-job training activity may have in turn diminished the ability of those supervisors to benefit fully from subsequent stages of the training experience and to apply the concept taught during training to situations in their jobs.

A third way of viewing the reason for the findings regarding concept application is to consider the inflexible nature of the method that was used to evaluate learning. Concept learning was evaluated through the use of a rating instrument that was designed to evaluate examples of the constructive feedback process generated by supervisors. The quality of each response was rated in relation to the degree to which it demonstrated each of the six steps in the constructive feedback process as defined in the instructional unit. While this defined process was presented to supervisors in the deductive group at the
beginning of their training experience, the nature of the guided discovery method called for trainees in that group to induce the definition of the constructive feedback process through their learning activities. A review of the transcripts and materials from the guided discovery training sessions found that the definition that the group induced consisted of five rather than six steps. The trainees had combined the six distinct steps identified in the instructional unit's definition of the constructive feedback process into two steps. Moreover, the trainees had created three additional steps which were not identified in the instructional unit's definition of the process, those being identify the problem situation, prepare for the constructive feedback session and follow-up after the session. A result of the differences in the definitions of the constructive feedback process identified by the trainees and by the instructional unit may be that the supervisors in the guided discovery group learned a great deal but were unable to demonstrate that learning because the assessment tool was designed to measure learning in relation to a pre-defined six-step process.

While related theory and research suggest that both methods of training have the potential to effect high levels of transfer, several reasons have been presented which plausibly explain why the findings on concept application occurred. Supervisors in the deductive group may have been more able to apply the concept taught during training to their jobs because of the different sequence and purpose of the instructional activities in the two groups, because of the differential impact of the limited amount of time allotted for the on-the-job training activity for the two instructional groups, and/or because of the way in which the criterion was measured.

In addition to concept learning outcomes, the findings showed that a guided discovery method and a deductive method of training did not differentially impact the problem-solving skill of supervisors or the degree to which supervisors facilitated the development of problem-solving skill in their subordinates. Theory conflicts in some ways
with these findings. Learning theorists, for example Taba (1966), Bruner (1961a, 1961b), and Gagne (1966), believe that the use of discovery learning methods promotes improved problem-solving skill. Empirical studies conducted by Klauer (1989), Holland et al. (1986), Taba (1966) and Wittrock (1966) have confirmed the proposed relationship between the use of guided discovery methods and improved problem-solving skill.

However, the literature also presents several plausible explanations for the findings of no difference between the two methods on the development of problem-solving skill. Joyce and Weil (1986) and Newbert and Binko (1992) suggest that while immediate improvements in problem-solving skill are not often found with the use of one particular method of instruction, the continual and repeated use of an inductive method, such as guided discovery, will in all likelihood promote the development of problem-solving skill. Thus, the findings that self-reported and facilitated problem-solving skill were not differentially impacted by the two methods of training might be explained by the proposition that learners require repeated exposure to the guided discovery method to realize any significant improvements in this type of cognitive skill.

A second explanation for these findings is that the empirical studies which have confirmed associations between the use of inductive methods and improved problem-solving skill are flawed. Cronbach (1966) has criticized many of the empirical studies of discovery learning stating that they lack strong research design and that the tasks that are used as referents in the investigations are arbitrary and are thus "too lacking in rationality for proper study of rationality" (p. 79). Perhaps that when strong research designs are used and when these designs include tasks in context as referents, the theoretical proposition that the use of guided discovery methods results in improved problem-solving skill becomes more difficult to confirm.

A third way of explaining the findings related to problem-solving skill is that different organizational factors may not have supported the types of behaviors which are
manifested during the problem-solving process. Specifically, it appears that three organizational factors may have inhibited the transfer of problem-solving skill from the training environment to the workplace.

First, the culture of the organization may preclude supervisors from using and facilitating the development of problem-solving skill. Although many of the supervisors in this organization work in teams, some reported that they are expected to solve problems on their own and are discouraged from seeking outside advice or assistance during the problem-solving process. For instance, some supervisors that did engage in information gathering activities during the problem-solving process were negatively reinforced by their superiors and their peers for seeking additional assistance and/or resources. Clearly, the norm in the organization is that employees should solve problems on their own, with a minimum amount of interaction with others and as quickly as possible. In all likelihood, this type of closed culture inhibits rather than encourages the use and development of problem-solving skill.

A second organizational factor that may have inhibited the use or development of problem-solving skill in the workplace is the goal orientation of the organization. Fundamentally, the organization in this study values production and efficiency as worthy accomplishments. Supervisors are responsible for operationalizing these goals through the work of their employees. For instance, supervisors in the study reported that the problems that they encounter primarily involve managing people, projects and tasks in order to meet production standards and/or target dates. Supervisors described how they align their actions and behaviors with these types of organizational expectations. Seemingly, the predominant orientation to production and efficiency leaves little opportunity for the use, development or facilitation of problem-solving skills. Even if differences in problem-solving skill had existed between the two groups at the end of the training experience, it is plausible that the goal orientation of this organization implicitly and explicitly encouraged
supervisors to focus solely on operational responsibilities and discouraged them from
developing their own problem-solving skill or facilitating the development of this skill in
their employees.

A third organizational factor that may have inhibited the use or facilitation of
problem-solving skill in the workplace is the organization's incentive system. Essentially,
the organization provided little to no incentive for supervisors to use or facilitate the
development of problem-solving skill. For example, the majority of the subordinates
reported that their supervisors knew that they were supposed to pass on the meaning of
constructive feedback to them. These subordinates further reported that they had either
been explicitly told by their supervisors or had implicitly come to believe that their
supervisors were not able to complete the assignment because they had other tasks to do
which had higher priority. It appears that many of the supervisors engaged in other
activities for which they were positively rewarded by the organization. By their lack of
completion of this activity, however, supervisors sent a tacit message to their subordinates
which told them that their professional development was not valued by their supervisors.
Seemingly, many of the supervisors were unaware of how their actions influenced the
attitudes of their subordinates. As a result, many of the subordinates in the study
experienced negative reinforcement rather than a developmental activity.

Several reasons have been presented which plausibly explain why the theoretical
proposition that the use of the guided discovery method will effect improved problem-
solving skill was not confirmed in this study. These reasons include that there may have
been insufficient exposure to the instructional method, that the theoretical proposition may
be false and that certain organizational factors may not have supported the use and/or
facilitation of problem-solving skill.

Paradoxically, while the findings showed no difference between the two
instructional groups on problem-solving skill and showed that participants in the deductive
group demonstrated greater application of the concept, it was found that participants in the guided discovery group perceived that the quality of their training experience and its relevance to their jobs were higher than those in the deductive group. Two rationales are explored which plausibly explain the inconsistency between what the findings show actually happened and what the trainees perceived had happened in the training experience.

To begin with, differential levels of learner participation in the two methods of training may account for the inconsistency between the findings and the perceptions of the trainees. In contrast to deductive methods, Newbert & Binko (1992), Wittrock (1966), and Taba (1966) report that high levels of learner participation in most phases of the learning process are integral components of the guided discovery method. According to these reports, higher levels of learner participation typically result in higher levels of motivation to learn, greater interest in the content of the lesson and increased intrinsic satisfaction in learning.

Consistent with these reports, participants in the two instructional groups of this study did had different levels of participation during the training experience. For the most part, supervisors in the deductive group passively received information during the presentation of content in their training experience. Adult educators, for example Knowles (1986), believe that adults do not enjoy this type of passive role during the learning process. Confirming this belief, one of the supervisors in the deductive group commented that an aspect of the training experience which could be improved was that the trainer should "wait and encourage responses to jointly develop suggestions" rather than present the information to the trainees already in its final form. In contrast, supervisors in the guided discovery group actively participated in most phases of their training experience. This group of trainees gathered information, made generalizations, and tested those generalizations. As one supervisor from the guided discovery group commented,
the aspect of the training experience that was most useful to him in his job as a supervisor was "trying to summarize the [constructive feedback] process in our own words; this cements the concepts in my mind." Thus, different levels of involvement during the learning process for the two groups could explain the differences that were found in the perceptions of trainees toward the training experience.

Another way of viewing the reason for the differences in perceptions toward the training experience is that different trainers were used to deliver each of the training methods. In general, the personality of the trainer who delivered the deductive unit could be described as task-oriented whereas the personality of the trainer who delivered the guided discovery unit could be described as people-oriented. While the behaviors of both trainers were prescribed to a high degree through the use of prepared scripts, it is possible that trainees preferred the people-oriented style of the trainer in the guided discovery group and, in turn, those preferences may have positively influenced their perceptions toward the training experience.

While it is concerning that the perceptions of trainees toward the training experience were not consistent with job outcomes, they did confirm theory and past research regarding the high level of interest and satisfaction that trainees experience with a guided discovery method.

The findings of this study regarding concept acquisition and perceptions of supervisors toward the training experience are clearly consistent with related theory and empirical research. Yet, the findings regarding the application of learning to the job and problem-solving skill were in some ways inconsistent with theory and past research.

As shown in Figure 10, the theoretical model proposed in this study has been revised to accommodate these findings. An analysis of findings suggests that job expectations influence the desire and ability of trainees to participate in the training
Figure 10

Revised Theoretical Model of the Relationships Between Method of Training and Training and Job Outcomes
experience. Furthermore, two categories of variables appear to mediate the supervisor training process, organizational factors and aspects of the training experience. For organizational factors, the findings suggest that an organization's culture, goal orientation, and incentive systems influence the desire and ability of supervisors to participate in the training experience as well as to use newly acquired knowledge and skills in their jobs.

In addition to these organizational factors, the findings suggest that four aspects of the training experience influence training and job outcomes. The first aspect is the roles of participants during the training experience. Specifically, evidence was found to suggest that the level of trainee participation and the personality of the trainer may influence the attitudes of supervisors toward the training experience. Classified as a training outcome, trainees' attitudes toward the training experience may, in turn, affect the degree to which supervisors apply knowledge and skills acquired during training to tasks in their jobs. Second, the findings suggest that the amount of exposure to a particular method of training may influence training and job outcomes. Third, it was found that factors related to the instructional events of the training experience may influence training and job outcomes. These factors include the degree of similarity between conditions in application activities and job situations, the amount of practice trainees experience with the content in its final form, and the amount of time provided for independent training activities conducted in the job setting. Lastly, the findings suggest that evaluation methods influence training and job outcomes. Specifically, an analysis of the participant responses suggests that the type of evaluation used in a training program and the flexibility of an evaluative instrument influence the ability to detect, develop, and use innovative and divergent thinking.
Implications

The findings of this study are important to theory, research, and practice in HRD. First, more should be known about the guided discovery method of training before it can effectively be used in organizational settings. Although the job outcomes in this study indicate that the deductive method was more effective, the findings also indicate that the trainees preferred the guided discovery method. In addition, anecdotal evidence suggests that supervisors in the guided discovery group used more inductive methods to facilitate the development of their subordinates than supervisors in the deductive group. Because of the small sample size and the level of statistical power that is necessary to determine differences which may exist, there is the possibility that if a larger sample had been used differences may have been discovered that could not be detected with a sample of this size. Perhaps further study of the guided discovery method with larger sample sizes and enhancements to some aspects of the method would find differences on the ability of trainees to acquire and apply the content of training all the while maintaining the high levels of trainee interest, motivation, and satisfaction in the training experience that were found in this study.

A second implication of the findings is that supervisor training programs should cautiously continue to use deductive methods for training novice supervisors. As was used in this study, a deductive method of training featuring a combination of lecture and role-play enables the acquisition and application of the content taught during training to a greater degree than the guided discovery method. Further, no significant improvements in problem-solving skill were found in the present study to warrant the use of the guided discovery method with novice supervisors at this time. However, some evidence in the self-directed learning literature suggests that the desire and ability of a trainee to participate in and learn from different methods of training may vary with his/her level of
expertise (Pratt, 1988; Grow, 1991). For example, Grow in his Staged Self-Directed Learning Model matches the degree of directiveness of the trainer with the desire and ability of the trainee to be self-directing during the learning process. Similar to Grow's model, it is plausible that more experienced supervisors may respond differently to the guided discovery method since they have greater knowledge, skills, and abilities to utilize during the learning experience. Since this study focused on novice supervisors, further investigation of the relationship between level of expertise and method of training is clearly warranted.

Third, methods that involve assessing changes in job behaviors and job performance should be used for evaluating training programs. Traditionally, HRD practitioners and researchers have relied on exit surveys and, to a lesser degree, measures of learning as the means for evaluating training programs. The concern with these methods of evaluation is not with their usefulness but with their completeness. The findings of this study showed that the perceptions of trainees toward training and their levels of learning immediately after training were not consistent with subsequent job behaviors. If the results of this study had been solely based on traditional methods used for evaluating programs, that is, an attitude survey and a measure of concept acquisition, the conclusions of the study would have been markedly different. As this study illustrates, the usefulness of different methods of training would be better understood if the impact of those methods on job behaviors and job performance was evaluated. Indeed, the ideal evaluation of a training program would be the situation in which perceptions of trainees toward the training experience, attainment of short-term training outcomes, and changes in job behaviors were found to be consistent with each other and highly correlated.

Related to methods for evaluating training programs, a fourth implication of the findings in this study is that the impact of particular methods of evaluation on the use of divergent and innovative thinking during training experiences should be considered when
designing methods for evaluating training programs. In this study, the constructive feedback process created by the guided discovery group was different in some respects than the defined process in the instructional unit. According to several constructive feedback experts, the process that the group created was in some ways better than the defined process. Yet, the rating scale that had been designed to evaluate learning was based on the defined process. It appears that this is an example of the inflexible nature of an evaluative instrument. If organizations truly believe that creativity, innovation, and inductive thinking should be valued and embraced, it appears that more flexible methods of evaluation may be better suited to those types of training methods and content areas which call for the use of divergent thinking and innovative concept development.

A fifth implication of the findings in this study is that intermittent rather than continuous schedules should be considered for supervisor training programs. Historically, continuous schedules have been used for training. As a consequence, training has often been characterized as a one-shot event rather than an on-going process. In contrast, an intermittent schedule calls for training to be offered at regular intervals for fairly short periods of instructional time. Benefits associated with intermittent training schedules are that trainees have time to process information acquired during training, to apply the information to tasks and situations in their jobs, and to receive feedback about those experiences from people involved in the training experience (Kirkpatrick, 1993). In addition to these benefits, anecdotal evidence from this study suggests that trainees prefer intermittent training schedules. In their attitude surveys, supervisors commented that they would prefer to have half-day sessions on a weekly or biweekly basis rather than one week of day-long sessions. Thus, an intermittent training schedule appears to provide greater opportunities for learning to take place and is seemingly the format that many trainees prefer.
Suggested Future Research

Clearly, the effects of using a guided discovery versus a deductive method for training supervisors are not fully understood. As shown in Figure 11, further investigation in five main areas would assist in improving present understandings about this topic. First, future related research should investigate the usefulness of inductive and deductive methods for training different groups of employees with varying levels of expertise in different content areas. Greater understanding of the effects of using inductive and deductive methods with different populations and with different content areas will expand present knowledge regarding the usefulness of these methods for different types of training activities.

Second, future studies should investigate the influence of aspects of the training experience on training and job outcomes. Specific variables of interest include the degree and type of guidance, the amount of instructional time, the type of training schedule, the use of learning resources in the workplace, the level of trainee participation, and the method of evaluation. Future studies of this nature will improve understandings about the influence of each of these aspects of the training experience on training outcomes, job behaviors, and job performance.

A third area of future research involves studying the impact of using inductive versus deductive methods on different types of training outcomes. Much has been written about the relationship between the use of inductive methods and the development of higher-level cognitive skills such as reasoning, problem solving, critical thinking, and decision making. However, more empirical research is required to test the relationships proposed in these writings. In addition, further investigation is required to examine the impact of using inductive versus deductive methods on other types of training outcomes such as interpersonal skill, technical skill, and attitude development.
Future Research Areas for Investigating Relationships Between Method of Training and Training and Job Outcomes
A fourth area of future related research is investigating the impact of using inductive versus deductive training methods on different aspects of job behavior and performance. This study assessed the impact of two training methods on problem solving and feedback behaviors. These two job outcomes were identified as being consistent with present job requirements of supervisors. Valuable information about the effectiveness of training methods could be obtained by studying the ability of training methods to impact other types of job outcomes that are also consistent with job requirements of supervisors. Examples of such job outcomes include the ability to reason, to make decisions, to learn on-the-job, and to facilitate learning in subordinates.

A last area for future research is the study of the influence of organizational factors on the transfer and development of different types of knowledge and skill. The findings in this study clearly indicate that factors were present in the organization that inhibited the transfer and development of learning. While a fair amount of empirical study has been conducted on the transfer and development of technical skill, much less is known about organizational factors that inhibit or support the transfer and development of cultural knowledge and cognitive skill. To effect lasting changes in organizations, training interventions by themselves are not sufficient. More must be known about the role of organizational factors in the transfer of knowledge and skill from the training environment to the workplace and the development of those attributes in the job setting.
APPENDIX A

COMPARATIVE OVERVIEW OF THE INSTRUCTIONAL EVENTS

IN THE TWO METHODS OF TRAINING
A Comparative Overview of the Instructional Events in the Deductive and the Guided Discovery Units

<table>
<thead>
<tr>
<th>Instructional Events:</th>
<th>Deductive Unit</th>
<th>Guided Discovery Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Prepare trainee:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>■ Advanced organizer</td>
<td>Trainer states topic</td>
<td>Trainer states topic</td>
</tr>
<tr>
<td>■ Purpose/ Rationale</td>
<td>Trainer presents purpose and rationale</td>
<td>Trainer presents purpose and rationale</td>
</tr>
<tr>
<td>■ Training objectives</td>
<td>Trainer presents objectives</td>
<td>Trainer presents objectives</td>
</tr>
<tr>
<td><strong>2. Deliver training:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>■ Present feedback model</td>
<td>Trainer presents feedback model</td>
<td>Trainees generate examples of the feedback model; Trainees induce the feedback model from analysis of the examples</td>
</tr>
<tr>
<td>■ Provide examples of the feedback model</td>
<td>Trainer provides an example of the feedback model</td>
<td>Trainees generate examples of the feedback model</td>
</tr>
<tr>
<td>■ Explain components of feedback model</td>
<td>Trainer leads a discussion in which the components of the model are explained and applied to the example</td>
<td>Trainer guides trainees through an inductive thinking process (explained above) whereby the components of the feedback model and their relationships to each other are discovered</td>
</tr>
</tbody>
</table>
In its instructional Events:

2. Deliver training (continued):

- Demonstrate techniques for using constructive feedback process

<table>
<thead>
<tr>
<th>Deductive Unit</th>
<th>Guided Discovery Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Steps of the feedback process are presented and explained to trainees;</td>
<td>(a) Trainees gather examples of constructive feedback techniques from experts in their job settings;</td>
</tr>
<tr>
<td>(b) Steps of constructive feedback process are modeled and analyzed using videotaped scenarios:</td>
<td>(b) Trainees share the information that they have gathered in small groups;</td>
</tr>
<tr>
<td>- &quot;Humphrey, Vehicle Maintenance&quot; -- positive example</td>
<td>(c) Trainees categorize the information and select names for each of the categories;</td>
</tr>
<tr>
<td>- &quot;Edith, Hospital&quot; -- negative example</td>
<td>(d) Trainees examine the categories to differentiate important from unimportant information;</td>
</tr>
<tr>
<td>- &quot;Susan, Hospital&quot; -- positive example</td>
<td>(e) Trainees make predictions about the steps in the feedback process based on the information in each of their categories;</td>
</tr>
<tr>
<td></td>
<td>(f) Trainees test their predictions by applying them to videotaped scenarios:</td>
</tr>
<tr>
<td></td>
<td>- &quot;Humphrey, Vehicle Maintenance&quot; -- positive example</td>
</tr>
<tr>
<td></td>
<td>- &quot;Edith, Hospital&quot; -- negative example</td>
</tr>
<tr>
<td></td>
<td>- &quot;Susan, Hospital&quot; -- positive example</td>
</tr>
<tr>
<td>Instructional Events:</td>
<td>Deductive Unit</td>
</tr>
<tr>
<td>---------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>3. <strong>Require response from trainee:</strong></td>
<td></td>
</tr>
<tr>
<td>■ Explain purpose/rationale</td>
<td>Trainees identify situations that call for constructive feedback</td>
</tr>
<tr>
<td>■ Explain feedback model</td>
<td>Trainees develop a plan for giving constructive feedback in which the components of the feedback model are identified (the plan will be used as a resource for trainees during the skills practice activity)</td>
</tr>
<tr>
<td>■ Explain feedback steps</td>
<td>Trainees develop a plan for the skills practice activity in which they explain the steps that they will use to give constructive feedback</td>
</tr>
<tr>
<td>■ Generate an example of constructive feedback</td>
<td>Trainees generate and analyze examples of constructive feedback in the: (a) Skills practice activity and (b) On-the-job application activity</td>
</tr>
<tr>
<td>■ Demonstrate technique for giving constructive feedback</td>
<td>Trainees apply the techniques described in their constructive feedback plans in a skills practice activity</td>
</tr>
<tr>
<td>Instructional Events:</td>
<td>Deductive Unit</td>
</tr>
<tr>
<td>----------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Summary/Review</td>
<td>Trainer facilitates a discussion in which trainees summarize situations which call for constructive feedback and the important components and steps of the constructive feedback process</td>
</tr>
</tbody>
</table>
Letter Informing Supervisors of Their Participation in the Research Study

February 28, 1994

Dear "name of organization" Employee,

Human Resources Development is pleased to welcome you to the Supervisor Skills Training program. As a participant in this week's program you are going to be involved in a supervisor training study. The study is being conducted in the "Giving Constructive Feedback" module of the Supervisor Skills Training program and is investigating alternative methods of training supervisors.

Your involvement in this study consists of participating in three training sessions and completing an on-the-job application activity. The first training session will be held today, February 28. The second session is scheduled for the morning of March 11 and the third one-hour session will be held on April 5. Each participant's supervisor/manager has been informed of his/her participation in this study.

HRD appreciates your participation and assistance in this research study. It is important for you to know that any information acquired from the study will only be used by HRD to improve its supervisor training programs. Be assured that your participation does not affect the assessment of your performance in any way.

Best wishes for a valuable supervisor training experience,

Name, Manager
Human Resources Development

Name, Consultant
Human Resources Development
Memorandum Informing Supervisors of the Data Collection Session

TO: (Supervisors)

FROM: Name, Manager
      Human Resource Development

DATE: March 11, 1994

RE: Session for Gathering Information Pertaining to the
    HRD Supervisor Training Study

Thank you for recently participating in the Supervisor Skills Training program. As you
know, Human Resource Development (HRD) is studying the use of alternative methods of
training in the Constructive Feedback unit of the program. The purpose of the study is to
find out more about how training methods influence the ways that supervisors use the
knowledge and skills acquired during training experiences in their jobs.

Supervisors are involved in three main activities in the study. You have already
participated in the first two activities; the training experience and the initial collection of
information which occurred immediately after training. The last activity involves
collecting information from you after you have been back at your job for a period of time.
The purpose of this activity is to find out how you have used some of the information
presented during training in your job.

A one-hour session has been scheduled to complete the third activity. It is extremely
important that all supervisors who attended Supervisor Skills Training attend this session.
Information collected during this session will be used by HRD to assess the effectiveness
of the training methods that are being studied.

The session is scheduled for Tuesday, April 5, 1994 from 9:30 a.m. to 10:30 a.m. at
Nationwide Plaza 1 on the 18th floor in Conference Room #1. If you have any questions
or concerns about being able to attend this meeting, please contact Peg Lohman at 792-3757.

The HRD staff would like to thank you for participating in this study. Due to the efforts
of employees such as yourself, HRD is able to develop and offer the most useful and
highest quality training programs possible.
Reminder Notice for Supervisors

TO: Names of Supervisors

FROM: Peg Lohman
      HRD Consultant

DATE: March 29, 1994

RE: Reminder Notice for Supervisor Training Session

This is a brief note reminding you that the third and final session for the supervisor training study is approaching. The session is scheduled for Tuesday, April 5, from 9:00 a.m. to 10:00 a.m. at One Nationwide Plaza on 18th floor in Conference Room #1. Refreshments will be provided. Please contact me at 792-3757 if you have any questions or concerns about attending this session.

In addition, remember to pass on the meaning of constructive feedback to the subordinates or colleagues that you selected to participate in the study before next Tuesday if you have not done so already. For your information, this group of employees will also be meeting Tuesday, April 5, from 1:30 p.m. to 2:30 p.m.

The HRD staff thanks you for participating in the supervisor training study and Beth, Carolyn, and I look forward to seeing you on Tuesday.
Memorandum Announcing the Make-Up Data Collection Session

To: Names of Supervisors

FROM: Peg Lohman
HRD Consultant

DATE: April 6, 1994

RE: Make-Up Session for Participants in the Supervisor Training Study

Our records indicate that you were not present at the supervisor training session that you were scheduled to attend on April 5th at 9:00 a.m. It is important that you complete a final activity in order to finish your participation in the supervisor training study. Therefore, a make-up session has been scheduled for Monday, April 11 from 9:30 a.m. to 10:30 a.m. to complete this task.

The session will be held at One Nationwide Plaza on 18th floor in Conference Room #1. Refreshments will be provided. Please contact me at 792-3757 if you have any questions or concerns about attending this session.

Thank you and I look forward to seeing you on Monday.
Memorandum Informing Subordinates of Their Participation in the Research Study

TO: Selected Subordinates of Participants in Supervisor Training Study

FROM: Name, Manager
       Human Resource Development

DATE: March 11, 1994

RE: Session for Gathering Information Pertaining to the
    HRD Supervisor Training Study

Your supervisor has been participating in a study that Human Resource Development (HRD) is conducting. The study is exploring alternative ways to train supervisors. One part of the study involves gathering some information from a few of each supervisor's employees. Your supervisor has selected you to participate in this activity.

The activity will involve attending a one-hour session at which time you will be asked to share how your supervisor completed a task that they were asked to do. The information gathered from this activity will be used by HRD to assess the effectiveness of its supervisor training program. The session is scheduled for Tuesday, April 5, 1994 from 1:30 p.m. to 2:30 p.m. at Nationwide Plaza 1 on the 18th floor in Conference Room #1.

The HRD staff appreciates the contribution that you will be making to this study and looks forward to seeing you there. If you have any questions about the session, please call Peg Lohman at 792-3757.
Reminder Notice for Subordinates

TO: Names of Subordinates

FROM: Peg Lohman
Human Resource Development Consultant

DATE: March 29, 1994

RE: Reminder Notice for Human Resource Development (HRD) Meeting

A memo was sent several weeks ago informing you that your supervisor or, in some cases, one of your colleagues has selected you to participate in a supervisor training study that is being conducted by the HRD department. Your participation in this study involves attending a one-hour meeting and sharing how your supervisor or your colleague completed a task that they were asked to do.

The meeting is scheduled for Tuesday, April 5 from 1:30 p.m. to 2:30 p.m. at One Nationwide Plaza on 18th floor in Conference Room #1. Refreshments will be provided. Please contact me at 792-3757 if you have any questions or concerns about attending this meeting.

I look forward to meeting with you on Tuesday.
Memorandum Informing Subordinates of the Make-Up Data Collection Session

To: Names of Subordinates

FROM: Peg Lohman
HRD Consultant

DATE: April 6, 1994

RE: Make-Up Session for Subordinates Participating in the HRD Supervisor Training Study

Our records indicate that you were not present at the session that you were scheduled to attend on April 5th at 1:30 p.m. As a result, you were not able to complete an activity that is important to the supervisor training study. A make-up session has been scheduled for Monday, April 11 from 1:30 p.m. to 2:30 p.m. to complete this task. The session will be held at One Nationwide Plaza on 18th floor in Conference Room #1. Refreshments will be provided. Please contact me at 792-3757 if you have any questions or concerns about attending this session.

Thank you and I look forward to seeing you on Monday.
APPENDIX C

MATERIALS RELATED TO OUTCOME MEASURES
Share an Example of Constructive Feedback

Activity

Share a real or hypothetical example of constructive feedback. Include the following items in your example:

♦ A job-related situation that calls for the use of constructive feedback; and

♦ The specific steps or actions that you use when giving constructive feedback.

Instructions

Write your example on the attached sheets of paper. Please include as much detail in your response as possible. After you are finished, record the approximate amount of time that you took to write your response in the space below.

Time to complete your response: ________ minutes

You will find a code number in the lower right corner of each page that you have been given. Code numbers are being used to make sure that your response is confidential. So, you can be assured that no one other than an independent researcher will read your response.
Concept Application Essay Instructions

How Do You Give Constructive Feedback?

Activity

Share a recent situation in which you gave constructive feedback to an employee. Preferably, select a situation which has occurred since the time of the Supervisor Skills Training program.

If you cannot recall a situation in which you recently gave constructive feedback, share a hypothetical example of constructive feedback. The example should describe a constructive feedback situation that you can foresee occurring in your job.

Include the following items in your response:

♦ A job-related situation that called for or could call for the use of constructive feedback;

♦ The specific steps or actions that you used or can foresee using to give constructive feedback.

Please include as much detail as possible in your response.

Instructions

Write your response on the attached sheets of paper. After you are finished, record the approximate amount of time that you took to write your response in the space below.

Time to complete story: ________ minutes

You will find a code number in the lower right corner of each page that you have been given.

Code numbers are being used to make sure that your response is confidential. So, you can be assured that no one other than an independent researcher will review your response.
Concept Learning Rating Scale Information for the Constructive Feedback Process

Role of the Concept Learning Rating Scale
This instrument has been designed to assess a participant's mastery of the constructive feedback process as it is depicted in Zenger Miller's Frontline Leadership module entitled "Giving Constructive Feedback". Participants complete a short-answer written essay that requires them to generate an example of the constructive feedback process. An expert rater then uses the Concept Learning Rating Scale (CLRS) to evaluate the written responses.

How to Use the Rating Instrument
The CLRS is used to evaluate responses to the following essays: (a) the concept acquisition essay entitled "Share An Example of Constructive Feedback" and (b) the concept application essay entitled "How Do You Give Constructive Feedback". After reading a response to either of these two essays, a rater evaluates the quality of the response in relation to each of the six constructive feedback steps that have been identified on the attached CLRS.

The CLRS uses a 4-point scale with 1 being the lowest point and 4 being the highest point of the scale. The criteria for rating each of the steps are:

<table>
<thead>
<tr>
<th>If the response . . .</th>
<th>Then the response is . . .</th>
<th>And you should circle . . .</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does not identify or mention the step</td>
<td>Poor</td>
<td>1</td>
</tr>
<tr>
<td>Identifies the step but it is very vague, very confusing, or lacking one or more components identified in the step</td>
<td>Fair</td>
<td>2</td>
</tr>
<tr>
<td>Describes the step but it is out of sequential order, somewhat vague or confusing</td>
<td>Good</td>
<td>3</td>
</tr>
<tr>
<td>Describes the step accurately and completely</td>
<td>Excellent</td>
<td>4</td>
</tr>
</tbody>
</table>

Rating Example
For example, when rating Step 2 a response that indicates that the supervisor uses extremely general terms to describe an observed behavior instead of specific terms would be rated as fair and number 2 would be circled:

2. Supervisor specifically describes the behavior that has been observed

Code Number: _______
## Concept Learning Rating Scale (CLRS)
### Constructive Feedback Process

<table>
<thead>
<tr>
<th>Steps for Giving Constructive Feedback</th>
<th>Quality of Response</th>
<th>Weight for each item</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The supervisor states the constructive purpose of the feedback</td>
<td>1 2 3 4</td>
<td>18%</td>
<td></td>
</tr>
<tr>
<td>2. The supervisor specifically describes the inappropriate behavior that has been observed</td>
<td>1 2 3 4</td>
<td>22%</td>
<td></td>
</tr>
<tr>
<td>3. The supervisor describes his/her reactions to the observed behavior&lt;br&gt;&lt;em&gt;(Reactions include a description of how the supervisor feels about the observed behavior and the consequences of those behaviors)&lt;/em&gt;</td>
<td>1 2 3 4</td>
<td>11%</td>
<td></td>
</tr>
<tr>
<td>4. The employee responds to the reactions of the supervisor</td>
<td>1 2 3 4</td>
<td>15%</td>
<td></td>
</tr>
<tr>
<td>5. The supervisor and employee discuss specific suggestions for changing the employee's behavior</td>
<td>1 2 3 4</td>
<td>18%</td>
<td></td>
</tr>
<tr>
<td>6. The supervisor summarizes the decision on the best plan of action for changing the employee's behavior</td>
<td>1 2 3 4</td>
<td>16%</td>
<td></td>
</tr>
</tbody>
</table>

**Total = 100%**

**Code Number:** _____
Panel of Experts for the Concept Learning Rating Scale

Members

Dr. Nancy Dowling, Management Consultant; research expert
Ms. Carolyn Sheets, HRD Coordinator; population expert
Ms. Beth Olsen, Trainer; subject matter expert

Procedures

A meeting was convened to assess the instrument's face and content validity. Two of the three panel members attended the meeting. Instructions were verbally provided to the experts and they reviewed the instrument individually. After the experts had reviewed the instrument, a discussion about specific concerns was held. The discussion was tape recorded. Information generated from the discussion was reviewed and synthesized after the meeting. Because Dr. Dowling was not able to attend the meeting, the instructions and instruments were mailed to her for review. She shared her comments and concerns about the validity of the instruments with the researcher in writing and verbally over the telephone.

Instructions Provided to Experts

Thanks so much for serving as a member of this study's panel of experts. The study is investigating the effects of using an inductive versus a deductive approach for training supervisors on concept acquisition, concept application, supervisory problem solving skill and facilitated problem solving skill of subordinates. The content for the instructional unit is "Giving Constructive Feedback".

Two instruments have been developed to measure the dependent variables. The first instrument, the Concept Learning Rating Scale (CLRS), is designed to measure concept acquisition and concept application. That is, the instrument measures the ability of trainees to demonstrate their knowledge of giving constructive feedback immediately after training and their ability to demonstrate giving constructive feedback on-the-job one month after training.

The second instrument, Problem Solving Rating Scale (PSRS), is designed to measure the self-reported problem solving skill that supervisors demonstrate when addressing a work-related problem and the problem solving skill that supervisors expect their subordinates to demonstrate when acquiring the meaning of the concept "giving constructive feedback" as
Panel of Experts for the Concept Learning Rating Scale
(page 2)

reported by a sampling of supervisors' subordinates. (Note: the supervisors during training will be instructed to pass the meaning of the concept on to their subordinates).

Subjects will write short-answer responses to the essay questions that are attached to the instruments. An expert rater will then rate and score the responses using the appropriate instrument.

I am asking you to complete three tasks. The first two tasks relate to the validity of the instruments. To begin with, analyze each instrument and the corresponding essay questions for face validity. This activity requires that you look at the instrument and the essay questions and assess whether they look like they will measure the level of knowledge that a respondent has about giving constructive feedback. Secondly, analyze the instrument and the essay questions for content validity. This step involves analyzing whether the instrument and questions measure the concept "giving constructive feedback", all of the concept as you understand it and nothing other than the concept.

The third task pertains only to the Concept Learning Rating Scale. After you analyze the instrument for face and content validity, please use your own expertise to suggest a weighted percentage for each item that is identified on the instrument. The weight that you select should reflect your perception of the each item's relative importance in terms of knowledge of the concept "giving constructive feedback". The sum of the weighted percentages should equal 100%.

Please write any specific comments, concerns or questions that you have about particular aspects of the instrument directly on the instrument in the appropriate areas. General comments, concerns or questions can be written on a separate sheet of paper.
Results

The panel of experts generated several important concerns about the content validity of the instrument. The following identifies those concerns and the action taken to remedy them:

<table>
<thead>
<tr>
<th>General Concerns for Both Instruments</th>
<th>Actions Taken</th>
</tr>
</thead>
<tbody>
<tr>
<td>No instructions present describing how to use the instruments</td>
<td>Placed instructions at beginning of instruments</td>
</tr>
<tr>
<td>Intent of instrument not clear</td>
<td>Inserted introductory paragraph in instrument describing its function</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Concerns about the CLRS</th>
<th>Actions Taken</th>
</tr>
</thead>
<tbody>
<tr>
<td>No criteria identified for points on rating scale</td>
<td>Identified criteria for selecting points on scale in instructions section</td>
</tr>
<tr>
<td>Sections of rating scale are confusing</td>
<td>Labeled sections</td>
</tr>
<tr>
<td>Quality response rating scale in section on components of constructive feedback does not seem appropriate since it seems to be a nominal category</td>
<td>Removed components of constructive feedback section since they are incorporated in the constructive feedback process</td>
</tr>
<tr>
<td>Some steps in constructive feedback process assessed performance, not behavior</td>
<td>Changed steps to focus on behavior rather than performance</td>
</tr>
<tr>
<td>Step 5 does not reflect the generation of suggestions from the employee</td>
<td>Change step 5 so that the responsibility of generating suggestions is shared by the employee and the supervisor</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Concerns About the Essays</th>
<th>Actions Taken</th>
</tr>
</thead>
<tbody>
<tr>
<td>The relationship of the respondent to the constructive feedback situation is unclear.</td>
<td>Changed the test so that respondents are reporting feedback situations in which they are the givers of feedback</td>
</tr>
</tbody>
</table>
Field Tests for the Concept Learning Rating Scale

I. Field Test #1

Members

Inez Bayes
Sherrie Hedden
Susie Jarvis
John King
Rose Pinciaro

Procedures

A meeting was convened to assess the face and content validity of the essay instruments. Instructions were verbally provided to the participants and they reviewed each essay individually. After the participants had reviewed the instrument, specific concerns and comments regarding the essays were discussed. Lastly, participants were asked to generate a response for one of the essays.

Instructions Provided to Participants

Thanks so much for participating in this field test activity. One of the units in the SST program is "Giving Constructive Feedback". We are going to review four essays today that have been designed to assess how much people have learned that have participated in that course. The purpose of our review is to determine whether the essays look like they will measure what they are supposed to measure and will in fact measure what they are supposed to measure. Lastly, participants were asked to generate a response for one of the essays.

A. Concept Acquisition

First, let's take a look at the essay, Concept Acquisition. Please read the essay question to yourself. While you are reading the essay, ask yourself two questions.

First, ask yourself whether the essay looks like it will measure someone's knowledge of giving constructive feedback.
Second, ask yourself whether the essay will in fact measure someone's knowledge of giving constructive feedback and only their knowledge of giving constructive feedback.

In addition, as you read mark any unclear sentences or instructions that you find in the text of the essay.

*After participants are done individually reviewing essay:*

OK, let's share our comments. Regarding the first question, in your opinion does the essay look like it will measure someone's knowledge of giving constructive feedback? (Get feedback)

Regarding the second question, in your opinion will the essay in fact measure someone's knowledge of giving constructive feedback and only their knowledge of giving constructive feedback? (Get feedback)

Lastly, did you find any unclear sentences or instructions in the text of the essay? (Get feedback)

B. Repeat same procedure for concept application essay, problem solving essay for supervisors and problem solving essay for subordinates

C. Ask each participant to generate a response to one of the essay questions.
Results

Participants of the field test generated several important concerns about the content and face validity of the instrument. The following identifies those concerns and the actions taken to remedy them:

<table>
<thead>
<tr>
<th>General Concerns about Essays</th>
<th>Actions Taken</th>
</tr>
</thead>
<tbody>
<tr>
<td>■ Supervisors did not feel that the title &quot;Tell me a story&quot; and the story format was appropriate for the culture at Nationwide. Examples of quotes from field test participants are &quot;supervisors do not have time to be telling stories&quot; and &quot;if you want to hear a story, I'll tell you a whopper of one-- but it will probably not be the kind you had hoped for&quot;.</td>
<td>■ Changed the format of the essay from a story-orientation to more of a critical incident situation</td>
</tr>
<tr>
<td>■ Organization of sections in the body of the essays is confusing</td>
<td>■ Separated the activity from the procedural instructions in the essay</td>
</tr>
<tr>
<td>■ Supervisors felt that a time constraint was inappropriate -- it reminded them too much of formal school experiences</td>
<td>■ Moved the time statement from the text of the essays to the instructions for administering the essay</td>
</tr>
</tbody>
</table>
II. Field Test #2

Members

Judy Martin  
Lynn Nelson  
Heather Russell

Procedures

A second field test was convened to assess the revised essay's face and content validity. Instructions were verbally provided to the participants and they reviewed each essay individually. After the participants had reviewed the essay, specific concerns and comments were discussed. Lastly, participants were asked to generate a response for one of the essays.

Instructions Provided to Participants

Thanks so much for participating in this field test activity. One of the units in the SST program is "Giving Constructive Feedback". We are going to review four essays today that have been designed to assess how much people have learned that have participated in that course. The purpose of our review is to determine whether the essays look like they will measure what they are supposed to measure and will in fact measure what they are supposed to measure.

A. Concept Acquisition

First, let's take a look at the activity "Share an Example of Constructive Feedback". Please read the activity to yourself. While you are reading, ask yourself two questions.

First, ask yourself whether the activity looks like it will measure someone's knowledge of giving constructive feedback.

Second, ask yourself whether the activity will in fact measure someone's knowledge of giving constructive feedback and only their knowledge of giving constructive feedback.
Field Tests for the Concept Learning Rating Scale
(page 4)

In addition, as you read mark any unclear sentences or instructions that you find in the text of the activity.

After participants are done individually reviewing activity:

OK, let's share our comments. Regarding the first question, in your opinion does the activity look like it will measure someone's knowledge of giving constructive feedback? (Get feedback)

Regarding the second question, in your opinion will the activity in fact measure someone's knowledge of giving constructive feedback and only their knowledge of giving constructive feedback? (Get feedback)

Lastly, did you find any unclear sentences or instructions in the text of the activity? (Get feedback)

B. Repeat same procedure for concept application activity, problem solving activity for supervisors and problem solving activity for subordinates.

C. Results:

Participants of the field test generated several important concerns about the content and face validity of the instrument. The following identifies those concerns and the action taken to remedy them:

<table>
<thead>
<tr>
<th>Concerns About Essay Instrument</th>
<th>Actions Taken</th>
</tr>
</thead>
<tbody>
<tr>
<td>If respondents are new supervisors, they may not be able to identify an example of constructive feedback.</td>
<td>Added to the text that respondents may use a real or hypothetical example of constructive feedback.</td>
</tr>
</tbody>
</table>
Instructions for Administering the Pilot Test for the Concept Learning Rating Scale and the Problem Solving Rating Scale

A. **Explain:** Hello. My name is Peg Lohman. I am a researcher from Ohio State University. The Human Resource Development (HRD) and The Ohio State University are jointly working on a research project that is investigating the impact of using different types of instructional designs in the "Constructive Feedback" unit of the Supervisory Skills Training program. A part of this project involves developing and testing two instruments for measuring the outcomes of the training program. That is why I am here today.

This group has been selected to take part in the pilot test of the instruments that have been developed to measure two types of training outcomes for the "Constructive Feedback" unit. The purpose of the pilot test is to assess the reliability with which the instruments measure what they are intended to measure. That is, the purpose of the pilot test is to assess whether the instruments consistently measure what they are supposed to measure.

Your role in the pilot test is to complete two activities.

B. **Distribute:** "Share an Example of Constructive Feedback" activity and "How Do You Handle Challenging Situations?" activity to participants.

C. **Explain:** Each of you has been given two activities.

1. The purpose of the first activity "Share an Example of Constructive Feedback" is to assess how much knowledge someone has about constructive feedback. Let's read the instructions together for this activity. (Read information on participant's copy).

2. The purpose of the second activity "How Do You Handle Challenging Situations?" is to find out more about the processes that supervisors use to handle challenges in the workplace. Let's read these instructions for this activity. (Read information on participant's copy).
Instructions for Administering the Pilot Test
(page 2)

You can be assured that your responses will only be used to help assess the reliability of the training program evaluation tools. In addition, all of the activity and answer sheets are coded to ensure that your responses are confidential. So, you can feel confident that one other than the research team will be reviewing your responses.

After you are finished with both activities, bring them to me and then feel free to go on break. The group will reconvene at 1:30 p.m.

D. **Explain:** Please take your time as you complete the two activities. A good technique for writing these kinds of responses is to review what you have read after you are finished writing. A review of what you have read may bring other things to mind that you would like to include in your response that you did not think of while you were writing it.

E. **Ask:** Are there any questions or concerns about what you are supposed to do? If not, feel free to begin.
Self-Reported Problem Solving Skill Essay Instructions

How Do You Handle Challenging Situations?

Activity

Supervisors encounter a variety of challenging situations in their jobs. Depending on a number of factors, challenging situations can be either problems or opportunities that supervisors face as they attempt to do their jobs. To find out more about how different types of training experiences influence the ways that supervisors handle challenging situations, please respond to the following:

Share a recent job-related experience, preferably one that occurred during the past three weeks, in which you had to handle a challenging situation. Remember, challenges can involve problems or opportunities related to people, tasks or responsibilities. Please include the following items in your response:

♦ Describe the challenging situation.

♦ Did you think through what to do about the situation? If so, describe what these thoughts were as best as you can.

♦ Explain what you did to handle the situation.

♦ Describe the people and materials/tools that you used to help you handle the situation.

Try to include as much detail as you possibly can in your description of each of the above items.

Instructions

Use the attached sheets of paper to write your response. After you are finished, please record the approximate amount of time that you took to write your response in the space below.

Time to complete response: ________ minutes

You will find a code number in the lower right corner of each page that you have been given. Code numbers are being used to make sure that your response is confidential. So, you can be assured that no one other than the independent researchers will review your response.
Facilitated Problem Solving Skill Essay Instructions

How Did You Learn About Constructive Feedback?

Activity

Your supervisor or, in some cases, one of your colleagues recently participated in a supervisor training program. In this program s/he was asked to pass on the meaning of constructive feedback to you. The purpose of this activity is to find out the process that s/he used to pass on this information to you and whether the type of training experience that your supervisor recently had influenced how s/he completed this task.

To complete this activity, please respond to the following:

Describe how your supervisor expected you to learn the meaning of constructive feedback. Specifically, identify anything that your supervisor asked you to think about and/or do to learn the meaning of constructive feedback.

Try to include as much detail as you possibly can when describing your thoughts and actions in relation to how you recently learned about constructive feedback.

Instructions

Write your response on the attached sheets of paper. After you are finished, please record the approximate amount of time that you took to write your response in the space below.

Time to complete response: _______ minutes

You will find a code number in the lower right corner of each of the pages that you have been given. Code numbers are being used to make sure that your response remains confidential. So, you can be assured that no one other than the independent researchers will read your responses.
Problem Solving Rating Scale Information

Function of Rating Scale: The Problem Solving Rating Scale (PSRS) has been designed to assess the degree of problem solving skill that an individual demonstrates when solving a work-related problem. The instrument is used to rate responses to a short-answer essay. In the essay, respondents describe how they have handled a challenging work-related situation. An expert rater then uses the PSRS to evaluate the written responses.

How to Use the Rating Scale: The PSRS is used to evaluate responses to either the problem solving essay for supervisors entitled "How Do You Handle Challenging Situations?" or the problem solving essay for subordinates of supervisors entitled "How Did You Learn About Constructive Feedback". After reading a response to either of these two essays, a rater evaluates the level of evidence that is present in the response for each of the nine problem solving activities that are identified on the attached PSRS.

The PSRS uses a 4-point scale with 0 being the lowest point and 3 being the highest point on the scale. The criteria for rating each of the nine activities are:

<table>
<thead>
<tr>
<th>If the response...</th>
<th>Then the appropriate rating is...</th>
<th>And you should circle...</th>
</tr>
</thead>
<tbody>
<tr>
<td>■ Does not mention any information related to the activity</td>
<td>Not Evident</td>
<td>0</td>
</tr>
<tr>
<td>■ Contains information which alludes to the activity but does not provide specific information to verify that the activity occurred</td>
<td>Little Evidence of Activity</td>
<td>1</td>
</tr>
<tr>
<td>■ Contains some information which suggests that the activity occurred</td>
<td>Some Evidence of Activity</td>
<td>2</td>
</tr>
<tr>
<td>■ Contains information which describes the activity</td>
<td>Much Evidence of Activity</td>
<td>3</td>
</tr>
</tbody>
</table>

An Example:

For rating the problem solving activity identified in #3, circle the number 3 if the response provides evidence that the person determined the relevance of each group of information in relation to the problem situation. Then write the number 3 in the score column.

<table>
<thead>
<tr>
<th>3. Determines the relevance of each group of information to the problem situation</th>
<th>Not Evident</th>
<th>Little Evidence of Activity</th>
<th>Some Evidence of Activity</th>
<th>Much Evidence of Activity</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

Code Number: _______
### Problem Solving Rating Scale (PSRS)

**Activities in the Problem Solving Process:**

<table>
<thead>
<tr>
<th>Level of Evidence</th>
<th>Not Evident</th>
<th>Little Evidence of Activity</th>
<th>Some Evidence of Activity</th>
<th>Much Evidence of Activity</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Gathers information about the problem situation</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>_____</td>
</tr>
<tr>
<td>2. Places information into groups having similar features</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>_____</td>
</tr>
<tr>
<td>3. Determines the relevance of each group of information to the problem situation</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>_____</td>
</tr>
<tr>
<td>4. Determines the relationships between the relevant groups of information</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>_____</td>
</tr>
<tr>
<td>5. Makes inferences about why the problem occurred</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>_____</td>
</tr>
<tr>
<td>6. Considers more than one solution for solving the problem</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>_____</td>
</tr>
<tr>
<td>7. Selects the best solution</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>_____</td>
</tr>
<tr>
<td>8. Presents explanation or reason for selecting the best solution</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>_____</td>
</tr>
<tr>
<td>9. Tests the solution to determine if it resolves the problem</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>_____</td>
</tr>
</tbody>
</table>

**Total = _____**

**Code Number: _____**
Panel of Experts for the Problem Solving Rating Scale (PSRS)

Members

Dr. Nancy Dowling, Management Consultant; research expert
Ms. Carolyn Sheets, HRD Consultant; population expert
Ms. Beth Olsen, HRD Consultant; subject matter expert

Procedures

A meeting was convened to assess the instrument's face and content validity. Two of the three panel members attended the meeting. Instructions were verbally provided to the experts and they reviewed the instrument individually. After the experts had reviewed the instrument, a discussion about specific concerns was held. The discussion was tape recorded. Information generated from the discussion was review and synthesized after the meeting. Because Dr. Dowling was not able to attend the meeting, the instructions and instruments were mailed to her for review. She shared her comments and concerns about the validity of the instruments with the researcher in writing and verbally over the telephone.

Instructions Provided to Experts

Thanks so much for serving as a member of this study's panel of experts. The study is investigating the effects of using an inductive versus a deductive approach for training supervisors on concept acquisition, concept application, supervisory problem solving skill and facilitated problem solving skill of subordinates. The content for the instructional unit is "Giving Constructive Feedback".

Two instruments have been developed to measure the dependent variables. The first instrument, the Concept Learning Rating Scale (CLRS), is designed to measure concept acquisition and concept application. That is, the instrument measures the ability of trainees to demonstrate their knowledge of giving constructive feedback immediately after training and their ability to demonstrate giving constructive feedback on-the-job one month after training.
Panel of Experts for the Problem Solving Rating Scale (PSRS)
(page 2)

The second instrument, Problem Solving Rating Scale (PSRS), is designed to measure the self-reported problem solving skill that supervisors demonstrate when addressing a work-related problem and the problem solving skill that supervisors expect their subordinates to demonstrate when acquiring the meaning of the concept "giving constructive feedback" as reported by a sampling of supervisors' subordinates. (Note: the supervisors during training will be instructed to pass the meaning of the concept on to their subordinates).

Subjects will write short-answer responses to the essay questions that are attached to the instruments. An expert rater will then rate and score the responses using the appropriate instrument.

I am asking you to complete three tasks. The first two tasks relate to the validity of the instruments. To begin with, analyze each instrument and the corresponding essay questions for face validity. This activity requires that you look at the instrument and the essay questions and assess whether they look like they will measure the level of knowledge that a respondent has about giving constructive feedback. Secondly, analyze the instrument and the essay questions for content validity. This step involves analyzing whether the instrument and questions measure the concept "giving constructive feedback", all of the concept as you understand it and nothing other than the concept.

The third task pertains only to the Concept Learning Rating Scale. After you analyze the instrument for face and content validity, please use your own expertise to suggest a weighted percentage for each item that is identified on the instrument. The weight that you select should reflect your perception of the each item's relative importance in terms of knowledge of the concept "giving constructive feedback". The sum of the weighted percentages should equal 100%.

Please write any specific comments, concerns or questions that you have about particular aspects of the instrument directly on the instrument in the appropriate areas. General comments, concerns or questions can be written on a separate sheet of paper.
Panel of Experts for the Problem Solving Rating Scale (PSRS)
(page 3)

Results

The panel of experts generated several important concerns about the content validity of the PSRS instrument. The following identifies those concerns and the action taken to remedy them:

**General Concerns for Both Instruments**

- No instructions present describing how to use the instruments
- Intent of instrument not clear

**Actions Taken**

- Placed instructions at beginning of instruments
- Inserted introductory paragraph in instrument describing its function

**Specific Concerns about the PSRS**

- No criteria identified for points on rating scale
- Dimension A3 vague; raters may not know what categorizing information operationally looks like

**Actions Taken**

- Identified criteria for selecting points on scale in instructions section
- Specified in A3 that categorizing information is interpreted as placing a label on a group of items

**Specific Concerns about the Essays**

- Instructions to identify mental and physical activities that are used to identify and resolve problems may not be clear to respondents

**Actions Taken**

- Added examples of mental and physical activities related to problem solving process
Field Tests for the Problem Solving Rating Scale (PSRS)

I. Field Test #1

Members

Inez Bayes
Sherrie Hedden
Susie Jarvis
John King
Rose Pinciaro

Procedures

A meeting was convened to assess the face and content validity of the essay instruments. Instructions were verbally provided to the participants and they reviewed each essay individually. After the participants had reviewed the instrument, specific concerns and comments regarding the essays were discussed. Lastly, participants were asked to generate a response for one of the essays.

Instructions Provided to Participants

Thanks so much for participating in this field test activity. One of the units in the SST program is "Giving Constructive Feedback". We are going to review four essays today that have been designed to assess how much people have learned that have participated in that course. The purpose of our review is to determine whether the essays look like they will measure what they are supposed to measure and will in fact measure what they are supposed to measure.

A. Concept Acquisition

First, let's take a look at the first essay, Concept Acquisition. Please read the essay question to yourself. While you are reading the essay, ask yourself two questions.

First, ask yourself whether the essay looks like it will measure someone's knowledge of giving constructive feedback.
Second, ask yourself whether the essay **will in fact measure** someone's knowledge of giving constructive feedback and **only** their knowledge of giving constructive feedback.

In addition, as you read mark any unclear sentences or instructions that you find in the text of the essay.

*After participants are done individually reviewing essay:*

OK, let's share our comments. Regarding the first question, in your opinion does the essay **look like** it will measure someone's knowledge of giving constructive feedback? *(Get feedback)*

Regarding the second question, in your opinion will the essay **in fact measure** someone's knowledge of giving constructive feedback and **only** their knowledge of giving constructive feedback? *(Get feedback)*

Lastly, did you find any unclear sentences or instructions in the text of the essay? *(Get feedback)*

B. Repeat same procedure for concept application essay, problem solving essay for supervisors and problem solving essay for subordinates

C. Ask each participant to generate a response to one of the essay questions.
Results

Participants of the field test generated several important concerns about the content and face validity of the instrument. The following identifies those concerns and the actions taken to remedy them:

**General Concerns about Essays**
- Supervisors did not feel that the title "Tell me a story" and the story format was appropriate for the culture at Nationwide — examples of quotes from field test participants are "supervisors do not have time to be telling stories" and "if you want to hear a story, I'll tell you a whopper of one— but it will probably not be the kind you had hoped for".
- Organization of sections in the body of the essays is confusing.
- Supervisors felt that a time constraint was inappropriate — it reminded them too much of formal school experiences.
- Field test participants were not confident that supervisors would take the time to complete these activities if they were expected to be done in the workplace. However, they felt that there wouldn't be a problem with participation if data were collected at a scheduled meeting (meetings add legitimacy and accountability to actions and events in this particular organization).

**Actions Taken**
- Changed the format of the essay from a story-orientation to more of a critical incident situation.
- Separated the activity from the procedural instructions in the essay.
- Moved the time statement from the text of the essays to the instructions for administering the essay.
- Changed the data collection plan from delivering the application and problem solving essays to supervisors in the workplace to collecting the data from all study participants at a one-hour meeting.

**Specific Concerns About the Problem Solving Essays**
- Some supervisors believed that "problem" is a loaded word. These individuals stated the belief that problems to one person may be perceived as opportunities to others.

**Actions Taken**
- Changed wording of text from "problems" to "challenging situations" which can include problems or opportunities.
II. Field Test #2

Members

Judy Martin
Lynn Nelson
Heather Russell

Procedures

A second field test was convened to assess the revised essay's face and content validity. Instructions were verbally provided to the participants and they reviewed each essay individually. After the participants had reviewed the essay, specific concerns and comments were discussed.

Instructions Provided to Participants

Thanks so much for participating in this field test activity. One of the units in the SST program is "Giving Constructive Feedback". We are going to review four essays today that have been designed to assess how much people have learned that have participated in that course. The purpose of our review is to determine whether the essays look like they will measure what they are supposed to measure and will in fact measure what they are supposed to measure.

A. Concept Acquisition

First, let's take a look at the first activity "Share an Example of Constructive Feedback". Please read the activity to yourself. While you are reading, ask yourself two questions.

First, ask yourself whether the activity looks like it will measure someone's knowledge of giving constructive feedback.

Second, ask yourself whether the activity will in fact measure someone's knowledge of giving constructive feedback and only their knowledge of giving constructive feedback.
In addition, as you read mark any unclear sentences or instructions that you find in the text of the activity.

After participants are done individually reviewing activity:

OK, let's share our comments. Regarding the first question, in your opinion does the activity look like it will measure someone's knowledge of giving constructive feedback? (Get feedback)

Regarding the second question, in your opinion will the activity in fact measure someone's knowledge of giving constructive feedback and only their knowledge of giving constructive feedback? (Get feedback)

Lastly, did you find any unclear sentences or instructions in the text of the activity? (Get feedback)

B. Repeat same procedure for concept application activity, problem solving activity for supervisors and problem solving activity for subordinates.

C. Results:

Participants of the field test generated several important concerns about the content and face validity of the instrument. The following identifies those concerns and the action taken to remedy them:

<table>
<thead>
<tr>
<th>General Concerns for Both Instruments</th>
<th>Actions Taken</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respondents may feel uncomfortable about sharing information about how they handle challenging situations because they don't know what the intent of the activity is or what will be done with the information.</td>
<td>Explained in the third sentence of the opening paragraph the purpose of the activity and how the responses will be used.</td>
</tr>
<tr>
<td>Supervisors felt that the words &quot;mental&quot; and &quot;physical&quot; were ambiguous; they weren't sure what was being asked.</td>
<td>Changed the wording from &quot;mental&quot; and &quot;physical&quot; to &quot;think about&quot; and &quot;do&quot;.</td>
</tr>
</tbody>
</table>
Participant Information Sheet

Please take a moment to answer the following questions. Return your sheet to the trainer when you are finished.

Thank you!

1. How long have you been a supervisor?

_____ years _____ months

2. How many employees do you directly supervise?

_____ employee(s)

3. What kinds of employees do you supervise?
   a) _____ Professionals
   b) _____ Non-Professionals
   c) _____ Mixture of professionals and non-professionals

4. Do you supervise other supervisors or managers?
   a) ____ Yes
   b) ____ No

5. Of the following types of departments, check the one that best describes the type of department that you supervise:
   a) _____ Production-Oriented
   b) _____ Accounting/Clerical
   c) _____ Sales/Marketing
   d) _____ Engineering/Technical
   e) _____ Other types of departments
Part of the supervisor training study involves gathering some job-related information from a sampling of each supervisor's subordinates. The activity will take each subordinate approximately 30 minutes. Please select two of your subordinates to participate in this activity. Print their names, office telephone numbers and department locations in the spaces below:

<table>
<thead>
<tr>
<th>Name</th>
<th>Office Phone Number</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>A)</td>
<td>____________________</td>
<td></td>
</tr>
<tr>
<td>B)</td>
<td>____________________</td>
<td></td>
</tr>
</tbody>
</table>
Participant Survey for the Instructional Unit on "Constructive Feedback"

I. Please circle the number which best describes your response to the following items:

<table>
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<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) The objectives of this program were clear.</td>
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<td></td>
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</tr>
<tr>
<td>(b) The content of the course covered those objectives.</td>
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<tr>
<td>(c) There was an appropriate balance of different types of learning activities in the training sessions.</td>
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</tr>
<tr>
<td>(d) The topic of the training sessions was relevant to my job.</td>
<td></td>
<td></td>
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<tr>
<td>(e) The course materials provided in this unit were a useful resource for my learning.</td>
<td></td>
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</tr>
<tr>
<td>(f) I expect to use what I have learned from this training experience on my job.</td>
<td></td>
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</tbody>
</table>

II. Please use the following scale to rate the training activities listed below:

- 5 = EXCELLENT  Outstanding; superior quality.
- 4 = VERY GOOD  Few weaknesses, if any.
- 3 = GOOD       May require minor improvements in a few areas.
- 2 = FAIR        Moderate improvements in some areas required.
- 1 = POOR        Definite weaknesses, major improvements required in many areas.

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<tr>
<td>(g) Large group discussions</td>
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<td>(h) Small group activities</td>
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<td>(i) Skills practice activity</td>
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<td>(j) On-the-job training activity</td>
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<tr>
<td>(k) Overall training experience</td>
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</table>

Code Number: _____
(l) Describe any aspects of the training experience that you feel will be most useful to you in your job as a supervisor:

___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________

(m) Describe any aspects of this training experience that could be improved:

___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________
___________________________________________________________________________________________

Code Number: _____
APPENDIX D

RAW DATA RELATIVE TO CHAPTER III AND CHAPTER IV
## Test-Retest Reliability Data

<table>
<thead>
<tr>
<th>Participants</th>
<th>CFT1</th>
<th>CFT2</th>
<th>PST1</th>
<th>PST2</th>
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<td>10</td>
<td>1.58</td>
<td>1.36</td>
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</table>

CFT1 = Concept learning rating scale test #1  
CFT2 = Concept learning rating scale test #2  
PST1 = Problem solving rating scale test #1  
PST2 = Problem solving rating scale test #2

Reliability coefficient for concept learning rating scale = .84

Reliability coefficient for problem solving rating scale = .83
Data Sheet for Measuring the Internal Consistency of the Concept Learning Rating Scale (Cronbach's Alpha)

**Raw Scores of Subjects in the Pilot Test:**

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<th>04</th>
<th>05</th>
<th>06</th>
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Cronbach's Alpha = .32

**Raw Scores of Subjects in the Research Study:**

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Cronbach's Alpha = .83
Data Sheet for Measuring the Internal Consistency of the Problem Solving Rating Scale  
(Cronbach's Alpha)

<table>
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<th>Items</th>
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Cronbach's Alpha = .79
# Inter-Rater Reliability Data Sheet for the Concept Learning Rating Scale

1. **Scores and Totals**

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2. **Squares of Scores and Totals**

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3. **Sums of Squared Scores and Totals**

- (a) 20 Participant scores squared = 2607
- (b) 5 Participant totals squared = 10301
- (c) 4 Judges totals squared = 12231

4. **Variances**

- Total score \( \sigma_1^2 = (10301/5) - (2212/5^2) = 106.56 \)
- Sum of item \( \Sigma \sigma_i^2 = (2607/5) - (12231/5^2) = 32.16 \)

5. **Reliability**

\[
r = \frac{k}{k - 1} \left[ 1 - \frac{\Sigma \sigma_i^2}{\sigma_1^2} \right] = .9286 = .93
\]
Inter-Rater Reliability Data Sheet for the Problem Solving Rating Scale

1. Scores and Totals

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<tr>
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2. Squares of Scores and Totals

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3. Sums of Squared Scores and Totals

- (a) 20 Participant scores squared = 2350
- (b) 5 Participant totals squared = 8152
- (c) 4 Judges totals squared = 8904

4. Variances

- Total score: $\sigma_t^2 = (8152/5) - (184^2/s^2) = 276.16$
- Sum of item: $\Sigma \sigma_t^2 = 2350/5 - 8904/52 = 113.84$

5. Reliability

$$r = \frac{k}{k-1} \left[ 1 - \frac{\sigma_t^2}{\Sigma \sigma_t^2} \right] = .78174 = .78$$
## Concept Acquisition and Concept Application Data Sheet

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CAS = Concept Acquisition Score  
CAT = Concept Acquisition Time (time taken to write response)  
CAW = Concept Acquisition Words (# of words used in response)  

CTS = Concept Application Score  
CTT = Concept Application Time (time taken to write response)  
CTW = Concept Application Words (# of words used in response)
Self-Reported Problem Solving Skill Data Sheet

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PSS = Problem Solving Score
PST = Problem Solving Time (time taken to write response)
PSW = Problem Solving Words (# of words used in response)
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n = 12

**SUBS = Subordinate score on PSRS; SUBT = Time subordinate took to write response; SUBW = # of words subordinate used in response**
### Attitude Survey Data

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n = 8

**Group:**
- 1 = Deductive
- 2 = Guided Discovery

**Scales:**

- a-f: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree
- g-k: 1 = Poor, 2 = Fair, 3 = Good, 4 = Very Good, 5 = Excellent

(a) The objectives of this program were clear.
(b) The content of the course covered those objectives.
(c) There was an appropriate balance of different types of learning activities in the training sessions.
(d) The topic of the training sessions was relevant to my job.
(e) The course materials provided in this unit were a useful resource for my learning.
(f) I expect to use what I have learned from this training experience on my job.
(g) Large group discussions
(h) Small group activities
(i) Skills practice activity
(j) On-the-job training activity
(k) Overall training experience
Deductive Group Participant Comments (Group 1):

(1) Describe any aspects of the training experience that you feel will be most useful to you in your job as a supervisor:

- All aspects of the training can be useful in my job.
- The constructive feedback section is something that I can use immediately and often.
- I will be better prepared to give feedback to others by using the steps we learned.
- I will listen to what the person I'm giving feedback to has to say.
- This [training experience] has opened my eyes to my need to state the purpose of what I'm giving the feedback for.
- Develop an on-going dialog with all employees so these issues (positive and negative) can be discussed in a more timely fashion and with a more comfortable ease (i.e., "The only time we talk is when I'm in trouble.").
- Balancing positive and negative feedback.
- The six steps [of constructive feedback] are good and I will use them the next time an appropriate situation comes up.
- Pointing out the reasons for constructive feedback: (1) purpose, (2) specific actions to reinforce/correct, (3) consequences of those actions.

(m) Describe any aspects of this training experience that could be improved:

- More time should be given to complete the on-the-job activity. Being out a week for training, followed by attending an off-site conference Monday -- I spent most of the week catching up. The added pressure of the need to complete this activity before 3/11 did not help. Not enough time to prepare! (2 supervisors made this comment)
- Too long!
- Too many follow-ups!
- This week didn't provide a good opportunity for feedback of any negative kind which is where I would probably have a lot of room for improvement.
- Waiting and encouraging responses to jointly develop suggestions.
- Don't wait so long to address issues of concern.
- Employee development -- don't avoid it.
- Clarity -- I wasn't sure what would happen when. I was confused about the assignments until other class members asked clarifying questions.
Guided Discovery Group Participant Comments (Group 2):

(l) *Describe any aspects of the training experience that you feel will be most useful to you in your job as a supervisor:*

- Learning to listen.
- Planning a discussion first.
- The amount of information that I have gathered from the other supervisors who attended this session. It is always good to see just how others react in real life situations.
- Providing all types of feedback.
- Role playing during the constructive feedback sessions was an excellent skills exercise.
- Learning what other supervisors do. It gave me ideas to try in the future.
- Thinking through the constructive feedback process.
- Interviewing experts.
- Trying to summarize the process in our own words. This cements the concepts in my mind.

(m) *Describe any aspects of this training experience that could be improved:*

- Shorter sessions.
- Have half day sessions on a weekly or biweekly basis instead of a full week to keep more focused. (2 supervisors wrote this comment)
- More time to interview experts. Had only one week after being out of the office for one week.
- Condense the materials and get to the point.
APPLICATION FOR EXEMPTION FROM HUMAN SUBJECTS COMMITTEE REVIEW

RETURN TWO (2) COPIES OF THE TYPEWRITTEN APPLICATION (including original signatures) TO: Office of Research Risks, Room 300, Research Foundation Building, 1940 Kenny Road, Campus. (ATTACH A BRIEF ABSTRACT DESCRIBING THE RESEARCH ACTIVITY IN NON-TECHNICAL LANGUAGE. ANY QUESTIONS CONCERNING REQUIREMENTS OR SURVEY INSTRUMENTS.)

Principal Investigator: Ronald L. Jacobs
(Typed Name)  
(Signature)
Academic Title: Associate Professor
Department: Department of Educational Studies
Campus Address: 315 Ramseyer Hall
Room Number - Building
Co-Investigator(s): Margaret C. Lohman
(Typed Name)  
(Signature)
Protocol Title: The effects of a guided discovery versus a deductive training method on the job behaviors of supervisors

Yes No

X. A. The ONLY involvement of human subjects in the proposed research activity will be in one or more of the exception categories as described in the appendix of "Human Subjects Program Guidelines."
  1. Category(ies) to be

X. B. The proposed research activity will involve minors (under the age of 16).

X. C. The proposed research activity will involve pregnant women, mentally retarded, mentally disabled, and/or prisoners.

X. D. The proposed research activity will involve human in vitro fertilization.

X. E. The proposed research activity will involve an element of deception.

X. F. The proposed research activity will expose subjects to discomfort or harassment beyond levels encountered in daily life.

Source of Funding for Proposed Research: (Check A or B.)
A. OSURF: Sponsor __________________ RF Proposal/Project No. __________________
B. Other (Identify) None

EXEMPTION STATUS: √ APPROVED ___ DISAPPROVED**

Date

Chairperson

** Principal Investigator must submit a protocol to the appropriate Human Subjects Review Committee
LIST OF REFERENCES


Bienvenu, B.J. (1976). Supervisor status and training...an approach to the changing needs in supervisory development. In B.B. Boyd (Ed.), *Supervisory training: Approaches and methods* (pp. 11-16), American Society of Training and Development.


Carnarius, S. (1976). So you're going to handle supervisory training...being tough-minded can help. In B.B. Boyd (Ed.), *Supervisory training: Approaches and methods* (pp. 3-10), American Society of Training and Development.


The University of Texas at Austin. (1975). Professional supervisory competencies: Competency specifications for instructional leadership personnel. (ERIC Document Reproduction Service No. ED 121 022)


