

AN ANALYSIS OF COLLECTIVE INVESTIGATION
AS AN ADULT EDUCATION METHOD

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ABSTRACT

The purpose of this study was to determine whether one form of non-formal adult education, collective investigation (C.I.), significantly increased an individual's ability to formulate problems. Collective investigation is an adult, non-formal, group educative process. Through C.I., participants identify, isolate and critically question their "social reality." Learning occurs through self-reflection and shared experience.

The concept of individual experience was used as the basis for the framework which guided this study. C.I. provided a vehicle to identify and transform everyday problems facing the participants. A hypothesized model was developed to describe the process of problem formulation. This model draws upon the literature regarding C.I. and "practice knowledge," an application of adult learning in the work environment, to describe potential learning through a collective educational process.

The study used a quasi-experimental research design to examine the affect of an intensive C.I. workshop experience on individual's problem formulation abilities. The experimental group was compared with two control groups: 1) a more traditional approach to adult education (pre-readings and didactic lecture), and 2) a non-treatment control group. The

lecture method was not seen as an alternative method to teach problem formulation but was used as another type of control group. The data source was representative samples of child welfare personnel employed in British Columbia. All groups were pre and posttested, using a semi-structured instrument. Nine research hypotheses centered around learner information-production and problem formulation strategies were tested by ANCOVA. The results were significant in several instances, allowing for the rejection of four of the original nine null hypotheses. However, in all nine instances the C.I. group scored the highest, suggesting a general trend.

The results showed the collective investigation workshop experience significantly increased participant production of information. The workshop group also demonstrated a significant increase in specific, occupational information which was used for individual problem formulation. Workshop training for other applications of the production of information, (identification of contextual variables and problem solving) was not provided. The scores in these applications did not significantly increase. In addition, the findings showed that a significant difference exists between the perceptions of the C.I. group and the Lecture group. The individuals in the C.I. group perceived the activities and structured interaction of collective investigation to be beneficial to their learning. However, this study showed no impact on qualitative aspects of learning.

Based on these findings, it was concluded that collective investigation affected group communication and encouraged the development of supportive networks. Furthermore, collective investigation promoted individual confirmation and enhanced "personal power" providing effective motivation for learning. The opportunity to practice new skills during the collective investigation process also developed performance strategies. Since such outcomes affect instructional design and the practice of non-formal adult education, they merit consideration among the range of adult education methods available to adult educators.

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INTRODUCTION

This study examined the learning outcomes promoted by collective investigation (C.I.). Collective investigation is an adult, non-formal, group educative process. Several of the central principles of C.I. (active participant involvement, needs satisfaction, and personal development) are basic principles of adult education. An analysis of C.I. as an adult education method may be of interest to adult educators as the process relates to several of the principles that guide the practice of adult education.

Gelpi (1979) believes that adult education research should investigate the educational contributions of "everyday life." From a similar perspective, Cropley (1977) stresses the importance of innovative methods in non-formal education by emphasizing information organization, recall of information and subsequent communication with other people for the purpose of learning. In a later document, he states the importance of identifying "...the learning process which leads to the development of attitudes and skills vital for lifelong learning, including...the ability to organize and order information and the ability to make inferences" (Cropley, 1980, p. 210). While

recognizing the value of formal education, Cropley and Gelpi also believe adult learning occurs through non-formal methods.

C.I. is composed of the following elements: 1) active community participation and exploration of problems, 2) collective analysis, to develop a better understanding of the problems and the underlying structural causes of the problems, and 3) collective action aimed at short-term and long-term problem solutions (Society for Participatory Research in Asia, 1982). Collective investigation can be considered as an adult education method; individuals teaching community peers, connecting everyday problems and adult education.

The content of C.I. revolves around problems identified by the participants. C.I. methods may include some or all of the following: group discussions, public meetings, open-ended surveys, fact-finding tours, production of audio-visual materials, and popular theatre. C.I. differs from other group work methods in three ways: 1) the "critical" role of the facilitator challenges existing participants' perceptions, 2) the process intent is toward transformation of the participant's "social reality," and 3) the participants control the content of the educational activity.

The collective investigation process involves problem formulation, where participants identify and analyze their social reality, learning from self-reflection and shared

experience (Society for P.R. in Asia, 1985). Problem formulation both specifies the problem and critically questions the underlying cause. Understanding how and why a problem exists is necessary in planning ways to solve it. Problem formulation may lead to the redefinition of the initial problem, which could "fix and determine" the steps or sequencing used for problem solution (Schön, 1987). The basic premise underlying this study is that exposure to the interactive group activities of a collective investigation process will affect an individual's problem formulation abilities.

Research Question

To what extent and in what way does the collective investigation process affect an individual's ability to formulate problems?

Purpose of the Study

The purpose of this study was to determine whether C.I. significantly increased the ability to formulate problems and in this way, examine the effectiveness of one non-formal adult education method. In the last several years the C.I. process

has been a topic and discussion item for many adult education conferences and seminars (Conchelos and Kassam, 1981). One area of debate relates to a lack of quantitative data upon which to evaluate process outcomes.

One aim of the study concerns the need to increase knowledge within the broad area of non-formal adult teaching. Cropley (1980) believes that research is needed to help identify the "relationship between different kinds of learning in different settings and the outcomes in terms of personal satisfaction and self-development" (p.211). Appropriate research findings may help to determine what kinds of education are most appropriate for certain kinds of development. This study addresses the general issues presented by Cropley, Gelpi and others by exploring a type of non-formal, innovative educational method (collective investigation) which is assumed to promote the group production, organization and communication of information.

A quasi-experimental research design was used to examine the affect of an intensive C.I. workshop experience on individual's problem formulation abilities. The workshop experience was compared with: 1) a more traditional approach to adult education, (pre-readings and didactic lecture), and 2) a non-treatment control group. The C.I. discussions provided the content for teaching problem formulation. The lecture method

was not primarily seen as an alternative instructional choice to teach problem formulation but was rather used as another type of control group. Based on the workshop content developed by the participants in the C.I. workshop, information about problem formulation was presented to the Lecture group through a lecture and pre-readings.

The presentation of the dissertation proceeds as follows: A literature review of relevant materials is presented in Chapter 2 to provide direction for the study. The third chapter describes the framework and conceptual model used in the study. Chapter 4 presents the study's instrument development, design, data collection, hypotheses and method of analysis. The results of the analyses are presented in Chapter 5, followed by the final chapter which discusses the results, limitations of the research, theoretical and practical implications, conclusions and areas for future research.

CHAPTER 2

LITERATURE REVIEW

This chapter examines two topics: 1) the previous research regarding C.I., and 2) the concept of "practice knowledge", an application of adult learning in the work environment. The work environment can be seen as a component of everyday life and a context for non-formal education. The presented topics focus on the particular elements that have the greatest relevance to the original research question. C.I. is described first, followed by a discussion of the acquired learning outcomes. Similarly, practice knowledge is defined, leading to a description of cognitive strategies for problem formulation.

Collective Investigation

Formal education curricula are often planned in advance by content experts and standardized in a bureaucracy. By comparison, the content of C.I. can seldom be pre-planned and is often negotiated between participants and facilitators (Brown, 1985). The C.I. process implies a different education perspective from that of formal adult education, asking that

participants be both interdependent "programmers" and "co-learners." Successful C.I. is based on two-way discussions rather than one-way communication from teacher to student. The next section describes the basic characteristics of a C.I. process.

The Characteristics of C.I.

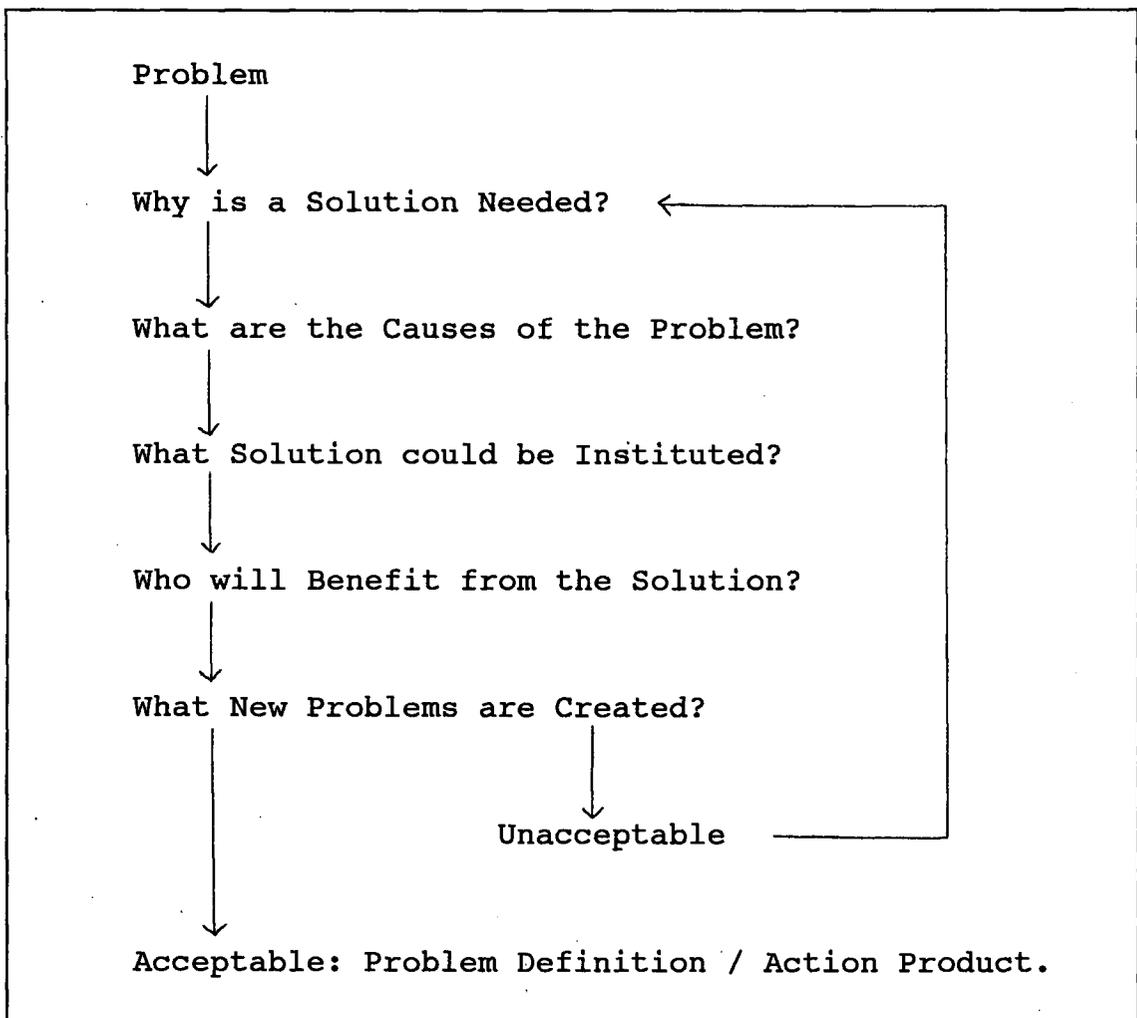
The following are five basic characteristics of a C.I. process:

- 1) The problem is defined, analyzed and solved by the community, through active participation,
- 2) The goal of C.I. is the transformation of social reality, improving the lives of the people involved,
- 3) C.I. can create a greater awareness of participants' resources and motivate the individuals for development,
- 4) The process facilitates an accurate analysis of social reality, and
- 5) The facilitator is a committed participant and learner (Hall, 1979).

These characteristics guide the action of the C.I. facilitator who works with the group to problem solve and generate knowledge. The role of the facilitator, while creating a group atmosphere of trust and safety, is to pose "critical,

hard questions while leaving the final decisions up to the constituency...while bringing a fresh perspective to the problem at hand through technical know-how and analytical skills" (Society for P.R. in Asia, 1982, p.40). Figure 1 illustrates the process of collective investigation.

Figure 1 : Process of Collective Investigation (Society for Participatory Research, 1982, p. 8)



Collective investigation is a systematic effort to examine a problem from all perspectives prior to commitment to a definition of the problem, which then leads to an "action product." This product is the basis for further problem solving activities. For example, women in a Mexican barrio were delighted that a badly needed medical doctor had been provided. However, C.I. facilitators encouraged the women's group to critically examine their general living conditions through various investigative methods. The group realized that unemployment, insufficient clean water supply, inadequate housing and poor nutrition created health problems that a medical doctor alone would not solve. While the group was pleased with the access to the doctor, they began to organize and demand more social services (Society for P.R. in Asia, 1982).

Learning Outcomes

The material in this section is drawn from research regarding "participatory research." Unfortunately, the name participatory research is misleading, because those who have developed the concept have blurred the distinctions between research, education and community development. Related literature in the topic area has tended simultaneously to report

on research implications, broad educational outcomes and societal impact on development issues, thereby creating confusion. However, "processes most closely related to investigation can be identified separately in any participatory research activity" (Society for P.R. in Asia, 1982, p.2). The material presented in this section has identified the learning outcomes which may be associated with C.I..

Swantz (1975) identified four possible outcomes of a C.I. process for participants: 1) learning about communication and how to solicit other's ideas; 2) skills in question answering, writing, responding to questionnaires, and processing data; 3) self-analysis benefits; and 4) creation of a common thinking process. Colletta (1976) provides a list of possible benefits derived from participation in a C.I. process: 1) information sharing between participants; 2) creation of an affiliation, based on mutual self-respect; 3) motivation through acknowledgment of participant opinions; 4) commitment and social responsibility through active involvement; and 5) identification of leadership and organization of individuals at a local level. These educational and motivational elements were identified from statements made by participants at final meetings, which may have influenced the data. Further design concerns relate to a lack of control groups for adequate comparison.

Other authors believe that the C.I. process could encourage the "learning of new ways of perceiving reality" (Fernandes and Tandon, 1983, p. 9). Beginning with people's concrete experience, C.I. includes both analysis and action aimed at change (Society for P.R. in Asia, 1982). Hudson (1980) supports this view, suggesting that C.I. may increase understanding of potential alternatives. Tandon (1981) suggests that C.I. develops increased knowledge about the particular social setting leading to a new self-image and increased potential to learn and act. "The learning process related...to the form of activity which makes for grass roots self-reliance and, ...the formation of a world-view" (Rahman, 1984, pg. 85). The above mentioned research ignores the issue that the participant's situations may be characterized by uncertainty, disorder and indeterminacy, limiting the capacity for mobilization of personal resources. The documents suggest that participation in a collective investigative activity leads to empowerment and change regardless of availability of personal resources.

Nevertheless, it is interesting to connect Rahman's concept of "world-view" to Leontiev's levels of "activity" for deeper understanding. Leontiev (1978) also believes that through reflection on the surrounding world, the individual reproduces properties of the environment that have survival value. Activity may become conscious through collective communication

of the object-nature, creating individual internal "tensions" or "contradictions," which may be used as motivation.

In a similar manner, Shrivastava and Tandon (1982) argue that C.I. raises awareness through a dialogue between facilitator and participant, promoting critical examination of objective and subjective reality. The Society for P.R. in Asia (1982) states that the process "strives to play a liberating role in the learning process by promoting the development of a critical understanding of social problems, their structural causes and possibilities for overcoming them" (p. 34). Mezirow (1985) suggests that a C.I. process could provide education for social action and that educators have a social action function which involves helping learners to become aware of the cultural contradictions which oppress them, to research their own problems, to build confidence and to examine action alternatives. From a similar perspective, Freire (1972), along with many other educators, uses the term "praxis" to refer to the relationship of reflection and action. Engeström (1987) suggests the "task is to get a grasp of the need state and primary contradictions...through discussions with people involved in the activity" (p.324). He believes that the locus and limits of the activity can only be properly defined after extensive participant observation and discussion.

Conclusion

The majority of the writings cited above suggest individual learning gain is linked to a group educative process: participants gain knowledge of practice skills and perception of reality. However, the extent of the learning gain and the process by which it may occur has not been addressed. Although the reported outcomes of much of the literature revolve on collective investigation and development of consensus regarding the problem definition, the learning process for accomplishing problem formulation has been ignored. While not acknowledging the possible indeterminacy of the participant's situation, much emphasis is also placed on individual and group empowerment possibilities. The next section of the review discusses elements of practice knowledge in preparation for a discussion of the cognitive strategies used for problem formulation.

Practice Knowledge

Schön (1983), discussing the concept of practice knowledge, emphasizes experimentation in instruction to utilize logical or empirical knowledge in work situations. He proposes 3-steps for "reflection in action" to determine the elements in practice knowledge. The first is "exploratory experiment": action taken to see what follows. Following this is the "move-testing experiments": a specific action to produce an intended effect. On the simplest level, if an action achieves the intended outcome it is affirmed, if not, the action is negated. The third type of strategy is "hypothesis testing." Hypothesis testing occurs through the process of elimination where the individual successively produces conditions to disprove competing hypotheses. Schön's work has several limitations. Specific cognitive strategies related to experimental activity are ignored. As well, the individual's emotional perceptions of and reactions to the experimentation are neglected.

From another perspective, Schein (1973) attempts to deal with the issue of uncertain occupational situations and knowledge by discussing the difference between basic and applied science. He states that it should be possible to convert a "convergent knowledge base" to "divergent practice" application,

but does not describe the theory or technique to accomplish this task. Hall (1979) deals with ambiguous situations by suggesting practice knowledge continually develops through a cycle of three phases: 1) the production and implementation of social relations and experience, 2) elaboration of theories arising from those problems encountered through the experiences, and 3) the application of those theories in social practice testing, with resultant verification and correction. He believes that individuals "do not acquire knowledge of things about that which their practice has not yet given them the need or opportunity of finding out" (Hall, 1979, p. 406). While personal motivation is connected to context, the discussion does not include the cognitive strategies by which this is accomplished.

Context and Cognitive Strategies

Baltes and Nesselroade (1984), while tending to focus on the universality in patterns of adult development, specify the influence of contextual determinants on knowledge acquisition. Scribner (1986) also argues the importance of context on cognition, stating there are three contextual work variables to consider when examining problem formulation: 1) least effort criteria; the amount of effort needed by the individual for the psychological re-organization of practical tasks in the

interests of simplicity, 2) setting and task specific knowledge, boundaries for work and what needs to be known may be developed in functional requirements for the task, and 3) novice-expert relationship; novices learn under the guidance of others who support their progress through adjustment of task difficulty. Scribner's position suggests "that perception and action occur in continuous dependence on the environment and therefore cannot be understood without an understanding of the environment" (Scribner, 1986, p. 23). Boud et al (1985) emphasize a limitation of Scribner's and Baltes and Nesselroad's research; the impact of emotions. An individual's emotional reaction may distort perception and influence cognitive processes.

The social experience may affect cognitive strategies in two ways (Vygotsky, 1978; Leontiev, 1978). First, sociocultural history provides "tools" (eg. writing) for the organization of information. Second, the immediate social interactional context structures individual cognitive strategy. Information regarding tools is transmitted to novice problem solvers through interaction with more experienced members of social groups. These experienced individuals define and regulate the joint strategies in accordance with sociocultural patterns. The interaction between novice and expert implies: 1) new ideas or information are available, 2) one individual has knowledge of or experience with the new information, 3) another individual does

not have the knowledge, and 4) some form of communication connects the two individuals (Rogers and Kincaid, 1983).

The nature of the information-exchange relationship among individuals determines the conditions by which an individual transmits information. Most people depend mainly on a subjective evaluation of information that is conveyed to them from other individuals like themselves who have adopted the information (Rogers and Kincaid, 1983). This suggests that the information diffusion process results from modelling and imitation. If this is the case, one important contextual issue is the process by which individuals examine and define problems that they are confronted with. The next section describes the specific strategies used in problem formulation.

Problem Formulation

Maier (1930) characterized problem formulation as changes in "organization and meaning," believing that a problem which is similar to one that was solved in the past may call up a solution by similarity. In a later work, he states, "the parts or experiences must be combined in a certain manner and a direction or way the problem is attacked seems to be a factor which determines the nature of the combination" (Maier, 1931, p. 143). Kahney (1986) has built upon Maier's seminal

documentation. He believes that individuals augment the information provided at the beginning of a problem with knowledge retrieved from long-term memory. With enough experience with a particular type of problem, individuals may internalize the "structure" of the problem. In every-day problems, this allows the individual to gather information during the process of solving a problem and fit the solution to the original presented information.

The real achievement consists in realizing that the situation is not in as good order as it looks; that it should be improved. Under these circumstances the process is often a transition from an and-sum or from a superficially structured view to a more adequate one... To envisage, to put the right problem, is often a far more important achievement than to solve a set task. (Wertheimer, 1959, p. 242)

By formulating the problem more productively, discreet phases of the solution that change the structure of the situation as a whole or change certain significant parts can occur. Polya (1957), Scheerer and Huling (1960) and Lave et al. (1984) believe the essence of problem formulation is the way some people perceive the tasks or segments of tasks as having particular qualities available for separation into detachable and moveable segments. Argyris (1982) believes this occurs as a result of the disjunction between a person's experience and

his or her "biography," allowing the individual to create premises about the problem, make inferences and draw conclusions. Anderson (1985) suggests that problem formulation results from a search process through a maze of "states." The "search" concept describes the possible steps an individual might take in a problem solution method. One method attempts to reduce the difference between the current perceived state and the goal state through measures of similarity, as suggested by Maier (1930). The problem is transformed into a state that more closely resembles the goal. Another method relates to working backward. If the goal is known, it can be decomposed into subgoals, which imply possible solutions. The sub-goals can then be worked on independently, allowing the individual to focus on one issue at a time. Yet another method is problem solving by analogy. The structure of one previously solved problem guides the formulation of the presented problem. One limitation of the above mentioned research is the possible difficulty of generalization of laboratory experiments (of which the inferences are based) to everyday problems.

Guilford (1965) proposes four cognitive strategies to describe the problem formulation process. 1) Fluent thinking: retrieval from memory of units, related correlates or systems in response to certain specifications, 2) Flexible thinking: the ability to search different classes of memory for information

used in both divergent thinking and for developing a convergent answer, 3) Insight: Sudden transformations of information to produce systems which provide a scheme or model, and 4) Evaluation: Elaborative abilities of implication to determine what is proper.

From a different perspective, Wilensky (1981) interprets problem formulation as a "meta-goal," involving general principles rather than specific information, which encodes knowledge about planning in general. This is similar to De Corte (1980), who believes general heuristics, while not guaranteeing the solution to a problem, increase the solution probability through provision of an effective search strategy.

Summary

The literature review in the chapter related studies from two distinct fields: adult education and cognitive psychology. Problem formulation depends on contextual information and the individuals's organization and/or reorganization of that information. Problematic situations are restructured into a more "productive" vision, which is used to implement a strategy aimed at effectively defining the initial issue. Fluent and/or flexible thinking may allow the individual to investigate his or her reality in relationship to problems.

If the outcomes of the problem are fixed and clear, the action decision is usually presented as an instrumental problem (Scribner, 1986). It can be argued that when the outcomes of a problem are unclear, there is no "problem" to solve and no action decision can readily be applied. Therefore, an ability to formulate problems, examine a problematic issue, identify critical features, consequences and tentative solutions for further testing is needed.

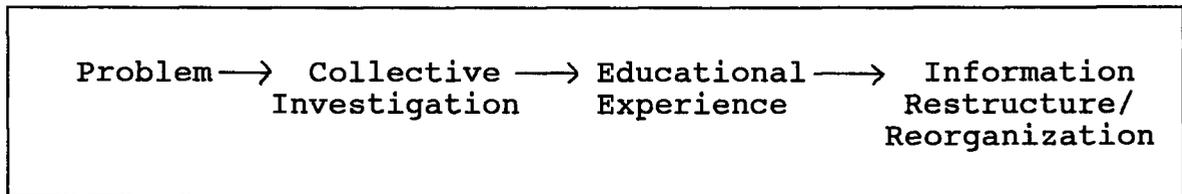
Collective investigation is an educational approach used to facilitate individual development in the areas of practice knowledge and perception of reality. Practice knowledge, a concept related to everyday problems, should be examined within various contexts, some of which may include - occupation, group interactions, individual emotional reaction and cognitive strategies. Leontiev (1978) suggests emphasis should be placed on the interplay between internal operations and external reality throughout the problem formulation process. Departing from the above discussion of the relevant literature, the framework and conceptual model of this study will be presented in the next chapter.

CHAPTER 3

FRAMEWORK and CONCEPTUAL MODEL

The first two chapters have outlined the broad considerations of this study as illustrated by Figure 2.

Figure 2: Educative Process of Information Restructure



To remain consistent with the C.I. literature, the framework focused on the following:

- the construction of individual meaning, and
- the development of a problem formulation model which provided the basis for interpretation of the learning process. After the discussion of individual construction of meaning, the relationship between the literature review, framework and conceptual model is presented.

Individual Construction of Meaning

This dissertation takes a constructivist position that meanings are contextual and personally constructed. Individuals mediate this construction with the help of verbal signs which have meanings (Vygotsky, 1978). When an individual reflects on an experience it may become meaningful. "Experience rests on continuous synthesis of recognition, either of selfsameness (identity) or of similarity (type)" (Schultz and Luckmann, 1974, p. 229). They further state:

I trust the world as it has been known by me will continue further and the stock of knowledge...will continue to preserve its fundamental validity...From this assumption follows...that I can repeat past successful acts. So long as the structure of the world can be taken as constant, as long as my previous experience is valid, my ability to operate on the world in this or that manner remains in principle preserved. (Schultz and Luckmann, 1974, p. 7)

Although every experience encompasses the atypical by virtue of its uniqueness, the individual suppresses its atypical elements by generating familiarity. According to Natanson (1978), the application of types necessarily suppresses "irrelevant" features of the objects we experience.

Typification is the generic term for an abstract process whose central accomplishment is the experience of the familiar...in the results of typification one is able to recognize the boundaries of one's world: the strange is constituted and appropriated as a limit of the familiar. (Natanson, 1973, p. 140)

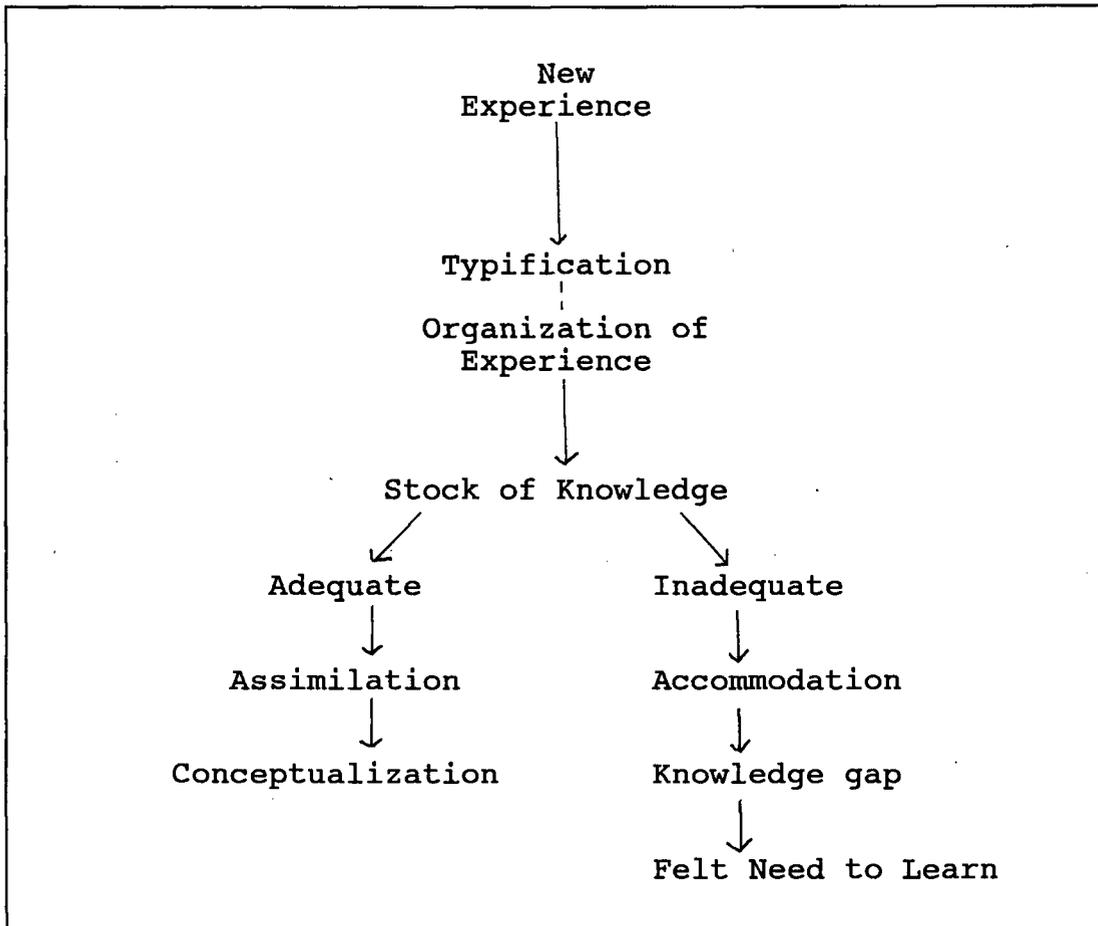
The world of experience is necessarily typified and Schultz (1973) has shown that the typical is essential to the organization of experience, not a mere consequence of translating experience into knowledge. Furthering this statement, Rogers (1983) believes that "habitual knowledge" consists of skills and useful knowledge that once learned, is "on hand" in all situations that are experienced. This stock of knowledge provides the means for determining one's location within reality, detailing concerns and reflecting interests. Reality involves interaction of the individual and environmental stimulus, as the individual acts on the stimulus and interprets it in terms of previous knowledge. From this perspective (Individual \Leftrightarrow Stimulus), the arrow pointing towards the stimulus represents assimilation and the arrow pointing towards the individual represents accommodation, where previous knowledge is modified (Guilford, 1965). Accommodation occurs in response to incomplete assimilation or contradiction with expectation. In a sense, the stimulus "acts" on the individual, but the action is in the individual. Engestrom (1987) believes such cognitive functions occur through reflective mediation.

The act of reflecting upon the relationship of the given stimulus to the broader, general context occurs through communication (internal and external to the individual). The cultural development of symbols (used for abstraction and generalization of thought) is the result of a super-individual, collective process. Only through a relationship and information exchange with other people does an individual learn how to relate to reality (Engeström, 1987).

This implies not only a psychological interchange between the individual and society but a dynamic interaction within the individual of multiple aspects of what is "known," including erroneous ideas that eventually disappear or are transformed. Consequently, every individual experience not only determines the stock of knowledge, but also prescribes a type of knowledge (Rogers, 1983).

What emerges as problematic implies specific gaps in the stock of knowledge. If an individual has a new experience, knowledge acquired through past living may not be able to provide the necessary automatic response. An awareness of this lack in knowledge may provide the individual with a felt need to learn. In summary, while recognizing this is a fluid process, Figure 3 illustrates the construction of meaning and what has been discussed above.

Figure 3: Construction of Meaning



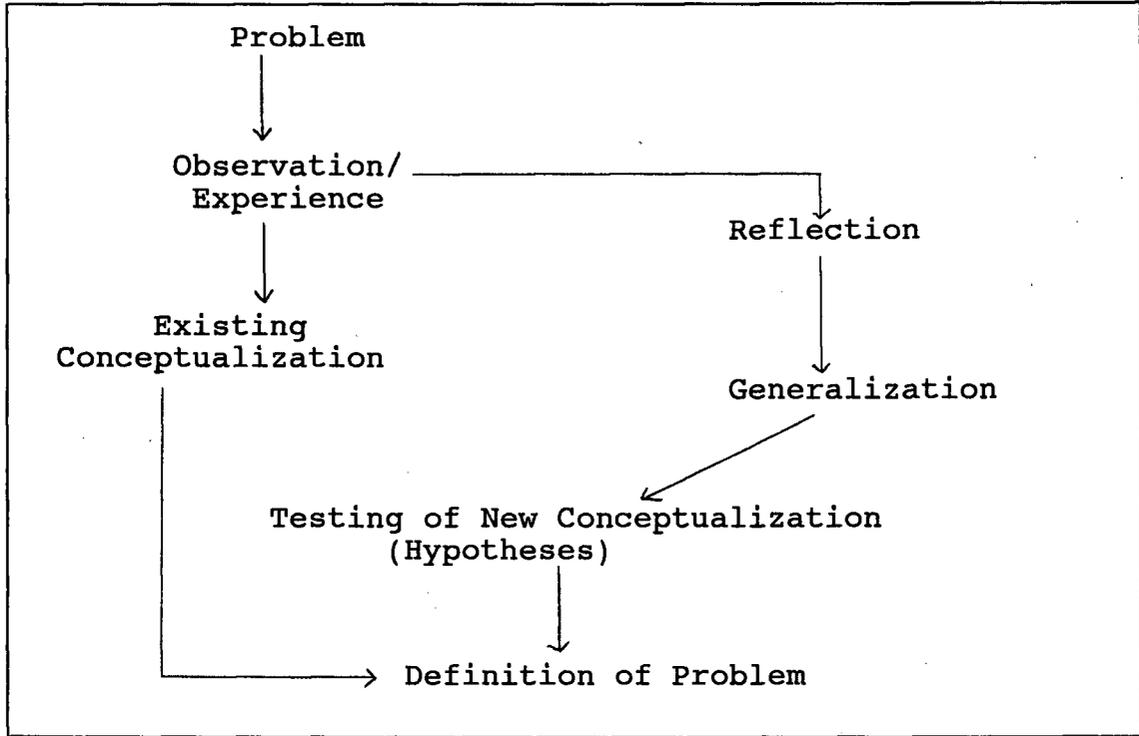
A problem creates an opportunity for experience or at the very least, a chance to observe. A dialectic results when previous reliance on existing conceptual interpretation and symbolic representation shifts through cognitive experimentation in conjunction with internal reflection (Kolb, 1984). Through either habitual or dialectic cognitive activity, the individual identifies elements as they appear in his or her personal history and context; that matrix for reflection is then compared

with a personal stock of knowledge. Gaps are not revealed by evaluation unless the stock of knowledge is inadequate to deal with the presented problem. If a gap occurs, motivation provides an opportunity for learning. If the stock of knowledge is sufficient to deal with the problem, the "self" is likely reinforced and growth consists of increased confidence in the ability to perform similar tasks in the future.

Problem Formulation Model

This study is concerned with problem formulation strategies. C.I. provides a vehicle to transform experience through heightened awareness of problems combined with the opportunity to share and incorporate the knowledge gained by others through their past experience. Any attempt to generalize a dynamic process, in order to illustrate it, can be criticized because of individual movement and inconsistency between the headings it identifies. It is unlikely that all individuals will experience the idealized model precisely as illustrated. The model in Figure 4 (based on Jarvis, 1987 and Kolb, 1984) illustrates problem formulation as it may occur as a result of a collective investigation process.

Figure 4: Presentation of Problem Formulation Model



Observation/Experience

The following text describes the model in detail. This process begins with the recognition that a problem issue exists or has relevance for the individual. As presented in Figure 3, the features of the problem are isolated and typified according to the familiar experiences that the person can recognize. This allows for the organization of the experience and determination

of the adequacy of the stock of knowledge. If relevance or recognition is not perceived or if the individual's previous stock of knowledge is sufficient to deal with the issue, it is unlikely that any new learning will occur (Jarvis, 1987) as the individual has a previously formed concept. However, it can be argued that the simple comprehension of incoming data necessitates the processing of information, which may mean the translation of the data into a form more meaningful to the individual.

Through interaction like what occurs in C.I., the translation of information about the problem is socially defined and that definition is supported. As Leontiev (1978) believes, meaning is objectified through ordinary language which could help set the stage for Schon's concept of "exploratory experiment." A problem is acknowledged and based on the stock of knowledge, a previous method of solution may be tried to see if the solution is applicable.

Existing Conceptualization

When individuals understand or are able to use some portion of their stock of knowledge, there is continuity with the socio-cultural reality (Jarvis, 1987). Experience acts as self-reinforcement to the existing stock of knowledge. The

evidence for possessing a concept may be weak, requiring only an ability to distinguish that to which elements of a problematic issue applies from that to which they do not apply. For example, to possess the concept of "abuse" could require no more than the ability to say "abuse" when confronted with the presence of abuse. Stronger evidence might involve the grasp of the logical or grammatical use of the term ("abuse" can only be a verb or a noun, not a proper name), factual knowledge (abused children tend to become abusive to others) or the ability to define or give the essence of the term. Regardless of the depth of the concept possession, the reference scheme used for identification of information may provide an automatic response to the presented information.

Reflection

Some people explore some of their experiences in a conscious manner to reframe the problem issue leading to a new understanding. Reflection may be of a superficial nature, or at other times, it may be deep and profound. However, if meaning is a subjective interpretation of experience, based on a synthesis of previous knowledge and current perception, each individual will bring his/her unique stock of knowledge to bear on the experience through reflection.

The strength of collective investigation may begin at this point, as the process allows the sharing and group exploration of each individual participant's experiences. Mezirow (1981) details seven levels of reflectivity. The first four relate to the level of consciousness whereby individuals become aware of their experiences while the latter three levels are regarded as critical consciousness (Jarvis, 1987). Individuals may reflect upon experience at one or more levels, but higher levels of reflection include the strategy of generalization.

Generalization

Beliefs and inferences about the problem are developed with the stage of generalization. Schön's (1983) "move-testing experiments" are likely to occur at this level. A specific action is attempted for a intended effect. If unsuccessful, further reflection may be required to reframe the issue. If successful, a hypothesis may be developed/confirmed. Acceptance or rejection of information is based on probability, using some criterion of "certainty/validity," (both individual and societal based). In everyday use this denotes a perceived conviction about what reality is likely to be. This probability is inferred by the individual from evidence of what is known, plus

knowledge of factors not yet determined. The adequacy of knowledge involves judgements about one's self (Rogers, 1983).

When the individual considers resuming taken-for-granted activity at a given point, to some extent he or she looks at the implications about the consistency and certainty of his or her self. Although "break-off" points involve pragmatic, situational considerations, above all they attempt to validate a self as the core meaning of human experiences (Rogers, 1983, p. 45.)

Validation may occur through communication (group activity) and development of what Schultz (1973) refers to as a "we-relation." Involving mutual awareness and sympathetic participation, "grounds for describing and specifying the constitution of intersubjectivity in everyday lives are determined" (Rogers, 1983, p.64). Individual action is based on knowledge and value system rules, which allow for predictions which may prove correct or incorrect. Predictions are deduced by assessing possible alternatives. The process of C.I. allows the sharing of knowledge and experiences co-operatively to evaluate the issues under examination. If the "group conviction" about the certainty/validity of the information is complete, the probability that the information will be believed

by an individual to be correct is likely to be high, while the reverse is true if the group believes the information is incorrect.

Testing of New Conceptualization (Hypotheses)

Using deduction and/or induction, the component of testing new conceptualizations involves the combination of a number of elements to form a coherent hypothesis, which can be "tested" according to the standards used by the individual. Consequences and implications for action are examined, attempting to adapt each particular hypothesis to the issue. If a particular hypothesis is successfully adapted, a problem definition and subsequent action likely occurs. If unsuccessful, the process may begin again. Schon's (1983) concept of "hypothesis testing" allows for the elimination of competing hypotheses based on information presented.

Through the group experience of C.I., a co-operative definition of the relative "truth" or sense of conviction about the hypothesis can be furthered. Correctness must be defined in terms of specific criteria, which the participants involved in the process describe for themselves. Inferences are derived from conviction in terms of the relative frequency with which

the inference yields correct conclusions. Judgements are made about the value of the hypothesis against some standard which is then applied in practice.

Problem Definition

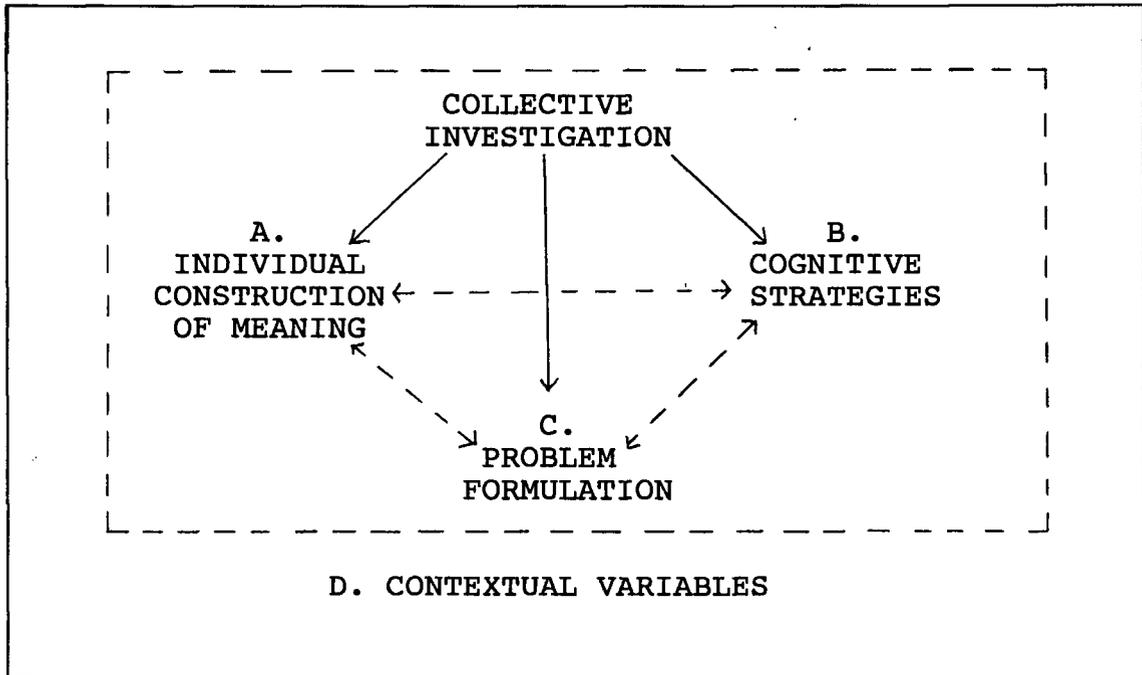
Once the issue has been defined in a productive manner by the individual, the problem becomes instrumental. Alternatives for action can be determined, consequences identified and a course of action chosen. With this comes evaluation and possible re-examination of the selection if the action is unacceptable.

This ends the discussion of the problem formulation model. The next section discusses the relationship between the literature review, framework and problem formulation model.

Literature Review, Framework and Model

Figure 5 illustrates a model for considering problem formulation, focusing on the interrelationships of the conceptual topics presented. The clusters of items are separated for possible discussion purposes but in actuality are interactive by nature of the educative experience.

Figure 5: A Model for Considering Collective Investigation



Collective investigation potentially affects problem formulation (C) directly and/or indirectly. The interactive process may simply reinforce existing conceptualizations held by the individual. Alternatively, the effect may be mediated by individual construction of meaning (A) and/or cognitive strategies (B), within the confines of the context (D). Based on the literature review of Chapters 2 and 3, it can be seen that construction of meaning may affect problem formulation at the interface between environmental stimulus and individual cognition. Which means that if the currency of reality is information, an individual may insert information into the

environment as well as extract information from it. Rogers' (1983) concept of a stock of knowledge (A) provides a means for determining one's location in reality and may prompt motivation to learn. As a result of typification, the stock of knowledge may be felt to be inadequate and the knowledge gap encourages the need to learn. Motivation to learn may influence cognitive strategies (B) as detailed by Guildford (1965), encouraging information processing and adaptation to the context (D). Contextual variables include group dynamics, interpersonal bonding, integration, and other situational elements. As a result of successful operationalization of the problem formulation model (C), individual meaning may be changed (A) or contextual variables could be affected (D) as task specific information could be increased or an existing peer relationship could be altered. The point to be made is that collective investigation has the potential to affect problem formulation in several ways.

However, it is obvious that collective investigation methods are not the only way to transmit content. Didactic approaches do emphasize and reinforce information previously read. When confronted with a mass of information encompassing details, definitions and examples, the didactic lecture synthesizes, abbreviates and summarizes the important information. Along with this, information from other sources not readily available

to the learners can be presented. This method can clarify information or specific points through review.

However, didactic methods use a one-way communication approach, selecting the information that is transmitted to the audience to learn. The issue of participant control of process (through collective investigation) becomes important if the assumptions of the interconnectedness of the variables as illustrated by Figure 5 are correct.

The relationship between the assumptions underlying the model and the collective investigation process were presented in preparation for the next chapter which provides the research methodology leading to the presentation of the research hypotheses.

Summary

So far, this study has examined individual experience, several contextual determinants, available cognitive strategies and the operationalization of a problem formulation model. The concept of individual experience was used as the basis for the framework which guided this study, examining how collective investigation affects an individual's ability to formulate problems. Collective investigation provided a vehicle to identify and transform functional problems facing the participants. These problems represent types of experience, as

a result of individual interpretation of context. The context is socially defined, supported and taught. A hypothesized model described the process of problem formulation. This model draws upon cognitive psychology to describe potential learning through a collective educational process. The next chapter presents the research methodology of this study.

CHAPTER 4

METHODOLOGY

A short summary of the research design begins the chapter. Then the instrument development, research design (including validity controls and descriptions of test groups), sample, and data collection procedures are described. Following this, the hypotheses are presented leading to the selected method for data analysis.

Summary

Twenty-four individuals representative of the caregivers in British Columbia were pre and posttested using an instrument developed by independent content experts. The research design used three groups - a non-treatment control, a group exposed to problem formulation through a workshop and a group exposed to problem formulation through pre-readings and a didactic lecture. The pre and posttest interviews consisted of two pairs of similar, but different, case situations that could occur in the participant's everyday life. The items of information produced by the participants in response to the pre and posttest were compiled and then classified by knowledge type. These

classifications were further examined according to application and participant use. One application related to perceived problem formulation strategy, a second to identification of contextual variables used and the third category to problem solution specified. The quality of response was determined by use of the SOLO taxonomy and participant perception of educative approach was also scored. ANCOVA was used for analysis of eight hypotheses, while an independent-samples t test was used for the ninth hypothesis.

Instrument Development

Prestudy

A small pre-study (eight individuals) was undertaken prior to the initiation of this research. Using the four case examples (Appendix B), interview questions and SOLO Taxonomy (Appendix D), several individuals with exposure to the C.I. process were interviewed. Other child welfare practitioners with no C.I. experience (same gender, relative age, number of years of experience) were also interviewed using the same format. Comparison of the prestudy results showed that both the case examples and the SOLO taxonomy were appropriate instruments for this study.

Main Study

Development and selection of the case situations were made by an independent panel of seven content experts (social workers, foster parents and child care workers). Selection criteria of the case examples involved several factors:

- perceived reality (the potential of encountering such issues was deemed relatively high),
- relatively noncomplex language, (jargon-free),
- high likelihood of participant identification with the problem,
- problems involved several potential issues,
- several external conditions impact on the problem(s),
- opportunity for demonstration of differentiated levels of cognitive complexity.

The four case examples were chosen to represent potential problematic situations that caregivers may encounter or have encountered throughout the course of their everyday lives.

Response was measured in two ways: 1) the total score or production of specific information items and 2) quality of response. Referring back to the model for consideration of

problem formulation (Figure 5), the responses enabled measurement of several factors influencing individual construction of meaning (A.):

- types of information used,
- past experiences utilized, and
- attitudes and values affecting problem formulation.

To further operationalize the model, measurement of responses for cognitive strategies (B.) focused on:

- clarification of issues,
- process and description of issue definition, and
- connection between information used and description of issue.

In a similar manner, problem formulation (C.) was measured by:

- reflection upon possible causes of problem issue,
- benefits of choice,
- possible consequences, and
- resolution of issue.

Finally, contextual variables (D.) were measured by a description of:

- potential unknowns in the issue,

- use of all information needed for problem description,
- use of "expert" peers within the group, and
- feelings of personal "comfort" with problem solution.

The panel determined the seventeen possible items (Appendix C) that an individual could potentially use when considering the presented case examples. Participants mentioning more of the possible seventeen items were scored higher. Conceptual categories were then generated on the basis of the compiled data. The seventeen items were divided into the following three classes:

- Specific Occupational Information,
- Knowledge of Self and
- Knowledge of Others.

As previously mentioned, the interview responses were also evaluated for the quality of the response. Factors such as cognitive sequencing, context, conventional descriptors (adverb/adjective), contrast, imagery, integrated impact and innovative use of metaphor or symbolism were measured. For the purpose of the classification, the Structure of Observed Learning Outcome (SOLO), developed by Biggs and Collis (1982) was used. The SOLO was chosen for its wide applicability and emphasis on the structural complexity of the outcome responses.

The levels of the SOLO taxonomy are ordered in terms of characteristics from concrete to abstract, with an increasing number of organizing dimensions; with self-generated relating principles used at the most complex level. The SOLO levels are as follows:

1. Pre-structural. In relationship to the prerequisites given in the question, the answers are denying, tautological and transductive, bound to specifics.
2. Uni-structural. The answers contain "generalizations" only in terms of one aspect.
3. Multi-structural. The answers reveal generalizations only in terms of a few limited and independent aspects.
4. Relational. Characterized by induction and generalizations within a given or experienced context using related aspects.
5. Extended Abstract. Deduction and induction. Generalizations to situations not experienced or given in the prerequisites of the question (Biggs and Collis, 1982, pp. 24 & 25)

Biggs and Collis (1982) suggest that four main dimensions be used to categorize responses:

- 1) Different capacities of memory - An individual needs to think about more items at once in order to make a relational response than to make a uni-structural response,
- 2) Interrelation between item cue and response - A

pre-structural response has no logical connection with the cue, while a multistructural response identifies several relevant features but does not connect them,

- 3) Consistency within a response and the relative necessity for closure within the response, and
- 4) The interaction of the first three dimensions, affecting the general overall structure.

Several possible limitations of the SOLO should be noted. Poor test wording can create participant confusion and lead to a low evaluation of performance. Prior experience with the task and the nature of the task may affect the level of response. The perceived time factor to answer questions may also create pressures if the individual is in a hurry, preventing careful consideration of all information. A final weakness relates to the concern that the SOLO does not recognize the possibility of emotional interference.

In accordance with the evaluation procedure suggested by Biggs and Collis (1982), good use of the quality components added an additional .25 to their SOLO score, while very good use added .50. "Good use" and "very good use" were determined through subjective interpretation of judges. The scale used for scoring the quality of response is presented in Table 4:1.

Table 4:1 SOLO Scoring

Level	Score
1. Prestructural	1
1a. transitional	1.5
2. Unistructural	2
2a. transitional	2.5
3. Multi-structural	3
3a. transitional	3.5
4. Relational	4
4a. transitional	4.5
5 Extended Abstract	5

The next section describes the research design used.

Design

Individuals in the experimental group and the Lecture control group were presented with two pretest case examples prior to workshop involvement or didactic lecture. Within one week after the treatment, a posttest was given (two additional case examples) and individuals from both groups were asked to reflect upon their educational experience. Both groups were facilitated by the same staff person. A narrative description of the

workshop and lecture will be presented later in this section along with the descriptions of the population and sample.

A third group (n = 8), not exposed to either the group experience or the lecture, were pre- and posttested within the same time period and acted as a control. All three groups began with no prior exposure of problem formulation. Figure 6 illustrates the design.

Figure 6: Research Design

Group 1: Pretest - Collective Investigation - Posttest
Group 2: Pretest -- Pre-Reading & Lecture --- Posttest
Group 3: Pretest ----- no treatment ----- Posttest

Internal Validity of the Design

Cook and Campbell (1983) detail many "threats" to internal validity in quasi-experimental research. Several common threats to field studies and compensatory controls are discussed in this section. Issues of testing and instrumentation invalidation were controlled by the similarity of the case examples and use

of standardized open-ended interview questions. The same relative time sequence between pre and posttest for all groups decreased maturation problems. It is recognized that participant sensitization to the test may have enhanced performance.

There was one "drop out" in this study. Originally, 26 individuals were involved. Respondent "A" left the province immediately after the C.I. workshop and was unavailable for the posttest interview. Equipment failure prevented successful audio taping of respondent "P." Randomization of the individuals into "treatment" groups was not possible due to the community outreach focus of the supportive agency and historical events which may have occurred between the interviews and could have affected the results. Although non-randomization presents serious statistical restrictions on this study, the issue must be tempered by ethical considerations. Random selection could be counterproductive to the development of the groups within each specific regional structure of the agency.

Initially, five groups within the organizational structure of the British Columbia Federation of Foster Parent Associations (B.C.F.F.P.A.) indicated interest in the process. Selection of the three groups for this study (one experimental group and two control groups) was based on a random digit table to prevent possible bias. It should be noted that the lecture, control and

non-tested groups were offered the C.I. service after the study was completed.

As far as it is known, no communication occurred between groups to lead to the possibility of treatment diffusion or rivalry of participants. Equalization of the treatments and time element were evaluated by an independent group of content experts and was determined to be similar.

External Validity

Threats to interaction of selection and treatment were reduced by offering the workshops at the time convenience of the individuals, at a place of easy access in their community. Settings were similar for both treatment groups (well-lighted, ventilated government office space). Although short-term historical effects could have influenced the treatment effect, the literature review did not provide evidence to refute a cautious causal relationship between the C.I. treatment and potential learning gain. The next section details the three groups.

Experimental Group

C.I. Group

One of the experimental groups (8 participating individuals) was exposed to the collective investigation component of C.I. through a two day training workshop (9am to 5pm). Depending on group interest and involvement, the minimum time for the group activity was 14 hours of intense group interaction. The agency facilitator had approximately 8 years of practical experience involving groups. The focus of the facilitator in the workshops was:

- recognition and identification of problem issue(s),
- acknowledgement of the issue(s),
- potential examination of relationships between two or more problem issues
- need for solution,
- possible causes of the problem,
- possible solutions,
- benefits of the possible solutions,
- consequences of solutions,
- clarification of major points
- group reflection on all of the above,

- reframing issues, as required,
- summarization, as required,
- developing inferences and generalizations regarding issues,
- testing potential hypotheses,

Control Groups

Lecture Group

Training in problem formulation for the first control group approximated the training for the experimental group. The Lecture group (8 participants) was exposed to similar content as the experimental group (C.I.), through a 3 hour didactic lecture. The content developed by the experimental group in the workshop was used as the content for the lecture.

Prereadings were given to the Lecture group. These readings described the process of problem formulation and took approximately 8 to 11 hours to read and understand, although the depth of comprehension is not known. Posttest interviews indicated the participants did read the materials.

The purpose of the readings were to: 1) supply the relevant conceptual information for participant acquisition, 2) ensure all participants received the same "base" information, 3) stimulate learner interest and 4) "mimic" one of the traditional

aspects of formal education. Within the lecture setting, little opportunity for group interaction was provided, although the participants were encouraged to ask questions freely throughout the presentation. The opening agenda listed what was going to be presented and how that related to the readings. The language was conversational, highlighting the key points and concepts of problem formulation. The lecture consisted of information related to:

- problem formulation,
- other group' experiences with the C.I. process,
- techniques for identification of problem issues,
- information ordering techniques,
- divergent and convergent thinking,
- development of techniques to link and connect information,
- techniques for problem formulation,
 - isolation of issue,
 - identification of causes,
 - identification of potential solutions,
 - possible solutions,
 - consequences,
 - benefits of solution.

While the principles identified by the curriculum mirrored the process of the experimental group, the "hands-on" flavour of the first group was not present in the second group. The experiential involvement of group 1 was the essential difference between the groups. The learning components present in problem formulation; reflection, generalization and hypothesis testing had to be developed without the help of the group in the lecture situation.

It is important to note that the C.I. group and the Lecture group were not specifically trained in "problem solving." Although it would be possible for an individual to generalize the provided training to a solution, this study was designed to examine the effects of collective investigation. As stated earlier, once an issue is defined, the problem becomes instrumental. A problem definition is seen as the action-product of the collective investigation process. Solution is generally determined from the consequences of various alternatives of action.

Control Group #2

The non-treatment control group (8 participants) had similar characteristics to the two experimental groups. No treatment

was provided, but this group was both pretested and posttested over the same time period as the other groups.

The next section details the research population and samples used in the study, including homogeneous and heterogeneous characteristics.

Research Population

The research was conducted in Southern British Columbia, using existing groups within the organizational structure of the B.C. Federation of Foster Parent Associations (B.C.F.F.P.A.). These groups volunteer at a local or regional level to provide education, support and advocacy services to other child care givers within their area. There are ten geographic regions with approximately three to ten local associations within each region. The groups are composed of foster parents, social workers and child care workers.

Based upon a random sample (B.C.F.F.P.A., 1987) of 199 individuals of the approximate 2,300 members in the population, the following information is available. The analysis showed

that caregivers who participated in the 1987 B.C.F.F.P.A. survey were between 30 and 50 years old and had completed their high school education, but not college. About half of the respondents had some formal child care education and the majority of the respondents had over two years of experience in child care.

Regional groups invite agency personnel to work within their particular area. All three groups had an equal possibility of assignment into any of the test groups and none of the individuals had prior experience of training in problem formulation before the research study. Respondents were asked to complete a demographic questionnaire to provide information regarding highest formal educational level achieved, formal education related to child care, experience with child care, age and gender.

Description of Research Sample

Tables 4:2, 4:3, 4:4, 4:5, and 4:6 detail the groups demographics regarding completed formal education, formal education related to child care, years of experience, age and gender, respectively.

Table 4:2 Completed Level of Formal Education

	C.I.	Lecture	Control
some high School	2	2	3
High School	2	1	2
Some College or University	2	2	2
Degree	1	2	1
Post Graduate	1	1	0

Table 4:3 Formal Education Related to Child Care

	C.I.	Lecture	Control
Yes	4	5	3
No	4	3	5

Table 4:4 Years of Experience in Child Care

	C.I.	Lecture	Control
under 2	0	0	1
2 - 5	4	3	3
6 - 10	2	2	2
over 10	2	3	2

Table 4:5 Age of Respondents

	C.I.	Lecture	Control
under 30	1	0	0
31 - 40	1	2	3
41 - 50	3	3	5
over 50	3	3	0

Table 4:6 Gender of Respondents

	C.I.	Lecture	Control
Male	3	4	4
Female	5	4	4

The sample group of twenty-four used in this study was representative ($p < .05$) of the larger population of care givers on the following characteristics:

- 50% attended or completed high school education ($r = .45$),
- 23 of the respondents were aged 30 and older ($r = .80$),
- 50% indicated formal child care education ($r = .45$),
- 23 of the respondents had more than two years experience ($r = .80$).

The next section describes the operationalization of the model, presenting how the data were collected across all groups.

Data Collection

Method

Semi-structured interviews were audio-tape recorded. Using a relatively non-directive interviewing style (open-ended questions, paraphrasing, connecting, summarizing) efforts were made to minimize the imposition of structure. Exception to this came from specific interviewer questions intended to clarify and explore broader issues of concern.

All interviews began with the following request:

I'm about to hand you a description of a situation that you might have come into contact with or could come into contact with. Please read the material because I will ask you a few questions afterwards about your opinion of the situation.

Two short case examples were presented face down to the participant, who was asked to choose one. Interviewer questions were:

- 1) Do you think there is a problem here?
- if yes; please outline or define the problem as you perceive it.
- 2) How did you clarify the problem in your mind?
- 3) Can you expand on the steps or the process you took to outline or define the problem?

- 4) You have used some information in defining the problem you have just presented to me. Would you please outline what ideas or information you used?
- 5) How did you decide on what information you would use?
- 6) What kinds of information did you use to come to your decision?
- 7) Describe, if you can, the connection or relationship between the information you used and your description of the problem?
- 8) How did you make the connection between the information you used and your description of the problem?
- 9) Have you used all the information you needed?
- 10) What are the causes (as you see it) of the problem?
- 11) In reflecting back upon your description, can you describe possible consequences of your choice?
- 12) What are the possible benefits of your choice?
- 13) Was previous knowledge necessary to define the problem?
- 14) Are there any unknowns in the problem?
- if yes; please describe.
- 15) Is the problem you have outlined for me similar to past experiences or other problems you have encountered?
- 16) How would you deal with or resolve the issue?
- 17) Can you expand upon the steps or process you would take to deal with or resolve the problem?
- 18) Are you comfortable with your choice of how you would deal with the problem?
- 19) Please outline any other possible solutions you see for the problem?
- 20) Is there anything else you would like to tell me about the problem you have described or anything we have discussed?

Interviews for the pretest groups ended at this point and analysis of content for each interview question began. For reliability, three independent judges were used to verify the number of information items used and the quality of the response (scores). The type of information used was then determined (classification), as was the application of the information (purpose).

All posttest interviews began with the same statement as the pretest, using two similar, but different, case examples for consideration. The items used in the pretest and posttest cases (age of the child, gender, possible ethnic issues, child behaviour) were correlated. The Pearson correlation between the primary researcher and the first judge was .92; the second, .91; and the third, .91 ($n=4$, $p<.05$). Interview questions were identical. Individuals involved in both the C.I. group and the Lecture group were then asked to describe factors that were perceived to be helpful or hindering in their personal learning. The next section describes the test reliability.

Test Reliability

Three independent judges scored the transcribed interviews according to: 1) the production of items of information,

application of information used in problem formulation, contextual variables considered and problem solution specified and, 2) the quality of the response in relation to the SOLO taxonomy. The judges were:

- a graduate student in the faculty of Social Work at U.B.C.,
- the Executive Director of the B.C.F.F.P.A., and
- a District Manager of the Ministry of Social Services and Housing.

These "assistants" were trained in the use of the research instrument and were not involved in any previous facet of the research. The Pearson correlation of production of information between the primary researcher and the first judge was .87; the second, .89; and the third, .88; (n=4, $p < .05$). These figures are quite acceptable for data of this kind (Biggs and Collis, 1982).

After the informational items produced by the respondents were compiled, the raw scores were reduced to classes according to the "type" of information that each item represented: 1-Occupational specific information; 2-Knowledge of self and; 3-Knowledge of Others. It can be noted that the researcher-judge agreement increased with this categorization.

The correlation of production of information between the primary researcher and the first judge was .94; the second, .95; and the third, .94, (n=4, p<.02).

Biggs and Collis (1982) believe interjudge reliability of response is crucial for the SOLO Taxonomy. The agreement regarding the levels of the SOLO taxonomy were also satisfactory as Table 4:7 illustrates.

Table 4:7 Averaged Interjudge Agreement (SOLO)

	Agree	Half Level Diff.	One Level Diff.	More than One Level
N	253	25	8	2
percent	88	8	3	1

Eighty-eight percent of the transcribed interviews were coded the same way, with a half-level difference being the next most common, one level next and more than one level in only 1% of the cases. The correlation of the SOLO measures between the primary researcher and the first judge was .88; the second, .89; and the third, .88; (n= 4, p<.05) respectively. This level of agreement is considered to be acceptable according to Biggs and Collis (1982).

To this point, this chapter has presented, in order: the instrument development, data collection, research design, presentation of the population and research sample, and data collection. The next section lists the research hypotheses that were tested and the analysis used, in preparation for Chapter 5, which will present the results of the study.

Hypotheses

The nine null hypotheses listed below are in the order in which the testing is reported in Chapter 5.

- H1: The difference of adjusted means of the groups in produced information does not significantly vary.
- H2: The difference of adjusted means of the groups in occupational specific information does not significantly vary.
- H3: The difference of adjusted means of the groups in knowledge of self does not significantly vary.
- H4: The difference of adjusted means of the groups in knowledge of others does not significantly vary.
- H5: The difference of adjusted means of the groups in problem formulation does not significantly vary.

- H6: The difference of adjusted means of the groups in identification of contextual variables does not significantly vary.
- H7: The difference of adjusted means of the groups in problem solution does not significantly vary.
- H8: The difference of adjusted means of the groups on the SOLO measure does not significantly vary.
- H9: There will be no significant difference of scores between the experimental groups on factors that were perceived to be helpful or hindering in the subject's learning.

Specific Definitions

Produced information - The stated information items used by the participants. Participants may respond to the case examples by using three types of information items: 1) irrelevant items, 2) relevant items contained in the original case example, and 3) relevant items and principles that are not given but which are implicit. (Biggs and Collis, 1982)

Occupational specific information - One subset of produced information which includes; appropriate child welfare knowledge, child development/behaviour information and knowledge of governmental policies and procedures.

Knowledge of self - A second subset of produced information which includes; recognition of prior educative information; awareness of personal attitudes, values and abilities.

Knowledge of others - The third subset of produced information which includes; organizational and professional responsibilities, societal, cultural and familiar information items.

Problem formulation - Adaptation or recombination of information items into a structure for problem definition.

Identification of contextual variables - Ability to identify environmental determinants which may effect problem formulation strategy.

Problem solution - Alternative ways of dealing with or resolving presented problems.

SOLO measure - Structure of participant responses to specific tasks which may relate to generalized information processing.

Factors perceived to be helpful or hindering - Participant beliefs regarding the usefulness of educative approach.

Analysis

One-way ANCOVA with one covariate, the pretest, was used as the method of analysis for eight of the hypotheses. Given the small sample size, the covariate was used to achieve a more sensitive test of the hypotheses, as pretest scores were similar, but not equal.

Conceptually, the covariate is viewed as an attribute of individuals who belong to two or more groups. Assuming the within-groups regression coefficients are homogeneous, one may test differences among groups after adjusting for, or partialing out, the effect of the covariate (Pedhazur, 1982, p.541).

In this study, the data fulfil these requirements (see Appendix F), as there is homogeneity of variance (within chance, the regression lines have the same slope). A separate independent-samples t test was used to test the ninth hypothesis regarding participant' perceptions.

Cook and Campbell (1983) caution against the use of ANCOVA in quasi-experimental studies without including a description of the possible measurement error and assumed selection differences. In this case, the pretest and posttest are operationally identical measures, as the same questions were used. It is believed that the research design and instrumentation used minimized possible bias from fatigue and maturation. Possible selection differences are minimized by similarities of demographics, (formal education, occupational specific education, experience, age, and gender), research settings (community based, informal) and volunteer orientation. While the relatively short time span (approximately one week) between tests reduced possible trait instability, it may have increased possible pretest sensitization effects. The participants were asked about possible behaviour change and as far as it is known, the structure of behaviours of the participants did not change during the test period.

Table 4:8 lists the summary of the hypotheses under consideration and corresponding statistics and tests which are presented in Chapter 5.

Table 4:8 Summary of Hypotheses and Tests

Hypotheses		Raw Score	ANCOVA	t test
Production of Information	H1	x	x	
Specific Classification of Information	H2 - H4	x	x	
Application of Classes	H5 - H7	x	x	
SOLO Taxonomy	H8	x	x	
Participant perceptions	H9	x		x

x - included in content of chapter 5

CHAPTER 5

RESULTS

The five sections of this chapter present the results as illustrated by Table 4:8, concerning: 1) total production of information, 2) classification of information, 3) participant application of classes, 4) SOLO scoring, and 5) participant perceptions of educative approach.

Total Production of Information

Table 5:1 lists each participant's raw pretest and posttest scores, including means and standard deviations for the three groups. The alphabetic letters indicate the individual participants.

Table 5:1 Total Production of Information

	C.I.		Lecture		Control	
	pre	post	pre	post	pre	post
B	100	154	J 51	60	S 78	75
C	82	105	K 70	77	T 70	70
D	120	93	L 58	58	U 95	101
E	124	135	M 75	67	V 96	90
F	52	98	N 161	155	W 71	38
G	88	94	O 94	94	X 185	203
H	186	207	Q 130	125	Y 53	44
I	116	161	R 109	94	Z 70	66
	---	---	---	---	---	---
	868	1047	748	730	718	687

Pretest:

	C.I.	Lecture	Control
Mean	108.5	93.5	89.8
S.D.	36.8	35.5	38.3

Grand Mean 97.3, S.D 37.8

Posttest:

	C.I.	Lecture	Control
Mean	130.9	91.3	85.9
S.D.	34.4	31.8	48.4

Grand Mean 102.3, S.D. 39.5

With the exception of respondent "D," there is a general consistent increase in production of information for the C.I. group. Scores in both the Lecture and Control group either increased or decreased. While the mean difference between the pre-posttest scores of the Lecture group and the Control group remained relatively the same, the mean difference of the C.I. group increased substantially. As noted, respondent "D" is the only C.I. participant to decrease on this measure of production of information. "D" describes herself as "a neurotic mother with a 10 year old daughter." One of the posttest interview questions describes a sexual assault against a 10 year old daughter, which may have triggered an emotionally reactive response, accounting for the poor posttest result of this subject.

H1: The difference of adjusted means of the groups in produced information does not significantly vary.

Table 5:2 provides an ANCOVA summary of the results of a comparison of the difference of adjusted means of the three test groups.

Table 5:2 Summary Table of Adjusted Y Sums of Squares and Variances for Total Production of Information

Source	df	SS Errors of Estimate	Mean Square	F	p
Adjusted Y Between Groups	2	3361.1	1680.5	4.9	<.05
Adjusted Y Within Groups	20	6813.2	340.7		
Total	22	10174.3			

	C.I.	Lecture	Control
Original Y means	130.9	91.3	85.9
Adjusted Y means	119.8	95.1	93.3

As the F-ratio demonstrated a significant difference, a correlated-samples t test was used to compare the adjusted means of the three groups. Table 5:3 shows the relationship. The analysis indicated that participants in the C.I. group demonstrated significantly greater gains in production of information when compared to the Lecture and the Control groups. The differences between the Lecture group and the Control group are not significant.

Table 5:3 t Test (Production of Information)

Groups	t score	p value
C.I. - Lecture	+2.57	<.02
C.I. - Control	+2.76	<.01
Lecture - Control	+ .19	*

* not significant at .05 level

The next section of this chapter examines the data by classification of the production of information.

Information Classification

The informational items assessed by the panel of judges were categorized according to: 1-Occupational specific information; 2-Knowledge of self and 3-Knowledge of others. This section presents the raw scores and ANCOVA results for each of the three classes.

Occupational Specific Information

Occupational information relates to appropriate child development/behaviour information, child welfare knowledge, knowledge of Ministry of Social Services and Housing (M.S.S. & H) policies, practice, and support services. Table 5:4 lists the pre and posttest responses classified as occupational specific information by individual and group. Means and standard deviations for the pre and posttest are included.

Table 5:4 Occupational Specific Information

		C.I.		Lecture		Control		
		pre	post	pre	post	pre	post	
B	83	111	J	39	48	S	52	51
C	58	70	K	53	63	T	42	47
D	81	68	L	32	33	U	70	72
E	72	99	M	55	57	V	76	67
F	36	74	N	116	120	W	48	20
G	79	85	O	74	81	X	143	159
H	139	163	Q	101	112	Y	39	27
I	89	138	R	91	61	Z	54	50
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		637	808	561	575	524	493	

Pretest:

	C.I.	Lecture	Control
Mean	79.6	70.1	65.6
S.D.	27.5	28.4	31.6
Grand Mean	71.8, S.D. 29.2,		

Posttest:

	C.I.	Lecture	Control
Mean	101.0	71.8	61.6
S.D.	32.3	28.5	40.3
Grand Mean	78.1, S.D. 33.7,		

Almost every individual in the C.I. group increased production of information related to specific occupation information. The majority of the Lecture group scores also increased, but to a lesser extent, while the majority of the Control scores decreased in occupational specific information. The group mean of the C.I. group substantially increased, and both the Lecture and Control remain almost consistent.

Only three respondents; "D," "R" and "W," demonstrated a substantial decrease in posttest results. Respondent "D" has been mentioned previously. Respondent "R," stated that he "picks information from a problem...on gut feelings...you sort of get angry...it sort of builds up inside... and you decide." The posttest score of respondent "W" was almost 50% lower than the pretest. That individual described "criteria of importance from a moral basis" and reacted very emotionally to the issue of sexuality.

H2: The difference of adjusted means of the groups in occupational specific information does not significantly vary.

Table 5:5 summarizes the ANCOVA statistics on occupational specific information.

Table 5:5 Summary Table of Adjusted Y Sums of Squares and Variances for Occupational Information

Source	df	Sums of Squares of Errors of Estimate	Mean Square	F	p
Adjusted Y Between Groups	2	2543.2	1271.6	5.1	<.05
Adjusted Y Within Groups	20	4996.4	249.8		
Total	22	7539.6			

	C.I.	Lecture	Control
Original Y means	101	71.9	61.6
Adjusted Y means	92.3	73.8	68.4

The C.I. group showed a significantly greater increase than the Lecture group and the Control group (see Table 5:6). Again the difference between the Lecture group and the Control was not significant.

Table 5:6 t Test (Occupational Specific Information)

Groups	t score	p value
C.I. - Lecture	+2.1	<.05
C.I. - Control	+2.9	<.01
Lecture - Control	+ .7	*

* not significant at .05 level

Knowledge of Self

The second information classification category to be examined was that of knowledge of self. This class of response includes knowledge of boundaries for self and others, personal attitudes and abilities, recognition of prior educative information and relationship of caregiver to foster child and own family. Table 5:7 presents the raw scores for this category.

Table 5:7 Knowledge of Self

		C.I.		Lecture		Control		
		pre	post	pre	post	pre	post	
B	1	15	J	1	2	S	16	8
C	9	19	K	6	5	T	23	16
D	6	7	L	13	10	U	6	7
E	22	22	M	11	8	V	6	7
F	4	3	N	19	17	W	12	9
G	0	0	O	9	3	X	12	24
H	23	26	Q	9	2	Y	1	2
I	11	11	R	5	15	Z	1	3
	--	--		--	--		--	--
	76	103		73	62		77	77

Pretest:

	C.I.	Lecture	Control
Mean	9.5	9.1	9.6
S.D.	8.3	5.1	7.1
Grand Mean	9.4, S.D. 6.8,		

Posttest:

	C.I.	Lecture	Control
Mean	12.9	7.8	9.6
S.D.	8.6	5.5	6.7
Grand Mean	10.1, S.D. 6.9,		

The group mean pretest scores are very similar on the knowledge of self variable. There was a slight increase in the mean posttest score of the C.I. group and a slight decrease in the Lecture group. Most individuals in the C.I. group increased their use of, or maintained the use of, information in this class. It is interesting to note that Respondent "B" increases dramatically in this category. This individual describes her strategy as one of "observing things in the child's behaviour...I have made some interpretations in order to identify the issue...putting it in categories, weighing it and then dealing with it by examining the consequences of their actions."

Most of the scores of the respondents in the Lecture group decreased in the use of knowledge of self, while many of the Control showed a slight increase. Respondent "X," who showed the greatest increase among the control subjects, describes a different selective encoding process at the time of the posttest; "I visualize the scene as an observer and it's like watching an act before me...I relate it to situations or past experiences...putting myself in the position of the person to draw conclusions and come to one that felt comfortable."

H3: The difference of adjusted group means in knowledge of self does not significantly vary.

Table 5:8 details the ANCOVA results.

Table 5:8 Summary Table of Adjusted Y Sums of Squares and Variances for Knowledge of Self

Source	df	SS Errors	Mean Square of Estimate	F	p
Adjusted Y Between Groups	2	98.5	49.3	1.7	>.05
Adjusted Y Within groups	20	595.9	29.8		
Total	22	694.4			

	C.I.	Lecture	Control
Original Y means	12.9	7.8	9.6
Adjusted Y means	12.8	8.0	9.7

The F-ratio is not significant, preventing the rejection of the hypothesis. The next part of this section examines the third classification of produced information, knowledge of others.

Knowledge of Others

This measure includes: knowledge of organizational policies and procedures and the professional relationship to colleagues and resources. Also included are items regarding societal concerns, cultural and heritage issues as well as perceived relationships, such as the child and his or her family of origin and the caregiver's family and the child. Table 5:9 lists the individual's pre and posttest scores in the category of knowledge of others (including means and S.D.).

Table 5:9 Knowledge of Others

		C.I.		Lecture		Control		
		pre	post	pre	post	pre	post	
B	16	28	J	16	10	S	10	16
C	15	16	K	11	9	T	5	7
D	33	18	L	13	15	U	19	21
E	30	14	M	9	2	V	14	16
F	12	21	N	31	18	W	11	9
G	9	9	O	11	10	X	30	20
H	24	18	Q	10	11	Y	13	15
I	16	12	R	13	18	Z	15	13
	--	--		--	---		--	--
	155	136		114	93		117	117

Pretest:

	C.I.	Lecture	Control
Mean	19.4	14.3	14.6
S.D.	8.1	5.0	6.9
Grand mean	16.1, S.D. 6.7		

Posttest:

	C.I.	Lecture	Control
Mean	17	11.6	14.6
S.D.	5.6	5.0	4.6
Grand Mean	14.4, S.D. 5.1		

There is a general decrease in production of information involving knowledge of others in the C.I. group and the Lecture group. The scores in the Control group either increase or decrease, but the pre and posttest means for this group are identical. The grand mean also decreases slightly in the posttest. Respondent "N," who showed the greatest decrease, reported using the problem formulation strategy of "whatever stuck my brain as being the most important part of it would be considered the issue...based on personal experience...through your own past experience, something that relates to the problem...what hits hardest," relying on emotional reaction.

H4: The difference of adjusted means of the groups in knowledge of others does not significantly vary.

Table 5:10 presents the test summary for this classification.

Table 5:10 Summary Table of Adjusted Y Sums of Squares and Variances for Knowledge of Others

Source	df	SS Errors	Mean Square of Estimate	F	p
Adjusted Y Between groups	2	56.4	28.2	1.2	>.05
Adjusted Y Within groups	20	479.1	24		
Total	22	535.5			

	C.I.	Lecture	Control
Original Y means	17	11.6	14.6
Adjusted Y means	15.9	12.2	15.1

Again, it is impossible to reject the fourth hypothesis given the F-ratio of the ANCOVA. Collective investigation seems not to result in an increase of information concerning knowledge of others in this study.

Conclusion

The process of collective investigation promoted significant change in the area concerned with specific occupational

information. Change in the other two information classes, knowledge of self and knowledge of others, were not significant. The next section deals with the application of the produced information.

Participant Application of Information

The interview questions were designed to reflect three areas of research concern: problem formulation, participant identification of contextual variables used in formulation of an issue and problem solution. The following sections report the raw scores on production of information in these three areas.

Problem Formulation

Problem formulation refers to the adaptation or recombination of information items into an individualistic structure for problem definition. Table 5:11 lists the participant pretest and posttest scores applied to problem formulation along with means and S.D..

Table 5:11 Raw Score (Problem Formulation)

	C.I.		Lecture		Control			
	pre	post	pre	post	pre	post		
B	44	75	J	19	21	S	34	36
C	38	64	K	30	30	T	28	23
D	52	59	L	24	20	U	34	37
E	50	64	M	24	26	V	44	34
F	18	31	N	52	41	W	20	10
G	32	47	O	33	27	X	74	102
H	80	102	Q	46	41	Y	16	16
I	53	75	R	36	35	Z	22	12
	---	---		---	---		---	---
	367	517		264	241		272	270

Pretest:

	C.I.	Lecture	Control
Mean	45.9	33.0	34.0
S.D.	19.5	10.6	17.3
Grand mean	38, S.D. 15.8		

Posttest:

	C.I.	Lecture	Control
Mean	64.6	30.1	33.8
S.D.	19.6	7.7	27.7
Grand mean	42.8, S.D. 18.3		

All of the C.I. group increased in the use of information for problem formulation. By comparison, the majority of the scores of the Lecture group decreased in this application, while half of the control showed small increases. The group mean of the C.I. group increased, while both the Lecture and the Control remained relatively consistent. Respondent "I," who showed a large gain on this variable, stated: "I analyze all the facts...absorb them, adopt the information, review everything I have heard and try to analyze it...priorize everything and try to get the most important fact out...once I've decided that a solution is needed, try to go through and find out what the causes are and how solutions should be instituted."

H5: The difference of adjusted means of the groups in problem formulation does not significantly vary.

Table 5:12 explores the relationship further.

Table 5:12 Summary Table of Adjusted Y Sums of Squares and
Variances for Problem Formulation

Source	df	SS Errors of Estimate	Mean Square	F	p
Adjusted Y between groups	2	1174.4	587.2	7.5	<.05
Adjusted Y within groups	20	1571	78.6		
Total	22	2745.4			

	C.I.	Lecture	Control
Original Y means	64.6	30.1	33.8
Adjusted Y means	51.9	37.1	39.4

As the F-ratio demonstrated a significant difference, further t tests were again used to compare the adjusted means of the three groups. The analysis showed that the C.I. group had significantly greater gains in problem formulation than the Lecture group and the Control. The difference between the Lecture and Control was not significant. Table 5:13 lists these comparisons. The fifth hypothesis can be rejected as problem formulation is positively affected by a collective investigation approach in this study.

Table 5:13 t Test (Problem Formulation)

Groups	t score	p value
C.I. - Lecture	3.1	<.02
C.I. - Control	2.6	<.01
Lecture - Control	-.5	*

* not significant at .05 level

The next part of this section deals with the participant identification of contextual variables for problem formulation.

Identification of Contextual Variables

This relates to the participants' ability to identify contextual determinants which effected their problem formulation strategy. Table 5:14 lists the individual scores and summary statistics on this variable.

Table 5:14 Raw Score (Contextual Variables)

	C.I.		Lecture		Control			
	pre	post	pre	post	pre	post		
B	45	53	J	22	23	S	26	25
C	30	24	K	25	35	T	32	30
D	53	24	L	22	23	U	40	41
E	53	45	M	31	28	V	40	35
F	20	39	N	65	68	W	37	17
G	27	25	O	45	46	X	76	64
H	57	62	Q	28	30	Y	12	14
I	40	72	R	61	56	Z	32	26
	---	---		---	---		---	---
	325	344		299	309		295	252

Pretest:

	C.I.	Lecture	Control
Mean	40.6	37.4	36.9
S.D.	12.8	16.3	17.1

Grand mean 38.3, S.D. 15.4

Posttest:

	C.I.	Lecture	Control
Mean	43.0	38.6	31.5
S.D.	17.2	15.4	14.8

Grand mean 37.7, S.D. 15.8,

Many of the participants in the C.I. group and the Control decreased in the use of contextual variables, while most of the Lecture group increased slightly. Grand means are almost identical.

H6: The difference of adjusted means of the groups in use of contextual variables does not significantly vary.

Table 5:15 illustrates the ANCOVA summary and findings.

Table 5:15 Summary Table of Adjusted Y Sums of Squares and Variances for Contextual Variables

Source	df	SS Errors of Estimate	Mean Square	F	p
Adjusted Y Between groups	2	326.1	163.1	1.3	>.05
Adjusted Y Within groups	20	2590.6	129.5		
Total	22	2916.7			

	C.I.	Lecture	Control
Original Y means	43	39	32
Adjusted Y means	41.2	39.7	33

No significant difference across the three groups was found, preventing rejection of the hypothesis. The next part of this section concludes the analysis of the produced information.

Problem Solution

Problem solution refers to the alternative ways of dealing with or resolving the presented problem. Table 5:16 lists the individual scores (and summary statistics) of the information applied to problem solution.

Table 5:16 Raw Scores (Problem Solution)

	C.I.		Lecture		Control			
	pre	post	pre	post	pre	post		
B	11	26	J	10	16	S	18	14
C	14	17	K	15	12	T	10	17
D	15	10	L	12	15	U	21	23
E	21	26	M	20	13	V	12	21
F	14	28	N	44	46	W	14	11
G	19	22	O	16	21	X	35	37
H	49	43	Q	35	23	Y	25	14
I	33	14	R	33	34	Z	16	28
	---	---		---	---		---	---
	176	186		185	180		151	165

Pretest:

	C.I.	Lecture	Control
Mean	22.0	23.1	18.9
S.D.	12.0	11.7	7.6

Grand mean 21.3, S.D. 10.4

Posttest:

	C.I.	Lecture	Control
Mean	23.3	22.5	20.6
S.D.	9.5	11.1	8.1

Grand mean 22.2, S.D. 9.6

The majority of individuals in all the groups increased slightly in this category. Pretest and posttest means are very similar for all groups.

H7: The difference of adjusted means of the groups in problem solution does not significantly vary.

Table 5:17 lists the test summary.

Table 5:17 Summary Table of Adjusted Y Sums of Squares and Variances for Problem Solution

Source	df	SS Errors of Estimate	Mean Square	F	p
Adjusted Y Between groups	2	9.5	4.9	.1	>.05
Adjusted Y Within groups	20	1937.1	96.9		
Total	22	1946.6			

	C.I.	Lecture	Control
Original Y means	23.3	22.5	20.6
Adjusted Y means	23.6	21.9	21.5

As evidenced by Table 5:17, produced information seems not to be applied to problem solution in this study.

Conclusion

Statistical analyses support the conclusion that participation in the collective investigation process positively affects problem formulation. Information was not applied to identification of contextual variables or used for problem solution. The next section presents the analysis of the quality of participant response.

SOLO Taxonomy (Raw Scores)

Table 5:18 lists the pretest and posttest scores of the participants according to the SOLO Taxonomy, including means and standard deviations.

Table 5:18 SOLO Taxonomy Scores

		C.I.		Lecture		Control		
		pre	post	pre	post	pre	post	
B	19.5	24.25	J	18	20	S	21.5	22.25
C	21	22.5	K	19.25	17.5	T	19	19
D	23	19	L	17.5	18.5	U	24	23.5
E	25.25	25.25	M	20.5	16	V	24	22.75
F	18	21.5	N	23	24.25	W	21	17
G	20	19.25	O	22.25	21.25	X	24.75	23.75
H	26.75	26.75	Q	19.5	22.5	Y	14.5	12
I	21	22	R	21	18	Z	18.75	19
---		---	---		---	---		---
		174.5	180.5	161	158	167.5	159.3	

Pretest:

	C.I.	Lecture	Control
Mean	21.8	20.1	20.9
S.D.	2.8	1.8	3.2

Grand Mean 21, S.D. 2.8

Posttest:

	C.I.	Lecture	Control
Mean	22.6	19.8	19.9
S.D.	2.6	2.6	3.8

Grand Mean 20.7, S.D. 3.3

Individual pre and posttest scores within the groups varied. Group means are very similar and the observed range difference between groups was small.

H8: The difference of adjusted means of the groups on the SOLO measure does not significantly vary.

Table 5:19 presents the test summary.

Table 5:19 Summary Table of Adjusted Y Sums of Squares and Variances for SOLO Taxonomy

Source	df	SS Errors of Estimate	Mean Square	F	p
Adjusted Y Between Groups	2	16.6	8.3	1.5	>.05
Adjusted Y Within Groups	20	113.8	5.7		
Total	22	130.4			

	C.I.	Lecture	Control
Original Y means	22.6	19.8	19.9
Adjusted Y means	22	20.4	19.9

The F-ratio is not significant, preventing rejection of the hypothesis. Quality of response appears not to be effected by collective investigation. The next section will present a different facet of the research regarding the participant perceptions of the educative approach.

Participant Perceptions of Educative Approach

To continue exploration of the educative approach, a separate independent-samples t test was conducted on the C.I. group and the Lecture group. Participants were asked to identify factors that they perceived to be helpful or hindering in their learning, which are listed in Table 5:20. To be included, the factors had to be mentioned by at least two of the eight people in the group as suggested by Borgen and Amundson (1984).

H9: There will be no significant difference of scores between the experimental groups on factors that were perceived to be helpful or hindering in the subject's learning.

Table 5:20 Identified Helpful Factors

Factors	C.I.	Lecture
Group interaction	8	-
Content of workshop	8	-
Facilitator Style	7	-
Structured approach to problems	7	-
Group activities	6	-
Lecture style	-	3
Information about problem solving	-	2
Positive attitude	-	2
Total	36	7

Individuals in the C.I. group did not identify any factors which they considered to be hindering to their learning. The majority of individuals were able to identify several helpful factors involving group participation, facilitator style and a structured approach to problems. By comparison, fewer participants of the Lecture group identified helpful factors. Five individuals from the Lecture group claimed no learning occurred and consequently were unable or unwilling to state hindering or helpful factors. For those who chose to respond, lecture style and content was considered helpful.

Obviously, while such information is highly subjective, it is interesting to note that a substantial difference exists between the perceptions of the two groups. The individuals in the C.I. group perceived the activities and structured interaction to be beneficial to their learning ($t=8.7$, $df=6$, $p<.001$). Consequently, the ninth and final hypothesis may be rejected. The next section summarizes the chapter, in preparation for the interpretation of the results, to be presented in Chapter Six.

Summary

ANCOVA was used to test 9 separate hypotheses about the effects of the collective investigation process on individual's ability to formulate problems. Table 5:21 presents the numbered null hypotheses, between group comparisons and corresponding p value.

Table 5:21 Summary of Hypotheses

Hypotheses	Between groups	p value	rejection of null
H1	C.I. - Lecture C.I. - Control	<.05 <.02 <.01	yes
H2	C.I. - Lecture C.I. - Control	<.05 <.05 <.01	yes
H3		>.05	no
H4		>.05	no
H5	C.I. - Lecture C.I. - Control	<.05 <.02 <.01	yes
H6		>.05	no
H7		>.05	no
H8		>.05	no
H9	C.I. - Lecture	<.001	yes

In a strict sense, four hypotheses can be rejected. However, the results indicated a consistent slight tendency for the C.I. group to out perform the Lecture and Control groups on the remaining five measures. Only knowledge of others decreases for both the C.I. group and the Lecture group.

- The "production of information" variable does appear to be positively effected by collective investigation. The C.I. group showed significantly greater gains than did either the Lecture or the Control groups. No difference was found between the Lecture group and the Control.

- The "produced information" variable was categorized into three classes. Significant results were seen in occupational specific information. Subsequent t tests indicated the C.I. group showed greater increases than either the Lecture or the Control groups. Again the t score between the Lecture and Control groups was not significant.

- The "application of the information" variable was also categorized into three sub-measures. Significant results were seen in problem formulation. The C.I. group showed greater gains than either the Lecture group or the Control group. No difference existed between the Lecture and Control groups.

- The t test comparing the C.I. and the Lecture groups on the "participant perception of educative process" variable was also significant.

As a consequence of these analyses, the original research question can be answered with confidence. The collective investigation experience in this study promotes increased production of specific, occupational information, used for problem formulation. The next chapter interprets the results.

CHAPTER 6

DISCUSSION and CONCLUSION

Summary of Study

This study focused attention on a group educative process, collective investigation. The literature in the area generally claims broad and sweeping learning outcomes. A methodological problem with much of the previous research was that these studies relied on data collected only after the process had occurred, raising questions concerning the validity of the findings. This study overcame this problem by collecting data before and after treatment. Another important methodological decision for this study was to collect data from a group exposed to problem formulation through a didactic lecture, supplemented by pre-readings. In this manner, "pure" lecture techniques were compared to collective investigation. As stated before, this was to use the Lecture group as a form of control.

The C.I. facilitator challenged participants to examine their existing conceptualizations for internal consistency, representation of validity and reflection of the "actual" world. Within an atmosphere based upon trust and relationships of

mutual respect for the perceptions and opinions of those participating, the C.I. facilitator acted as a "critic." Participants were asked to discuss problems for which their prior knowledge was appropriate and adequate. Activities within the group were aimed at the development of understanding and interpretation. Consequently, there was a high degree of interpersonal sharing of participants' reactions and meanings.

This communication pattern can be contrasted with the lecturer to the didactic group. Teaching was approached as a transmission of information procedure to be accomplished as quickly and efficiently as possible through control of the participant behaviour and learning conditions. Discussion was primarily question and answer, allowing participants to clarify communication. The lecture format was directed towards acquisition of verbal information and communication was highly centralized, as one person (the facilitator) directed message flow.

Nine research hypotheses centered around learner information-production and problem formulation strategies that were investigated. The sample consisted of three groups of eight caregivers employed within the child welfare system of British Columbia. One group was involved in an intensive C.I. workshop, stressing participant interaction. The second group

was exposed to a didactic lecture using problem formulation as the content. The third group received no treatment.

ANCOVA was used to analyze the test results with a pre-selected significance level of .05. The results were significant in several instances, allowing for the rejection of four of the original nine null hypotheses. However, in all nine instances the C.I. group scored the highest, suggesting a possible trend.

The remaining sections of this chapter will present an interpretation of the data, including selected theoretical considerations. This will be followed by a discussion of the limitations of the study, the overall implications of the results to the theory and practice of adult education and finally, suggestions for further research.

Interpretation of Hypotheses Testing

Total Production of Information (H1)

Participants in the C.I. group demonstrated significantly greater gains in production of information than the Lecture group and the Control group. This result is discussed in terms of:

- the nature of the group structure,
- diffusion of innovations within a group, and
- experiential learning.

Nature of Group Structure

The nature of the C.I. group created a decentralized information flow which may have affected the communication networks of the group. Another possible effect of low centrality and nonauthoritarian leadership is increased group morale (Colleta, 1976). Although this study did not specifically address morale, the significant scores regarding participant perception of the C.I. process and content imply the group well-being was consistently high as a result of the experience. The next section addresses the issue of information flow in small groups.

Diffusion of Innovations

An interpretation of the results may relate to the process by which information is communicated among group members. As discussed in the literature review, learning requires more than presentation of knowledge as the learners actively make decisions regarding acceptance or rejection of new information

(Jarvis, 1987). New information concerning innovations (collective investigation) may create uncertainty related to the expected consequences of adopting and using the concepts to be learned. People can seldom be certain that an innovation represents a superior alternative to previous practice. The cognitive operation of evaluation is concerned with decisions about the "goodness" of items of information. Evaluation "weighs" the presented information and makes judgements regarding it.

Appropriate methods of adult education provide an opportunity for reducing uncertainty and developing information processing. The information embodied in the innovation (collective investigation) represents the possible solution to the group's problems, providing learning motivation. Once the educational process has reduced the uncertainty about the expected consequences to a tolerable level, the participant's decision concerning adoption or rejection of the concept can be made (Rogers and Kincaid, 1983).

The perception of the relative advantage of the innovation is compared to existing values, past experience and needs. C.I. provided an opportunity for peer discussion and evaluation, increasing the "observability" of the process and likelihood of adoption. The act of discussion uses communication which implies relationships as the individuals are linked by the flow

of patterned information to form networks (Rogers and Kincaid, 1983). The more communication that occurs (particularly on meaningful content), the more likely they are to develop personal bonds and group integration. Using Figure 5, the bonding and group dynamics can be seen as contextual variables (Box D of model), and as such may impact the collective investigation process. Complexity of the process (perceived difficulty of use) and the degree to which the innovation may be experimented with are other factors affecting adoption.

The didactic lecture did not permit practice and consequently, the content may have been seen as too complex or of no use to the participants. The lecture method is somewhat limited, relying on the strengths of the pre-readings and presentation style of the facilitator to stress the importance of basic facts or associations. Ideally, the competent facilitator makes the content meaningful and intrinsically motivating through definition of the problem, specified instructional objectives and specified situations. This may provide the opportunity for increased attention to stimuli, beginning the process of information encoding. By prompting response, question and answers may provide immediate feedback and learning reinforcement.

Experiential Learning

If one accepts the research results, the diffusion process of the C.I. group may have created the opportunity for improved information discovery and transformation within the framework of experiential learning. While the goals of experiential learning emphasize personal growth, the techniques can be applied to unlimited content. Kolb (1984) believes experiential learning occurs through adaptive dialectics, creating confrontation between the individual's conceptual interpretation and symbolic representation of social reality. This may, as discussed in the literature review, occur through the connecting of the ideas which are part of the original experience and those which have resulted during reflection upon existing knowledge and attitudes (Guildford, 1965). New information is associated with those elements of the pre-existing knowledge that are relevant. The situation commonly serves as a cue for retrieval in any content area. It is useful that as many distinct associations be made as possible, as immediate connections might not lead to new conceptions and learning (Boud et al, 1985). Returning to Figure 5, collective investigation uses techniques of brain-storming, psychoanalytic free association, creative drama or structured experiences to generate divergent thought for

processing. The cognitive strategies (Box B of the model) used to generate divergent thought may influence individual construction of meaning (Box A) and/or operationalization of problem formulation (Box C). In this relationship, the interactive effects of the model can be seen.

A note of caution should be interjected at this point. While the C.I. group showed greater gains in production of information, one wonders about the choice of the information. It is possible that group pressure to conform may have distorted individual perception. As a result of group consensus, individuals may have considered their views to be incorrect and judged the group to be correct, affecting both their decisions and the test results. Although participants claimed not to be influenced by "experts" within the group, C.I. may produce social conformists rather than "critical thinkers."

Type of Information Produced (H2-H4)

The classification of information can be seen as a subset of total information production. The three hypotheses were tested regarding: 1) specific occupational information, 2) knowledge of self, and 3) knowledge of others. Of these, only occupational information significantly changed. The C.I. group showed a significantly greater increase than the Lecture group and the Control group. This result is discussed in terms of:

- work role & identity, and
- personal power.

Work Role and Identity

The first consideration of why only one type of information changed may relate to the work role and participant motivation for requesting the workshops. Posttest interviews determined that all of the participants came to the workshops to learn task related information. Work or an occupation can be seen to represent an important life event in terms of interpersonal involvement, personal sense of satisfaction and self-identity (Gelphi, 1979). Concerned practitioners may have become disturbed if they were unable to account for processes they perceive as central to their professional competence (Schon, 1983). As stated earlier, this uncertainty may have contributed to adoption of the presented innovations.

Personal Power

The second consideration related to work role and identity involves the development of personal power. Returning to the

framework (Figure 5), it can be seen that through problem formulation (Box C), participants may have recognized the extend of possible action and modified their previous knowledge (construction of meaning - Box A) according to new expectations.

The C.I. group controlled the process and content of the workshop, choosing to deal with work related issues. A positive view of the group control establishes a basis upon which to develop conditions for learning, namely, confirmation of their past experience and empowerment. Personal confirmation may have occurred through the development of the communication network, as individuals shared information. All of the participants in the C.I. group acknowledged that group interaction was helpful to their learning.

Critical examination of occupational information enables the development of personal power, which can be connected to the concept of internal locus of control. This relates to the extent to which individuals see themselves as manipulated by their environment, as contrasted with taking direct action designed to influence their surroundings. Individuals may have taken responsibility for helping the group to formulate common objectives and taken initiative in providing members of the group with the means for achievement. Internally controlled persons tend to see themselves as controlling reinforcements and consequently, influencing their life condition and meaning.

The context of professionalism and increased competence could then be a factor in understanding the different amounts of change in the three categories of information studied. The content of the workshop and the structured approach to the problems was mentioned by the majority of C.I. participants as helpful learning factors. Occupational information was mentioned more, leading to greater effects. The affiliation motive and co-operative work related concerns may have focused individual growth toward development of occupational goals. Personal control and knowledge of others is limited while knowledge of self and control of work is more accessible for individual intervention. Individuals could test the implications of developed hypotheses within the relative safety of the group situation.

Application and Use of Information (H5 -H7)

The three hypotheses tested: 1) problem formulation, 2) identification of contextual variables and 3) problem solution. All three represent possible applications of produced information. As with hypotheses 2 - 4, only one application of information significantly changed. The analysis showed that the C.I. group had significantly greater gains in problem formulation than the Lecture group and the Control group. The

"one out of three" issue can be easily understood as neither the C.I. group nor the Lecture group were trained in contextual identification procedures and problem solution techniques. The workshop ended at the point of definition of problem, a step prior to solution. The following section addresses:

- prerequisite information, and
- performance strategies.

Prerequisite Information

To be able to apply information assumes prerequisite knowledge and performance knowledge. To acquire prerequisite knowledge (verbal information) involves a cognitive search for relevant material which was personally coded according to prescriptive, narrative and imagistic comprehension for retention and retrieval (Guilford, 1965). Both the C.I. group and the Lecture group were exposed to prerequisite information about problem formulation. If this is the case, the affects of C.I. shown in Figure 5 relate to the issue of performance strategies.

Performance Strategies

The results suggest that the crucial difference between the groups and their application of information is at the level of performance strategy. This supports the theoretical framework (Figure 5) when considering the "circular" effects of problem formulation. Through problem formulation (Box C), the participants are made more aware of contextual information (Box D), and associated personal meanings (Box A), both of which may become more explicit. If the task for the participants is to learn problem formulation skills, the practical workshop exercises (grounded in their own experiences) may be more explicit than "abstract theory" as presented through the didactic lecture. Operationalization of problem formulation may influence cognitive strategies and may effect construction of meaning.

Performance strategies link stored conceptualizations with new information through integration in order to practice a skill (Guilford, 1965). At the simplest level, individuals within the group might think through the steps involved in putting a plan into practice. Using problem formulation, a more systematic form of mental rehearsal could be based on guided imagery. Participants are led through the problem formulation steps: why is a solution needed, what are the causes of the problem, what solution could be instituted, who will benefit, what new

problems are created and what are the consequences of action.

As the plan is visualized, the available information may become more explicit. Although it may depend on the particular content under consideration, abstractions such as concept maps and visual portrayal of links and interconnections stimulate practice skills. While similar content was used in both the C.I. and Lecture groups, the C.I. format allowed rehearsal of prerequisite knowledge and the opportunity to model the skill to be practised.

Increase in Quality of Response (H8)

After exposure to the two educative processes, the first seven hypotheses were used to test "how much" was learned. Hypothesis 8 concerned how well "quality of the information" was learned. Participant responses were scored according to five levels and participant use of cognitive sequencing, conventional descriptors (adverb/adjective), contrast, imagery and use of metaphor or symbolism (Biggs and Collis, 1982). This study does not support the hypothesis as there was no significant difference between the groups.

The issue of "quality of the information" raises an aspect of instruction concerning "meta-learning." Meta-learning strategies refer to: 1) a person's knowledge about his or her own mental processes and 2) the active control of those

processes to learn new information and skills. It is claimed by the Society for P.R. in Asia (1985) that meta-learning is promoted after exposure to the C.I. experience. The C.I. group integrated new information with previously acquired knowledge or experience, and through the process, uncovered causal connections and made inferences. However, although the transcripts show the C.I. group tended to make decisions based on cognitive strategy rather than emotional response, there is no statistical support for the claim made in the literature that collective investigation promotes meta-learning.

Participant Perception of Experience (H9)

As discussed in the literature review, participants in the C.I. group perceived the activities of and interaction with the facilitator to be beneficial to their learning. Individuals in the C.I. group did not identify any factors that hindered their learning. By comparison, fewer individuals in the Lecture group identified helpful factors and the majority claimed no learning occurred.

An interpretation of participant satisfaction may derive from the C.I. facilitator's encouragement of the sharing of meanings

and understandings within the group. The workshop was organized and structured to promote feelings of comfort, safety, challenge and acceptance. Within this context, the facilitator spent a great deal of time listening and encouraging participants to talk to each other. The framework for the discussion was always clearly related to the originally established group intentions, but the facilitator was open to hearing the concerns of the participants and directing discussion towards these issues. As previously stated, this attention to feelings provides a base for the facilitator to challenge expressed viewpoints and perceptions (Boud et al, 1985). The lecture, by comparison, is not designed to deal with individual emotional concerns.

Another interpretation of the differing group opinions on educative approach may suggest differing motivations towards learning. Based on the assumed "return" for effort, the individual projects "forward-looking" beliefs about what could happen as a result of one's actions. The net psychological force of the C.I. group could provide direction for learning. For example, if a person observed that high levels of participation are rewarded with high levels of peer recognition and confirmation, this experience may strengthen his or her belief linking participation and a desired outcome. Transcripts from the Lecture group indicate no perceived opportunity to

develop a potential group "culture." This loss may have prevented shared expertise in terms of official and unofficial rules within the group that could encourage learning, leading to a sense of isolation and apathy.

Conclusion

In agreement with existing C.I. literature (Tandon 1981; Society for P.R. in Asia 1982), collective investigation increases communication through the development of a network, which promotes effective diffusion of information. Through peer evaluation and validation, the possibility for persuasion to adopt the process was increased, enhancing learning opportunity. Information is made explicit, permitting practice of application strategies.

Although different types of information were produced as a result of the C.I. process, the content used by the C.I. group emphasized specific, occupational information. This focus on practice issues may provide a common group goal that contributes and influences the development of a supportive, risk-taking atmosphere. The opportunity for skill practice within the C.I.

group may promote the processing of verbal information used for problem formulation. However, contrary to previous research, this study showed no impact on qualitative aspects of learning. This concludes the interpretation of the results of the study. The next section presents the limitations of the research.

Limitations of Study

The problem of determining the limitations of this study relates directly to the demonstrated variation in skills across settings. It involves the question of how to best assess an individual's cognitive strategies, given that these skills are not employed independently of the context in which the problem is embedded (Scribner, 1986). To the extent that situational issues may prompt some problem solving process, the question of how experimental evidence can be applied to cognitive functioning in everyday life tends not to arise as an empirical issue.

In this research, the issue of generalization has two aspects: 1) task generalizability and the extent to which the task selected for study (problem formulation) shares some characteristics with other tasks involving problem solving, and 2) the assumption of some interindividual commonalities of

strategy in order to make statements about problem formulation ability on the basis of the small number of individuals whose performances are examined. Given the known literature, the research design appears consistent with previous research, permitting cautious generalization. The small sample size remains problematic in the sense that any differences have to be large for significance to appear.

Another limitation involves the nature of quasi-experimental research. Randomization of the participants in this study was not possible and it is recognized that by comparison, "true" experimental research is more powerful than quasi-experimental studies. An additional limitation may relate to the somewhat "artificial" nature of the didactic lecture approach used in this study. This group served the function of a second "control" group, allowing for comparison with the C.I. method. It is unlikely that a facilitator using the lecture method would actively prevent interaction between individuals, but would stimulate activity through a variety of instructional techniques. With these limitations in mind, the next section will deal with the issue of theoretical implications for this research.

Theoretical Implications

The results of this research are particularly relevant to some theoretical issues within adult education which deal with adult learning. An examination of the issues could provide an expanded basis for greater understanding of the adult learner and improved applied practice. Discussion will focus on the following two areas:

- adaptation to everyday life, and
- practice knowledge

Adaptation to Everyday Life

An example of how the research findings may be integrated with other theoretical perspectives can be demonstrated through the theory of adult learning as presented by Engeström (1987) and adaptation to everyday life. Engeström's theory is based on Vygotsky's (1978) definition of the "zone of proximal development." "It is the distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem solving...in collaboration with more capable peers" (Engeström, 1987, p.88).

In the context of everyday life, as discussed in the literature review, the zone of proximal development implies the increased use of existing knowledge as well as the development of interpersonal and intrapersonal knowledge, in a collaborative relationship. Cropley (1977) sees the need for existing knowledge to serve as the basis for a continuous process of further learning and relearning. He states, "individuals will need to acquire knowledge not only of the facts and processes of their society's technological and social organization, but of themselves, of other people and of their own and other cultures" (Cropley, 1977, p.13). Gelpi (1979) adopts a similar perspective, believing that educational methods should strive to develop individuals who are able to adapt to the personal tensions resulting from rapid economic, social and cultural change. In a future world of personal and emotional instability, new concepts of self and understanding of oneself, should be applied in relation to other people and life in general. The results of this study show that collective investigation is an educational method that promotes application of information and the development of interpersonal networks. An interpretation of this study's results suggest modelling and imitation are part of the adoption process of C.I. The next section will examine the concepts of modelling and imitation within occupational situations.

Practice Knowledge

In a practice situation, an individuals' attitudes are socially constructed and are largely a result of normative and informational cues (contextual variables) communicated to the worker by others in the work environment, particularly peers (Schön, 1987). Within a work context, returning to Figure 5, this suggests that job attitudes arise in part from the elements of the work environment that co-workers somewhat unconsciously call attention to in their everyday talk. As suggested in Chapter 3, this information may become typified and used to organize experience (individual construction). For example, an individual caregiver may have difficulty in communicating with a particular social worker within an office. In conversations with other caregivers, similar difficulties may be noted. As a result, the original communication issue may be typified as an interpersonal difficulty or the social worker's "personal problem." Either typification, regardless of the correctness, may influence future work experiences.

Engeström believes teaching and learning are moving within the zone of proximal development only when they aim at creation of new cultural-historical forms of "activity." Such learning is neither reaction nor a complex set of reactions, but the individual's active transformation of material objects and their

images (Rogers, 1983). Activity is always included in social relationships and is facilitated by communication. The needs and motives of an individual, the purposes, tasks and means of operation are the principal components of activity (Vygotsky, 1978).

In other words, by frequently talking about and evaluating certain aspects of the work context (Box D of the model), group members cue one another about the importance and "meaning" of elements (Box A) in the work environment. The stock of knowledge then becomes the basis for judgement decisions of assimilation or accommodation to new experience (cognitive strategy - Box C). Such a theoretical interpretation provides support for the model (Figure 5), suggesting there is a circular interaction which occurs as a result of the collective investigation approach.

Modelling and imitation then can be considered as a form of constructivism, as the individual produces and controls, from internal cues of feeling, what is perceived through visual and auditory observation of external stimuli. Inner and outer cues are coordinated to conform to the observations. It is in this sense that Schön's (1983) "reflection-in-action" may develop. The collective investigation process promoted the creation and sharing of information about the "action process" (reconstruction of information according to criteria judgements

of "certainty/validity"). If the prevailing C.I. literature is to be believed, the "action product" (desired learning outcomes) may also be subsequently encouraged. The next section will detail the potential impact of this research upon the practice of adult instruction.

Implications for Practice

The next question to be addressed concerns the practical utility of the findings. While remaining cognizant of the limitations regarding generalization of the findings, this section will examine some of the instructional practice issues and areas of C.I. debate raised by this study. Discussion will focus on the following three areas:

- instructional design,
- learner participation, and
- the role of the facilitator.

Instructional Design

The facilitator begins instructional design by recognizing that concepts are situational, open, frames of reference. These reference frames are individually constructed and minimally abstract in the sense that they remain close to the learner's

existing life-world. This begins to address a possible area of debate within the field regarding the foundation of C.I. as a non-formal adult education method. Production of knowledge begins with the practice situation, starting from reality perception and incorporating participant viewpoints.

"This implies that the proper unit of developmentally effective, expansive instruction is not a discrete task, but a whole cycle of activity generation" (Engström, 1987, p. 188). To remain consistent with Figure 5, the design of a C.I. activity should first transform an individual's concern to find the general relationship of the problem within the system of objects, then model the problem to examine the question in a graphic or symbolic fashion which is then developed into a concrete problem having a method of solution. Such a perspective makes a direct connection to meaningful experiences or concerns; a important objective for the practice of adult education (Jarvis, 1987; Mezirow, 1981).

Learner Participation

Adult learners are seldom called upon to formulate their own goals in an educational event and thus are confronted with only a part of the problem, that of the solution. The "open problem"

used by collective investigation includes its own justification, providing motivation and direction. The results of this study suggest the need to first create a motive for learners and then to disclose the possibility of reaching the goal through intermediate and "indirect" objectives.

The goal is for an individual to analyze the originating conditions of a problem, helping him or her to understand the relations within the subject field. For example, a communication problem between a social worker and caregiver can be understood within the general context of the child welfare system, with its mandated inequalities. The communication problem may be a singular manifestation of a "problematic system." A lack of communication about a child may be symptomatic of ineffective administrative policy and procedure, legal restrictions, or possible class bias on the part of the worker (in addition to a simple misunderstanding). Problems need not be blamed on the inherent inferiority of an individual, but rather on an unequal power structure, encouraging empowerment through reflection and transformation of their perspectives.

The Role of the Facilitator

The C.I. process and content is determined by the participants and it is through the guidance of the facilitator that the system of intermediate objectives is structured by group interaction. In this study, the facilitator acted as a "bridge" between information cliques within the group to stimulate the flow of new information through group process tasks. The homogeneity of the group aids in the production of information through development of communication networks. The more similar the group, the more likely that information diffusion will occur within the participants with subsequent development of interpersonal bonds (Rogers and Kincaid, 1983). The bonding may increase the "trailability" of the information, as the participants are reassured about the value of the information and become more willing to practice problem formulation skills. Using Figure 5, this may promote the use of evaluations skills (Box B) and/or influence individual meaning (Box A).

The nature of oral communication used by the facilitator has a considerable effect on the transmission of the cultural meaning-system (Scribner, 1984). Language reflects culture, so that the language used becomes one of the signs by which others locate people in social structure. This raises a final issue for consideration, that of class and culture obstacles to

facilitator communication with participants. In many collective investigation situations the facilitator may originate in a different class structure than the participants. The inequality of class may affect the group process and formation of knowledge by "silencing" those who feel inferior.

However, the facilitator may be in a position to raise the most pertinent questions due to access to information on the relevance and use of the collective investigation methods and theory. In addition, diffusion theory suggests that the people actively choose to adopt information, participating by themselves in the discovery of their contexts (Rogers and Kincaid, 1983). Through use of language to determine meaning-systems, participants can both perceive the class origins and estimate the reliability of the facilitator and the information gained. Such a belief remains committed to the belief in the abilities and dignity of adult learners. In this research, the level of communication between the C.I. group and the facilitator seemed to rely on the way in which the community saw the service that facilitator could provide (positive) and the degree of commitment to the articulated group goals (very high). The next section concludes this study and deals with future research that might be undertaken.

Future Research

The findings of this study have shown that collective investigation affects individual problem formulation. One issue not addressed directly in this study was the specific content of the pre-readings and didactic lecture. As different material could affect learning, it would appear worthwhile to identify and test content-related correlates in the future. In a similar fashion, the specific instructional sequencing of the C.I. workshop was not addressed. It would be interesting to examine process related variables, to identify which variables are affected under what specific condition. This might be useful in the identification of contextual determinants.

Specific recommended improvements on this study would be the use of another taxonomy for measures of quality of response to avoid the lengthy time period and potential difficulty in analyzing the data. Although interjudge agreement provided sufficient reliability in this particular situation, a more objective process for standardization is desirable.

Does collective investigation provide a good predictor for problem formulation within other non-formal adult education programs? That question remains to be seen. This study should be replicated within other occupations and across various

community contexts, perhaps involving larger numbers of participants.

Occupational skills can be seen to be embedded in: 1) the social unit that shapes an individual's reactions and 2) the individual's perception of self. Learning occupational skills may be interconnected with learning about the organizational culture and personal growth. Further research is needed regarding the process of reflection and work.

Another research issue relates to the "action-product" of the collective investigation process. After a problem has been defined and becomes instrumental, the problem solving activities may also provide learning opportunities for the participants. The "problem solution" aspects which may conclude a collective investigation process would be worthy of further study.

Finally, another research area relates to retention of problem formulation strategies. It would be interesting to examine the longitudinal results by re-testing of the participants of this study at six months after their exposure to the experience to determine long term effects.

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APPENDIX A

STATEMENT OF INFORMED CONSENT

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I consent to participate in the research project, "An Analysis of Collective Investigation as an Adult Education Method", conducted by Lee Titterington, a graduate student in the Department of Adult Education, University of British Columbia

I understand that the main purpose of the project is to examine the affect of collective investigation (an educational method emphasizing structured group discussions and exercises) on my ability to define problematic issues. I understand that the data will be compared to two other groups of caregivers; one group exposed to information about problem formulation through pre-readings and class-room type lecture, and one control group (no information is given). I understand that this will be measured by:

- 1) the number of items of information used, and,
- 2) the quality of the response.

I also understand that I will be working with the other members of my Regional Council in an eight-member group; that our group will engage in approximately 14 hours of activity. My total participation time will be approximately 16 hours, including one hour for an interview prior to beginning, and one hour after the session is completed. I realize the interviews will be recorded for later analysis, and I will receive a transcript for my own information.

Mr. Titterington has assured me that my identity will remain confidential (that my name will not be used during analysis of data and reporting of results). He has also offered to answer any questions I may have about the study and its procedures in order to ensure my full understanding.

Mr. Titterington has also informed me that I may refuse to participate in that study, that my services may be withdrawn at any time for any reason I choose, and that such withdrawal will in no way be held against me.

Finally, I acknowledge receipt of a copy of this statement, including all attachments.

Signature

Date

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- 1) the number of items of information used, and,
- 2) the quality of the response.

I also understand that I will be part of the audience with the other members of my Regional Council in an eight-member group, that our group will engage in an approximate three hour lecture after pre-readings have been distributed. I realize that the pre-readings may take about 8 - 11 hours to read and work through. My total participation time will be approximately 16 hours, including one hour for an interview prior to beginning, and one hour after the session is completed. I realize the interviews will be recorded for later analysis and I will receive a transcript for my own information.

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- 1) the number of items of information used, and,
- 2) the quality of the response.

I also understand that I will not receive any information about the C.I. process from Mr. Titterington and will act as part of the control group. I recognize that along with the other members of my Regional Council, I will engage in two one-hour interviews. I also understand that upon invitation from our Council, B.C.F.F.P.A. staff will be available to present the C.I. workshop. I realize the interviews will be recorded for later analysis and I will receive a transcript for my own information.

Mr. Titterington has assured me that my identity will remain confidential (that my name will not be used during analysis of data and reporting of results). He has also offered to answer any questions I may have about the study and its procedures in order to ensure my full understanding.

Mr. Titterington has also informed me that I may refuse to participate in that study, that my services may be withdrawn at any time for any reason I choose, and that such withdrawal will in no way be held against me.

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Appendix B, Case Examples (Pretest)

Case example #1.

John, a 16 year old foster child, was sexually abused. You were told of the abuse with placement and John has now been in your home for the last 3 months. He has become very depressed because he is unable to see his natural family and believes something is wrong with him because of the molestation. He has come to you to say that he lied - nothing at all happened to him and he wants to return to the natural family.

Case situation #2.

A six year old female Vietnamese foster child has been placed in your home for several years. On the first day of school, the child runs back to your home in tears. Because of the child's heritage, other school children had taunted and spat on her during recess.

Appendix B, Case Examples (Posttest)

Case example #3.

You have just had David, a 15 year old foster child in your home for the last two months. With placement, you were told that David was sexually abused but you were willing to attempt the placement. Last night your 10 year old daughter has come to you complaining about David. According to your daughter, David fondled her genitals and attempted intercourse. Your daughter was not hurt and although she is confused by what happened, she still likes David and does not want him removed from your home.

Case example #4.

A seven year old female foster child of Native and Black heritage has been in your home for years. In an argument with your natural child, the foster child is called several derogatory names because of their heritage. Although your own child has apologized, the foster child comes to you and says, "I hate being Indian".

Appendix C

Response Items

Specific Occupation Information

- 1) knowledge of Ministry Policies
 - legalities,
 - procedures,

- 2) social worker support
 - perceived commitment,
 - communication,
 - job knowledge,

- 3) technical knowledge (specific to child welfare)
 - sexual abuse/neglect issues,
 - placement concerns/cause,
 - placement separation and grief of child,
 - peer relations to foster child (outside of home),
 - physical housing and arrangement of home,
 - stress,
 - parenting skills, (nurturance, care, support),
 - house rules,
 - permanency planning for child,
 - supervision of child,
 - counselling skills (listening, talking, etc.)
 - problem solving,

- 4) appropriate child development/behaviour information
 - physical survival needs,
 - past background,
 - peer relationships,
 - behaviours,
 - values/attitudes,
 - self-esteem,
 - age,
 - emotional issues,
 - sibling issues,
 - understanding of self,
 - maturation stages,

- 5) other resource professionals (role and responsibilities)
- teachers,
 - psychologists,
 - clergy
 - family, neighbours, friends,

Knowledge of Self

- 6) cognizance of boundaries for self and others
- job responsibilities,
 - job relationships,
 - education and training,
 - confidentiality,
 - alternative action,
- 7) prior information
- readings,
 - non-formal workshops,
 - formal education,
- 8) personal attitudes
- values/beliefs,
 - intuition,
- 9) personal abilities
- personal experience,
 - child care experience,
 - empathy,
 - visualization,
 - emotional reaction,
- 10) relationship of caregiver and foster child
- 11) relationship of caregiver to own family

Knowledge of Others

- 12) B.C.F.F.P.A. policies
- procedures,
 - conflict of resolution,
 - recognition of status,

- 13) relationships to colleagues
 - perceived colleagues' opinions about self,
 - colleagues work history,
- 14) perspective toward issue,
 - societal concerns,
- 15) culture/heritage concerns
 - race,
 - nationality,
- 16) relationship of natural family and foster child,
- 17) relationship of care family and foster child,

Appendix D

SOLO Taxonomy for Problem Formulation

1. PRESTRUCTURAL
 - avoids question (denial),
 - repeats the question,
 - closure based on transduction,
 - makes irrelevant, personally based response
 - no consistent use of any problem formulation strategy,
 - 1a. Transition
 - inadequately uses potentially relevant datum,
 - attempts to answer the question, but only grasps a significant point.
2. UNISTRUCTURAL
 - answer based on one relevant aspect of information,
 - conclusion is limited and dogmatic,
 - constructs an interpretation from incomplete data or based on one relevant aspect of data,
 - make consistent use of one strategy, regardless of appropriateness to particular problem,
 - 2a. Transition
 - attempt to handle two relevant data, but is inconsistent and results in no firm conclusion being reached,
3. MULTI-STRUCTURAL
 - several consistent aspects of information are selected,
 - any inconsistencies or conflicts are ignored or discounted,
 - no integration of data,
 - draw a firm conclusion based on several basic aspects of selected information,
 - use of several problem formulation strategies, independently of each other,
 - can generalize in terms of limited or a few independent aspects,

3a. Transition

- any inconsistencies are noted,
- partial integration of data,
- several aspects of data are recognizable, but unable to reconcile the connection,

4. RELATIONAL

- most or all of information is used,
- integration through relating concepts,
- reconcile conflicting hypotheses from information given,
- data is placed into a system that accounts for given context,
- induce the meaning of an hypothesis from context,
- development of consistent problem formulation strategy,

4a. Transitional

- recognizes the relativity of the explanation, but inadequately makes use of abstract principles that override context,
- hint that closure or a firm conclusion is not inevitable,

5. EXTENDED ABSTRACT

- explanation of phenomena (example as part of a greater whole),
- recognition the example given is an instance of a more general case,
- hypotheses about examples that have not been given are entertained (symbolism and metaphors),
- conclusions are held open,
- deduce the meanings of developed abstract hypotheses,
- reconciliation of conflicting hypotheses within general terms,

Appendix E Class Intervals

The scores for the production of information were measured on an interval scale of performance; low performance beyond one standard deviation from the mean (> -1 S.D.), medium performance within -1 S.D. to $+1$ S.D. and high performance beyond one standard deviation from the mean ($> +1$ S.D.). Appendix E shows the class intervals for production of information and the SOLO Taxonomy, based on low, medium and high performance. Class interval, observed and expected frequencies are detailed. The information is not presented as a preliminary test for the other analyses, but rather to address the question of normality per se.

Production of Information

Class Interval	O	E	O-E	$(O-E)^2$	$\frac{(O-E)^2}{E}$
140 up	5	3.6	1.4	1.96	.5
130-139	1	3.0	-2.0	4.0	1.3
120-129	1	1.9	-.9	.81	.4
110-119					
100-109	2	4.1	-2.1	4.41	1.1
90 - 99	6	3.7	2.3	5.29	1.4
80 - 89					
70 - 79	3	1.4	1.6	2.56	1.8
- 69	6	6.3	-.3	.09	.01
Total	24	24.0			$x^2 = 6.5$

* This data does not differ significantly ($x^2=6.5$, $df=6$, $p<.05$) from a normal-curve model in which the mean is 102.3 and $s.d.=41$.

SOLO Taxonomy

Class Interval	O	E	O-E	(O-E) ²	$\frac{(O-E)^2}{E}$
25 up	2	3	-1	1	.33
23-24.9	4	4.1	-.1	.01	.002
21-22.9	7	4.4	2.6	6.76	1.54
19-20.9	5	5.3	-.3	.09	.02
17-18.9	4	3.7	-.3	.09	.02
-16.9	2	3.6	-1.6	2.56	.7
Total	24	24.1			-----

$\chi^2 = 2.6$

* This data does not differ significantly from a normal-curve model in which the mean is 20.7 and S.D. is 3.3 ($\chi^2 = 2.6$, $df=3$, $p<.05$).

Appendix F

Separate group regression coefficients for ANCOVA tests

1) Production of Information

C.I.	Lecture	Control
.88	.88	1.2

within-groups regression $b_w = .99$

2) Occupational Specific Information

C.I.	Lecture	Control
.97	.91	1.2

within-groups regression $b_w = 1.05$

3) Knowledge of Self

C.I.	Lecture	Control
.83	.60	.62

within-groups regression $b_w = .68$

4) Knowledge of Others

C.I.	Lecture	Control
.04	.74	.53

within-groups regression $b_w = .44$

5) Problem Formulation

C.I.	Lecture	Control
.96	.90	1.2

within-groups regression $b_w=1.02$

6) Contextual Variables

C.I.	Lecture	Control
.54	.92	.72

within-groups regression $b_w=.73$

7) Problem Solution

C.I.	Lecture	Control
-.32	.82	.63

within-groups regression $b_w=.38$

8) SOLO

C.I.	Lecture	Control
.46	.46	1.2

within-groups regression $b_w=.71$
