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"THE EFFECTS OF USING CONSCIOUS COGNITIVE STRATEGIES, BY ADULT LEARNERS, TO COMPENSATE FOR IMPOVERISHED TEXT"

by

Patricia G. Peebles

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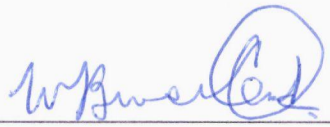
The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled "The Effects of Using Conscious Cognitive Strategies, by Adult Learners, to Compensate for Impoverished Text" submitted by Patricia G. Peebles in partial fulfillment of the requirements for the degree of Master of Arts.



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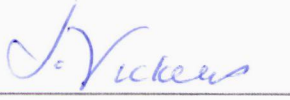

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ABSTRACT

The purpose of this study was to provide adult learners a means to take control of their own learning through the teaching of conscious cognitive processes and to study the effects of their using these cognitive processes to compensate for impoverished text.

Nineteen female adult students ranging in age from 19 to 44 enrolled in a grade 11 High School upgrading program participated in the study. The subjects were randomly assigned to one of two treatment groups or a control group. All subjects were tested to determine their verbal ability using the Woodcock-G Revised Standardized Test of Comprehension (1987). Two Informal Reading Comprehension Tests containing impoverished text (one used as a pre-test and the other used as the post-test) were administered to all subjects to test the effects of teaching the cognitive processes. The questions included factual and inference questions to correspond with the Pearson and Johnsons' (1978) taxonomy categories: textually explicit, textually implicit, and scriptually implicit.

Using study materials from their classes, the subjects were taught three cognitive strategies: paraphrase/imagery, networking, and analysis of key concepts. As well, they were taught a strategy to remember the logical steps for studying which included metacognitive strategies.

A difference was found on the performance of textually implicit questions. The experimental groups performed better than the control group and although after the age and grade equivalents were covaried this was not a statistically significant difference, but the scores for the textually implicit questions were approaching statistical significance.

In contrast to the statistical findings the researcher's observations indicated that the subjects were not only able to learn the cognitive processes but they applied them to new content areas to compensate for impoverished text. It was also noted by the examiner that the self-confidence of the subjects increased; they had a systematic method to remember and to inter-connect concepts.

The researcher recommends that a second study be undertaken using a different methodology; specifically a case study. This would enable a more in depth study of the strategies used prior to the treatment, give insight into the reactions of the students who incorporate new strategies, and study the transferability of the strategies to a variety of expository texts.

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It is with deep appreciation that I thank my husband, Ron, whose unending patience and faith in me inspired me to complete this study.

This thesis is dedicated to

my mother

MARGUERITE CATHERINE (CARSCALLEN) CONNELL

(1914 - 1989)

and to my father

GORDON ALLEN CONNELL

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CHAPTER I

THE PROBLEM

In recent studies conducted by Canadian Literacy Departments in Canada (Southam Survey, 1988) it has been stated that five million adult Canadians are functionally illiterate. Of these nearly half were identified as being 55 or older. Several reasons for this were given including poverty and education. The children of the jobless, the working class, and the poorly educated are more liable to be illiterate. Only half of the illiterates went to high school and of these one-third say they graduated. It was also found that illiteracy was higher among men than women "53.5 to 46.5 per cent " (p. 7). If this is the case then we need to retrain these people and teach them skills which will afford them opportunities to become literate.

Accelerated advancements in technology have persuaded many adults to upgrade their personal knowledge in order to: increase their income, work towards a job promotion, achieve personal satisfaction, gain new knowledge, or secure societal goals (Ansello, 1982). To accomplish their goals, people are often required to read textual material on their own. Much of this material lacks adequate presentation; for example, it contains ambiguous referents or inconsistent information which causes confusion and deters comprehension. From an instructional perspective

this type of presentation of material may often be described as "impoverished"; that is, it contains little or no helpful strategies to facilitate learning. Readers may become discouraged and terminate their quest for knowledge because of their inability to comprehend the material and their lack of knowledge on how to compensate for the inadequate display presentation.

Many teaching and testing methods implicitly encourage rote memorization which has little benefit in many job situations. Students need to be taught to be more effective learners; aware of their own cognitive capabilities, and more responsive to directing their own learning (Weinstein & Mayer, 1986). Instructors can facilitate this by teaching cognitive or intellectual learning strategies explaining how and when those strategies are effective and also by helping students to monitor their own learning. "By not stressing learning strategies, educators, in essence, discourage students from developing and exploring new strategies, and, in so doing, limit students' awareness of their cognitive capabilities" (Dansereau 1978, p. 2).

"We tell our students **what** to learn but we say nothing about **how** to go about learning" (Weinstein 1978, p. 32). Effective teachers not only need to be concerned with the products of learning--teaching **what** to learn, but more

importantly they need to be concerned with the process of learning--teaching **how** to learn. Many intellectual skills are practiced and acquired gradually throughout life. These skills are often inductively derived by students through incidental learning over years of practice. Similarly, cognitive mechanisms that enable students to decide which learning strategy is appropriate for a new, unfamiliar assignment have not always been acquired through direct learning but rather through experience and practice (Derry & Murphy, 1986). This indirect acquisition of skills may limit adult learners in their ability to apply the strategies effectively when encountering new material outside an instructional setting.

To take control over their own learning processes, learners need skills which they can apply independently from instruction. If students acquire a repertoire of strategies, they have the opportunity to choose an appropriate strategy which best 'fits' their own cognitive structure. Teaching such strategies early should allow time for students to procure and internalize a number of strategies. If the strategies are not internalized early then it behooves us as educators to provide opportunities for adults to learn those strategies. The present study investigated the possibility of teaching adults cognitive processes (see Table 1 pg. 17 for definitions of cognitive

processes and related terms which appear in this thesis). This involved teaching specific skills as well as self-monitoring strategies to be able to apply those skills effectively. Also, it examined the effect of teaching such strategies on learners who, by the time they have become adults, have already acquired their own strategies for learning.

"What a person retains from some learning task is a function of the task structure, the strategies adopted by the person to deal with the task, and the person's own skill and abilities" (McConkie 1977, p. 21). The purpose of this study was to discover if adult learners in an upgrading program could be trained to consciously use cognitive processes to compensate for impoverished text and to monitor their own learning related to the students' abilities.

CONSCIOUS COGNITIVE PROCESSING VERSUS APTITUDE-TREATMENT INTERACTION (ATI)

Two approaches to accommodate individual differences are discussed in the literature: Aptitude-Treatment Interaction (ATI) theorized by Cronbach & Snow (1977) and Conscious Cognitive Processing theorized by Rigney (1978) and Merrill (1979).

The ATI approach involves matching treatment to student ability. "This (ATI) often proved difficult to do,

and was not always cost effective. A further difficulty arose from the fact that the number of learner-aptitude, media-characteristic, and subject-matter permutations is enormous" (Winn 1984, p. 5-6). The cost to assess adult learners' abilities and then to match a treatment to this ability is not feasible.

Merrill (1975) agrees that instruction should be adapted to the individual but argues that ATI will not accomplish this goal. A strategy that may be of value to a learner for one particular text may not be appropriate for another because the experience of a human is continually changing. "The multidimensional dynamic state aptitudes which we feel most probably predict optimal learning ... are changing with every momentary experience. ... the search for the interaction of stable trait aptitudes and fixed treatments is never likely to be of instructional value" (Merrill 1975, p. 221).

An area of increasing interest in adapting instruction to learner characteristics, meeting the goal of independent learning, and giving the learners control over their own learning, is Conscious Cognitive Processing. Merrill (1979) delineated four levels of conscious processing over which a student can exercise deliberate learner control: (1) content control (2) strategy control (3) conscious cognitive control (4) meta-cognition. The first two are

controlled externally. Content control involves the selection and sequencing of external objectives; display (strategy) control is the selection and sequencing of external displays. The other two allow students to select and use a variety of internal processing strategies.

Content control is the opportunity for the learners to decide which segments, lessons, or units they wish to study.

Strategy control is the opportunity for the learners to choose the type of presentation they wish to study next.

Conscious cognition refers to the mental activities the students use to remember and integrate information.

The fourth level of conscious processing which directs the use of content control, strategy control, and conscious cognition, is **Meta-cognition.** Meta-cognition refers to the "how-to-learn" model which the learner uses to guide his/her interaction with the instructional system.

Vygotsky (1934, 1962) described what is now called metamemory thus:

> Attention, previously involuntary, becomes voluntary and increasingly dependent on the child's own thinking: Mechanical memory changes to logical memory guided by meaning, and can now be deliberately used by

> the child. One might say that both attention and memory become "logical" and voluntary, since control of a function is the counterpart of one's consciousness of it. (p. 90)

Cognition, then, involves such processes as attention, memory, comprehension, and retention. The **conscious** control of these processes is **meta-cognition** (Reynolds & Wade, 1986).

The degree of learner control depends on two factors: the ability of the learners to use the internal components of content selection, display selection, and conscious cognition; and the adequacy of the learners' meta-cognition model which directs their use of these functions (Merrill, 1984).

COGNITIVE COMPENSATING STRATEGIES

Although adult learners may or may not have control over the content they choose to study, and they may or may not have control over which material they choose to omit from a given display depending on how it is presented to them, they will always have control over selection and reconstruction of information for incorporation into their long-term memory (Merrill, 1984). Their ability to comprehend effectively and efficiently may be dependent on how well they use their internal processes (Merrill, 1984).

These processes consist of conscious cognitive strategies used to compensate for less-than-adequate display presentations and metacognitive strategies used to monitor their own learning.

Rigney (1978) uses the term "cognitive strategies" which incorporates Merrill's two levels of learner control: conscious cognition and meta-cognition. Rigney defines cognitive strategies as "operations and procedures that students may use to acquire, retain, and retrieve different kinds of knowledge and performance" (p. 165). He states that cognitive strategies involve representational capabilities of the student (reading, imagery, speech, writing, and drawing), selectional capabilities (attention and intention), and self-directional capabilities (self-programming and self-monitoring). Gagne (1985) defines cognitive strategies as "internally organized skills whose function is to regulate and monitor the utilization of concepts and rules" (p. 138).

Weinstein and Mayer (1986) use the term "learning strategies" in the same context as Rigney uses cognitive strategies. They define learning strategies as:

> ... behaviors and thoughts that a learner engages in during learning and that are intended to influence the learner's encoding process. Thus, the goal of any particular learning strategy may be to affect the

> learner's motivational or affective state, or the way in which the learner selects, acquires, organizes, or integrates new knowledge. (p. 315)

Weinstein and Mayer's definition will be the working definition for cognitive processes in this study. The two cognitive processes, as defined by Merrill (1984), investigated in this study were cognitive strategies and metacognitive strategies.

Compensating cognitive strategies, then, are cognitive methods employed by learners to enable them to compensate for inadequate information presentation to facilitate selection, acquisition, integration, and retention of knowledge (Callahan, 1979).

STUDENT CONTROLLED VERSUS LESSON CONTROLLED STRATEGIES

Cognitive strategies are always performed by the student but their use may be initiated by either the student or by an instructional system. An instructional system can be designed so that students are taught to use a cognitive strategy without making the student aware that they are in fact using cognitive strategies.

Cognitive strategies are categorized by Rigney (1978) as student assigned (SA) or instructional system assigned (ISA) as shown in figure 1.1

Figure 1.1 **Alternative approaches to teaching and using cognitive strategies.**

Explicitness of cognitive strategy	Control of orienting task	
	SA	ISA
detached (conscious)	A paraphrase	B use analogy
embedded (subconscious)	C spontaneous initiation	D inserted questions

Adapted from Rigney (1978). In H. O'Neil (Ed.), Learning strategies (p. 167) New York: Academic Press.

Rigney (1978) identified detached cognitive strategies as those strategies which a student consciously applies to text or those strategies given in an instructional presentation which direct the student to apply a specific strategy. A detached strategy is described independently from the subject matter. An example of a detached strategy would be instructions to use mental imagery or to think of an analogy. Conversely, an instructional system may be so designed that the student is 'forced' to use a particular strategy to comprehend text or a student may subconciously use a processing method, as an automatic or spontaneous response related to the text. These are what Rigney denoted as embedded strategies. An example of an embedded strategy would be a question requiring students to multiply

a three-digit number in their heads. This forces the students to do deeper semantic processing. They would have to use mental imagery to keep track of the intermediate steps while multiplying.

Instructional designers frequently use combination D (figure 1.1) to incorporate effective strategies to design instruction Rigney (1978). Rigney (1978) states that combination A is desirable under at least some circumstances, and that it can be realized by first implementing Combination B. That is, an instructional system can be designed to teach students that there are, in fact, cognitive strategies; and if the students apply these strategies properly, their use will facilitate acquisition, retention, and retrieval. Students who are consciously aware of strategies may choose to use whatever mental processing they deem appropriate for learning.

This study investigated the effect of teaching adult student-controlled detached strategies to compensate for impoverished material. It also investigated whether students not instructed to use a particular strategy would revert to their own previously developed strategies and if this produced a conflict which negatively impacted learning.

THREE STRATEGIES USED IN THE DESIGN

This study tested the use of three student controlled detached strategies. More specifically, it examined whether or not adult learners consciously use three elaboration strategies; that is strategies used to integrate new knowledge with prior knowledge. The three strategies taught were: paraphrase/imagery, networking, and analysis of key concepts. Paraphrase/imagery involves having students summarize the material in their own words and then form mental pictures of the concepts underlying this material (Dansereau et al. 1979a). Networking requires material to be transformed into node-link maps or networks. The student identifies important concepts or ideas (nodes) and represents their interrelationships (links) in the form of a network map (Collins & Quillian, 1969). Analysis of key concepts, like networking, is also derived from network models of memory (Diekoff, Brown, & Dansereau, 1982). Using this strategy, students identify and define key concepts, and determine how they relate to one another. The major difference between analysis of key ideas and networking is that the key ideas approach is structured and linear and provides for only local interrelationships between concepts, whereas networking is less structured and spatial and provides for global interrelationships.

HYPOTHESES

Studies by Dansereau et al. (1979a), Weinstein (1978), and Callahan (1979), upon which the present study was based, used university or college students as subjects (see Chapter 2 for specific details). They found that students were able not only to learn the strategies but also to perform better than the control groups on recall and comprehension tests. The present study extended this investigation by using a sample from a different population, students who were engaged in an upgrading program. The following was hypothesized.

H1 Adult students in an upgrading program who learn detached strategies will apply these strategies to content areas.

H2 Adult students in an upgrading program who learn the detached strategies will perform better than those who were not taught the strategies.

H3 Adult students in an upgrading program matching the characteristics of the students at the Alberta Vocational College (AVC) can be taught detached strategies.

DELIMITATIONS OF THE STUDY

Munro and Rigney (1977) cited 66 cognitive strategies. Students should probably be given exposure to several or all the techniques. This would allow them to choose the strategy or strategies they perceive to best suit the learning situation. The researcher was allowed three weeks in which to test and teach the students at AVC. Due to the time constraints in this study, only three cognitive strategies were taught as well as some training in metacognitive strategies.

In Dansereau's (1985) and Weinstein's (1982) studies the researchers tested the student's retention one month after the initial studies. Although this would be an excellent check on the retention and the continued use of the cognitive processes learned, time available for access to subjects in the present study did not allow for this.

Initially, the Alberta Vocational College had anticipated an enrollment of forty students but only received nineteen. This small sample size limits the generalizability of this study.

IMPLICATIONS FOR INSTRUCTIONAL DESIGN AND EDUCATION

Teaching cognitive processes provides the opportunity for students to become consciously aware of and to use skills to aid them in comprehending textual material. This

has implications for instructional designers. They are concerned with developing units of instruction which provide opportunities for students to have some control over their own learning. Their goal is to design instruction so that students may choose units they perceive to best meet their educational needs. If designers can incorporate learning strategies into their units, then the instruction will increase learner control.

Winn (1984) stated the following:

> It is no longer necessary to devote as much time and effort to identifying strong and weak learner aptitudes, and developing instruction accordingly. Nor is it necessary to develop different sets of instructional materials for learners of different ability. What is more relevant is to identify those mental skills that learners need to apply in order to learn what they have to, and to train the learners in those skills. (p. 10)

Derry and Murphy (1986) conceptualized a curriculum designed to develop "life long learning" by encouraging spontaneous initiation of learning strategies. They use learning strategies in the same context as this present study uses the term cognitive processes. This spontaneity may be engineered by moving a student from conscious lesson controlled processing through to an automatic form of

processing. Implementation of this process would initially start with teaching strategies detached from a specific curriculum. Employing verbal or visual prompts to encourage students to use these strategies within specified and varied curriculum would provide practice. Later as these strategies become automatic, the prompts would be less frequent to facilitate independent processing of materials.

SUMMARY

It was hypothesized that teaching strategies to adult learners would provide them with techniques to consciously compensate for impoverished text. It may also give adults a sense of control over their own learning enabling them to cope with new and unfamiliar material. If adults can be taught these strategies then this would provide a valuable approach for adult learning and retention.

Table 1.1

Definitions used throughout this study

Cognitive processes - a superordinate term which includes conscious cognitive strategies used to compensate for impoverished text, and metacognitive strategies used to monitor ones own learning.

Cognitive strategies - operations and procedures that students may use to acquire, retain, and retrieve different kinds of knowledge and performance (Rigney, 1978).

Cognitive structure - is the representation of relations between elements of memory (White & Tisher, 1986).

Conscious cognitive processing - is the conscious awareness, control, and use of the processes needed to comprehend textual material (Merrill, 1979).

Learning strategies - thoughts and behaviors that a learner engages in during learning which influence the learner's encoding process (Weinstein & Mayer, 1986).

Metacognition - is the "how-to-learn" model used to guide the interaction with instructional material (Merrill, 1979).

Metacognitive strategies - those strategies used by the students to monitor or guide their interaction with the textual material (Merrill, 1979).

CHAPTER II

REVIEW OF THE LITERATURE

INTRODUCTION

In this chapter the problem will be stated giving support to why the study was conducted, previous studies which are similar and their results will be cited, and it will delineate the theoretical framework of each part of the study.

PROBLEM

The American Association of Community and Junior Colleges estimates that "some 40 million adults will experience one predictable adult transition, the career change, in the next 10 years" (Gilbert 1980, cited in Ansello, 1982). As indicated in chapter one, many adults are upgrading their knowledge to keep up with new technological advancements or to prepare themselves for a new job. These adults may find it difficult to read expository material. This may be due to the student's lack of knowledge of skills used to increase comprehension and/or the difficulty may be inherent in the textual material itself. "Much of the available instructional material is inadequate judged against the prescription of Component Display Theory" (Merrill, Kowallis, & Wilson 1981, p. 341). This type of presentation of material may

be described as "impoverished"; that is, it causes confusion due to inappropriate logical connectives between concepts, it may have ambiguous referents, or contain inconsistent information which compounds the reader's difficulties in comprehending the text.

This study was conducted to determine the effectiveness of teaching adults three cognitive strategies to compensate for impoverished material and providing a means by which they would become consciously aware of when and how to use the strategies.

Three factors affect what is processed by the learner: (1) the strategy used, (2) the content on which the strategy was used, and (3) the ability of the learner (McConkie, 1977). These three factors were considered relevant to this present study. The first involved determining the ability of the students by employing a standardized test of verbal ability. The second involved determining the inadequacy of the display presentations; that is the degree of impoverishment. Based on the data gleaned from the first two factors the third involved extensive conscious cognitive strategy training in conjunction with metacognition skills.

Before discussing these three factors, three developments in the literature are discussed in order to set the study in context. One development is the use of

information processing theory to examine how one acquires information. The second, which extends from the first, is schema theory. The third is learner control.

INFORMATION PROCESSING THEORY

Since the late 1960's and early 1970's there has been increased interest in the mind and the way it functions. This is evident in research topics such as meaningful verbal learning (Ausubel & Fitzgerald, 1962, Ausubel, 1963), mathemagenic behaviors which help people gain information (Rothkopf, 1965, 1970), generative learning (Wittrock, 1974, 1978), cognitive modifiability (Feuerstein, 1980), and cognitive ability patterning (Flaro, 1989). There evolved a change in emphasis in learning theories from the behaviorist approach (stimulus-response) to the cognitive approach. The behaviorist approach does not consider the processes which take place within the learner. Farnham-Diggory (1977) summarizes this approach as: "a stimulus goes in, a response comes out, and what goes on in between is summarized by a hyphen" (cited by Weinstein & Mayer, 1986, p. 316). Conversely in the cognitive approach, students are no longer seen as passive recipients of information but as active participants in manipulating stimuli. Information-processing theorists believe that there is an interaction between the individual's cognitive structure and incoming information

which results in the acquisition, retention, and retrieval of information (Craik & Lockhart, 1972; Craik & Tulving, 1975; Melton & Martin, 1972; Montague, 1972; Rigney, 1976; Anderson, Spiro & Montague, 1977, cited by Weinstein, 1978).

Encoding of information has four main components (Cook & Mayer, 1983):

(1) Selection - specific information is attended to by the learner and is transferred to short-term memory (STM) also known as working memory. The learner is actively and consciously assessing the incoming information.

(2) Acquisition - if the learner chooses to retain the information, he/she actively transfers it from the working memory into long-term memory (LTM) for permanent storage.

(3) Construction - the learner actively builds connections among ideas from the passage in working memory.

(4) Integration -the learner actively searches for prior knowledge in LTM and transfers it to working memory where connections are built between this learned knowledge and the new knowledge.

Selection and acquisition are cognitive processes that determine how much is learned. Construction and integration are cognitive processes that determine how the

information interconnects and is organized. During construction and integration the learner is going through a process of building schemata.

SCHEMA THEORY

Schemata (or schema - singular) are knowledge frameworks or structures which readers impose on text in order to comprehend it (Ausubel, 1963; Bartlett, 1932; Bower, 1972; Minsky, 1975; Piaget, 1926; Rumelhart & Ortony, 1977; Schank & Abelson, 1977). A detail is either assimilated into existing knowledge or it is accommodated by creating a new framework to increase knowledge (Pichert & R. C. Anderson, 1977).

Schema-based Processes in Learning and Remembering

Reading is an interactive process, analysis does not proceed in strict order from the visual information in letters to the overall interpretation of a text. Instead, schema theorists contend that reading comprehension depends on two factors: (1) the learner's knowledge of the characteristics of the message and the context in which it is given, and (2) his or her efforts to relate the incoming idea units to each other and to previously acquired information.

As sentences are read, schemata are activated, evaluated and refined, or discarded. The process of comprehension is very much like the process of constructing a theory, testing it against the data currently available, and as more data become available, specifying the theory further. If the theory does not account for the outcome, it is given up and a new one constructed, or if a new theory presents itself which gives a more precise account, the old one can be dropped and the new one accepted (Rumelhart, 1981).

Bobrow and Norman (1975) (cited by Anderson, R. C. 1984, p. 247) called the processes that flow from print "bottom-up" or "data driven" and processes that flow from the person's mind "top-down" or "hypothesis driven". When there is a mismatch between what is expected and what actually occurs while reading, the learner's cognitive processes are activated. Both top-down and bottom-up processes must work together (Rigney, 1978).

As one reads, "interpretation of what a segment of a text might mean is theorized to depend both on analysis of print and on the hypotheses in a person's mind" (Anderson, R. C., 1984, p. 247). Students, especially those of low to average ability, need to be and can be trained in cognitive strategies to encode this new material and develop new schemata (Weinstein & Underwood, 1985). In order to help

these students become independent in their learning and to develop a 'life long learner' several methods of learner control have been proposed.

LEARNER CONTROL

As noted in Chapter 1 (see page 4), two methods of addressing individual differences in instruction are Aptitude-Treatment Interaction (ATI) theorized by Cronbach and Snow (1977) and Conscious Cognitive Processing theorized by Rigney (1978) and Merrill (1979).

The ATI approach involves matching treatment to student ability. According to a review of these studies Bracht (1970, cited by Dansereau 1974) concluded that "there is virtually no solid evidence for the existence of such interactions. ... tailoring teaching methods to individuals varying in aptitude will not substantially improve educational effectiveness " (p. 8). Also, the cost to assess adult learners' abilities and then to match a treatment to this ability for each subject is not feasible.

Reuven Feuerstein's work (1980) on Instrumental Enrichment supports this thinking. He states that too often educators take "a passive acceptance approach" towards learners rather than "an active modificational approach" (Feuerstein & Jensen, 1980 p. 402). In the passive mode students are accepted as is and are often put into special

classes to adapt the world to her/him. An active modificational approach considers the individuals as changeable/modifiable so that they will be able to "adjust to the ever changing conditions of life" (p. 403). Feuerstein has been quoted as saying that "intelligence is not carved in marble but is, rather, a soft plastic that could be shaped by will" (Chance, 1981, p. 3).

Merrill (1975) states that through learner control the learner can adapt the environment to meet her/his needs through training. A strategy that may be of value to a learner for one particular text may not be appropriate for another. The majority of expository material which the adult learners would be studying would not have been adapted to meet the individual learning needs for the students. Effective strategy training would allow adults to adapt the material to meet their own personal needs.

CONSCIOUS COGNITIVE PROCESSING

An area of increasing interest in meeting the goal of independent learning and giving the learners control over their own learning, is Conscious Cognitive Processing.

Merrill (1979) delineated four levels of conscious processing over which a student can exercise deliberate learner control: (1) Content control (2) Strategy control (3) Conscious cognitive control (4) Metacognition. The

first two are controlled externally. The other two allow students to select and use a variety of internal processing strategies.

Content control is the opportunity for the learner to decide which segment, lesson, or unit they wish to study. If they feel that material in a given component is already sufficiently understood then they may choose to skip it.

Strategy control is based on the assumption that an instructional sequence can be divided into a series of individual displays and then the students have the opportunity to decide on what type of presentation they will study. An instructional strategy is a presentation of a single subject-matter idea. The display can consist of a general statement, such as a definition, a set of steps in a procedure, or a cause-and-effect proposition; or a display can consist of a specific example, such as a demonstration of a procedure, or an illustration of a cause-and-effect phenomena.

Conscious cognition is the ability of a student to select and use a variety of internal processing strategies to encode information for its acquisition, retention, and retrieval. These cognitive activities may include, for example, rehearsal (repeating the information several times from memory), paraphrasing (reformulating the information

into the student's own words), or imaging (trying to form a picture using the information).

The fourth and most important level of conscious processing which directs the use of content control, strategy control, and conscious cognition, is **metacognition.** It is a "how to learn" model, which students use to guide their interaction with the instructional system being used.

Based on Merrill's definition of learner control, conscious cognition and metacognition are the two areas upon which this thesis focused.

CONSCIOUS COGNITION

Teaching adult learners what to learn without teaching them how to learn will be of little benefit to them in upgrading their knowledge. Students need to be taught to be more effective learners, more active in their own awareness of their cognitive capabilities and responsive to directing their own learning (Weinstein & Mayer, 1986).

In a number of studies conducted by Merrill and associates, they found when students were given control of what display to study next, the students differed in the number of displays they used, they also differed in the sequencing of the displays, and they used a wide variety of

strategies, yet, their performances were not significantly different. Merrill (1984) contends that we can no longer ignore the students' cognitive activities and by the appropriate selection of cognitive processing activities a student may be able to compensate for a less-than-adequate display or display sequence.

To take control over their own learning processes, learners need skills which they can apply independent of instruction. If students acquire a repertoire of strategies, they have the opportunity to choose an appropriate strategy which best 'fits' their own cognitive structure.

This study looked at teaching adults who were in a high school upgrading program, specifically grade 11, and the effect of three learning strategies to be used for independent learning on expository text. As well, there was an emphasis in teaching the students to become consciously aware of their cognitive abilities. As Merrill (1984) indicated this "how to learn' model is metacognition.

METACOGNITION

The work of Flavell (1976) and Brown, A. L. (1978) as well as others introduced the concept of metacognition although the issues of metacognition; planning, checking,

and evaluating activities, are not new. Researchers such as Dewey (1901), Huey (1908), and Thorndike (1917) (cited in Baker and Brown, 1984) were aware of these issues. Metacognition is the "thinking about thinking", the "how-to-learn model". More specifically, using the work of Vygotsky (1934, 1962) Reynolds and Wade (1986) defined cognition as the superordinate term for the cognitive processes such as attention, memory, and comprehension, and metacognition as "the superordinate term under which conscious control of these specific cognitive processes is grouped" (p. 308).

McNeil (1984) strengthens the argument that metacognitive processes are used by good readers and are needed to comprehend text. McNeil (1984) described metacognition as having a broad control over processes rather than being specific task strategies. He defined these metacognitive processes in reading as including self-knowledge, task knowledge, and self-monitoring.

> **Self-knowledge** - is the ability to recognize one's own strengths and weaknesses in comprehending. Students who encounter reading failure often attribute this failure to lack of ability rather than self-monitoring their actions, analyzing the situation, and then applying a different strategy as is done by successful readers.

Task-knowledge - is the ability of knowing what strategy is to be used and why it is useful in a particular comprehension task.

Self-monitoring - is the ability to self-regulate one's own progress and being able to revise if needed. Brown and her colleagues (Brown, A. L. et al., 1978; Brown & Palincsar, 1982) maintain that self-monitoring is indispensable as part of strategy training.

McNeil (1984) cited an example of self-instruction to train students to self-monitor their progress.

- "What is it I have to do?" (problem definition)
- "I have to find the topic sentence of the paragraph." (focusing attention)
- "The topic sentence is what the paragraph is about. I start by looking for a sentence that sums up the details or tells what the paragraph is about." (plan of action)
- "I haven't found it." (evaluation)
- "That's all right." (self-encouragement)
- "I'll try a new plan." (coping) (p. 87)

Subjects in this present study were taught to self-monitor their actions in order to maximize comprehension.

Mature readers know the purpose for reading and adjust their reading tactics if they are having difficulty comprehending text (Wong, 1986). They use "debugging devices" such as slowing down, back-tracking, or skimming. Mature readers have acquired metacognitive skills and apply them with such automaticity that the student is often unaware of their own comprehension monitoring. Conversely, learning-disabled readers show little indication of awareness of such skills (Anderson, T. H. 1980).

Gambrell and Heathington (1981) conducted a study with adult readers. They found that the poor readers looked at reading as a decoding process rather than a comprehending process. They also found that the poor readers reported knowing fewer strategies than the good readers and they were not as aware of how and when to use them.

Since 1981, Palincsar and Brown (1984) have been investigating a procedure called reciprocal teaching. This involves a dialogue between teachers and students for the "purpose of jointly constructing meaning of text" (Palincsar, 1986, p. 119). They have incorporated the same meta-cognitive skills as outlined by McNeil (1984) and found that students can be successfully trained in these skills.

Metacognitive training has proved to be beneficial to children of all ages and reading abilities. The children

showed significant gains in reading awareness and strategic reading (Paris, Cross, & Lipson, 1984; Paris & Oka, 1986).

Baker and Brown (1984) state that students who only receive skills training without the self-monitory and task-knowledge do not use the skills effectively. Meta-cognitive training involves modeling for learning-disabled readers the techniques used by mature readers. "The more we are able to specify the rules used by expert readers, the more we will be able to successfully instruct the novice" (Baker & Brown, 1984, p. 354).

This present study incorporated metacognitive training within the cognitive strategy training. Studies by Baker and Brown (1984), McNeil (1984), and Paris, Cross, and Lipson (1984) indicated, metacognitive training increased students' comprehension abilities.

COGNITIVE STRATEGIES

The subjects in this study were taught three specific cognitive strategies: paraphrase/imagery, networking, and analysis of key concepts. Interest in cognitive strategies developed not only because of the change in learning theories but its development can also be attributed to the fact of open admission policies of colleges and universities. There was an influx of students to these institutions and it was found that many of these students

lacked cognitive information-processing strategies (Rohwer, 1973; Rohwer & Ammon, 1971).

George Miller (1956) was one of the first researchers to investigate how verbal material is encoded and organized. He found that a person could store 7 (plus or minus 2) units of information in short-term memory. Due to the limited capacity of this working memory, Miller discovered that by enriching or elaborating these units into chunks, one could retain 7 (plus or minus 2) chunks of ideas. Not all information processing involves information reduction; it sometimes requires expanding the information to learn and remember it (Weinstein & Underwood, 1985). Creating schemata through elaboration is what Craik and Lockhart (1972) refer to as "depth-of-processing".

DEPTH-OF-PROCESSING

Craik and Lockhart (1972) postulate that there are two levels of processing: (1) a shallow level (sensory analysis) and (2) a deep level (semantic analysis). They also postulate that the more deeply prose is processed the better it will be remembered. It has been shown that deep processing facilitates learning and retention when students actively process meaningful information (Jensen & Rohwer, 1963; Frase, 1969, Bower, 1970). An example of this is the use of imaginal or verbal information (Paivio, 1971;

Posner, 1969; Rohwer, 1970; Underwood, 1969). These studies found that learners use various codes to organize information to be learned and retained. This involves creating images to remember the relationships between words, making inferences, creating analogies, using networking, or paraphrasing to relate new information to previous knowledge. This relationship is achieved by the use of schemata. Rohwer (1966, 1970, 1973) investigated verbal context as an aid to paired-associate learning with 6th grade students. His findings support the contention that learning efficiency increases when students are instructed in cognitive strategies.

Craik and Tulving (1975) elaborated on the concept of depth-of-processing. They asserted that the determiner of what is recalled is not the amount of time, effort, or difficulty of the orienting task. Rather, the qualitative nature of the task and the types of cognitive strategies used on the text, determine retention. The qualitative nature of the task can be made explicit to the learners by giving them a legitimate purpose for performing the task using effective cognitive strategies which actively involve the learners in that task.

STRATEGY TRAINING PROGRAMS

Researchers have investigated cognitive learning strategies in isolation such as using visual imagery

(Paivio, 1971), questions (Rothkopf & Bisbicos, 1967) or in combination with other cognitive strategy training.

Dansereau, Long, McDonald, and Actkinson (1975) were the first to try teaching a combination of strategies. In their study with undergraduate college students, Dansereau and his colleagues taught three strategies: question-answer, paraphrase, and imagery. One strategy was taught to each of the three treatment groups, each receiving about 7.5 hours of training. Those trained in imagery and paraphrase techniques performed significantly better than the control group. Those trained in question-answer showed no significant difference from the control group. The researchers concluded from their study that the subjects should receive training in all three strategies; then they could choose the one they felt most comfortable using. Another factor which evolved from their research was that these strategies should be taught to criterion, enabling the students to use them at their own discretion.

Weinstein (1978) and her colleagues investigated the effects of a diversified elaboration skills training program with ninth graders. Five strategies over five one-hour skill training sessions were taught to the treatment subjects to give them a repertoire of skills. These included paraphrasing, imagery, analogies, drawing implications, and creating relationships. The students

applied these strategies to tasks which they encountered in their school setting using science, history, English, foreign language and vocational educational curriculum. After training, the students were tested and those receiving cognitive strategy training did better on recall measures only. However, when the subjects' comprehension was measured one month later, the training group's comprehension increased significantly. Weinstein et al. (1979) contends that to enrich the repertoire of strategies students need to be exposed to the strategies and have time to practice their use. Well practiced conscious encoding processes become automated (Bower, 1970).

Callahan (1979) is one of a few people who looked at strategy compensation as a method of looking at impoverished texts. Impoverished texts are a major reason for comprehension failure (Stein & Glenn, 1979; Bruce, 1984 cited by Jones et al., 1987). Expert readers are able to impose structure and interpret impoverished materials but novice readers simply add new information without integrating it with stored knowledge (Ballstaedt & Mandl, 1985 cited by Jones et al., 1987).

Callahan's (1979) study was one of the first to look at the expected outcome and use of appropriate strategies to achieve this goal. Different advertisement layout styles were used in the study. One group was instructed to

paraphrase rules to remember advertisements. Another group was instructed to rehearse the definitions. They were given classification tests and remember-the-definition tests. The idea was to help students compensate for impoverished material by directing them to process the materials in a specific way. The paraphrase group performed better in the classification tests and the rehearsal group performed better on the remember the definition test. The study also revealed that the outcome was affected by the strategies used. Different types of processing may not lead to "more learning but rather to a different kind of learning" (Morris, Bransford, & Franks, 1977 cited by Cook & Mayer, 1983). Instruction in cognitive compensating strategies for impoverished instructional displays (sometimes referred to as deficient or inconsiderate text) was effective. Those who were instructed in cognitive compensating strategies to compensate for impoverished or deficient instructional presentation displays performed more effectively and efficiently than those students who were not given this instruction.

Dansereau et al. (1979a) developed an empirically based cognitive strategy training program to assist students in reorganizing, integrating, and elaborating incoming material to "increase conceptual connectivity in a

manner compatible with long-term memory structures" (Dansereau, 1978, p. 18). Previous learning skills programs have been founded on Robinson's (1946) SQ3R (Survey, Question, Read, Recall, Review) approach. Although they have shown some benefits, they also have drawbacks. These approaches are not empirically based and there is little detailed information on how to carry out the steps (Dansereau, 1985). Dansereau et al.'s (1979a) strategy training program alleviates these problems.

AN EXTENSIVE STRATEGY TRAINING PROGRAM by Dansereau, Collins, McDonald, Holley, Garland, Diekhoff, and Evans (1979a)

The present research was substantially influenced by Dansereau et al.'s (1979a) strategy training program. Research on providing relatively content-independent strategy training has been moderately successful (eg. Dansereau, 1978; Gagne & White, 1978; Mansfield, Busse, & Krepelka, 1978). Positive transfer resulted when the training and testing tasks were similar. Students, however, had difficulty in adapting the strategies to new contexts. In the program developed by Dansereau and his colleagues (1979a) subjects were first taught more general content-independent strategies, and then later these were broken down into more specialized content-dependent ones. It is generally recognized that both content-independent

and content-dependent strategies are important (eg. Glaser, 1985; Keil, 1984 cited by Shuell, 1986).

The subjects in this study were shown examples of content-independent strategies but then applied the strategies to their own courses of study.

Dansereau et al. (1979a) based their program on two premises: (1) the cognitive activities students engage in when encountering academic or technical learning tasks are important; (2) these activities can be made more effective and efficient through instruction. Their first premise was suggested by numerous educational researchers (eg. Rothkopf, 1966) and their second point is verified by research studies which have evaluated various cognitive strategies (eg. mnemonics -Bower & Reitman, 1972). The strategy program used by Dansereau et al. (1979a) was well grounded in research and found to be useful to learners who had difficulty comprehending text. The strategy program used by Dansereau et al. (1979a) was explicitly taught to the subjects at AVC in this study.

Training in appropriate cognitive information processing strategies facilitates acquisition, retention, and utilization of information (Dansereau, 1985). Two classes of strategies were identified in this program (Dansereau et al. 1979a); (1) those used to operate directly on the material (primary strategies), and (2)

those used to operate on the individual to help maintain a suitable, psychological climate (support strategies).

Instruction in this program focused on four aspects of learning in the two classes. Primary strategies were used to (1) identify important, unfamiliar and difficult material, (2) apply techniques for understanding and then retaining this material and (3) retrieval of this information. Support strategies allow primary strategies to be effective by helping students (4) cope with loss of concentration, fatigue and aid in monitoring primary strategies. Support strategies are metacognitive strategies.

Primary Strategies

In the Dansereau study, the acronym MURDER was used to help students remember the sequence of activities involved in applying the primary strategies.

This strategy was used in the present study to give the subjects a concrete sequential method to use when comprehending textual material.

The primary strategies include two strands:

(1) 1st degree **MURDER** for comprehension and retention; and (2) 2nd degree **MURDER** for retrieval and utilization. The **M**

in both acronyms stand for mood-setting and maintenance strategies that fall in the metacognitive category.

1st degree MURDER	2nd degree MURDER
Mood	Mood
Understand	Understand
Recall	Recall
Digest	Detail
Expand	Expand
Review	Review

The primary strategies require the student to actively read the text more than once. Studies on cognitive strategy training have shown that elaboration and multiple encodings of information with emphasis on active recall, facilitate learning and retention of complicated material (Norman, Genter, & Stevens, 1976 cited by Dansereau et al., 1979b; Rohwer, 1973). The first pass creates a 'structure' or 'network' of the important concepts which, in turn, solicits a schema from prior knowledge in the learner's memory. The multiple pass approach is also supported by the experiments of Ausubel (1968) on advance organizers although Ausubel's advance organizers tended to be subject oriented. Ausubel found that providing a 'scaffold' for the material before reading in depth, increases comprehension and retention.

Students create their own 'scaffold' by going through the material to give them a basic **Understanding** of the text. They underline the main ideas looking for meaning and if necessary use a dictionary or other resources.

In a study by Davidson (1977, cited by Wilcox et al., 1979) it was reported that students who underlined their own material and paraphrased the important ideas in their own words out-performed those who read material where the underlining and paraphrasing were done for them. This underlining achieves two goals: (1) it induces selective attention (Anderson, R. C. 1970), and (2) it summons prior knowledge.

Selective attention suggests that people attend to the strongest, most salient, or most meaningful aspect in a passage (Anderson, R. C. 1970). Prior knowledge is also activated.

Information is not learned in isolation; learning is cumulative (Shuell, 1986). The role of prior knowledge is important in the acquisition of new knowledge. Many researchers (Anderson, Spiro, & Montague, 1977; Cook & Mayer, 1983; Dansereau, 1985; Jones, Amiran, & Katims, 1985) have stated that the degree to which context is understood is a function of the background knowledge the

learner brings to the text as well as the learner's active cognitive processing.

The **Recall** strategy involves using one of the substrategies; paraphrase/imagery, networking, or analysis of key concepts. These sub-strategies will be discussed in more detail in the following section.

The **Digest** strategy involves focusing on the ideas previously underlined which the students still do not understand. They look at these ideas in more detail looking at other resources; human or textual material, to clarify what they do not understand.

The **Expand** strategy involves expanding their own knowledge through self-inquiry. The students are trained to ask: "Imagine you could talk to the author. What questions would you ask? What criticisms would you raise? How can the material be applied? How could you make the material more understandable and interesting to other students? How does this new information relate to what I already know?"

The **Review** strategy has the students review errors from a test and modify the study methods to prevent future errors. For example, if a student omitted several main concepts these are added to the network or other method used to retain the material or the method used is evaluated

to determine if this was the best method for that student using that particular material.

Several authors (Anderson, 1970; Merrill, 1975; Rigney, 1978) have indicated that three mediating processes are required for verbal learning: (1) attend to the to-be-learned material, (2) process the information in a "meaningful" way to retain in long-term memory, (3) consider how the various aspects of the stimuli are linked. The primary strategies incorporate all three mediating strategies. These primary strategies promote this by actively involving the learner through multiple manipulation of the to-be-learned material utilizing the substrategies.

Once the material is comprehended and stored in long-term memory, then at some point the learner will want to retrieve this information. Often learners display "tip of the tongue" behavior (Hart, 1965, cited by Dansereau, 1974). An idea is often stored in memory but for some reason it is inaccessible. The student may randomly search, guess, or more often, give up if they do not have systematic retrieval methods (Brown & McNeil, 1966). The 2nd degree MURDER strategy provides the student an executive or systematic retrieval strategy.

The **Understand** phase involves understanding what is being asked. The student transforms the test question into

an alternative symbol system; paraphrase, imagery, networking, analysis of key concepts to clear up any misunderstandings.

The goal of the **Recall** phase is to retrieve the main ideas necessary to answer the question. Students are instructed to relax and create a mental image of the situation in which the main ideas were acquired. This may have been through the use of paraphrase/imagery, networking, or analysis of key concepts. They are made aware of the interrelationship between the retrieval strategies and the processes involved in problem solving.

The **Detail** phase is the same as the digest phase in 1st degree MURDER. The student makes sure that s/he has included all the information which was asked for in the question.

The **Expand** phase is an organizing phase in which the information retrieved during the previous two stages is organized. This may involve numbering the main ideas and the supporting details to construct an organized and coherent response.

The respond and **Review** phase involves responding in some way which may be written or it may be a set of actions. The students are encouraged to look at their responses to determine if they correlate with the question.

Support Strategies

The internal psychological environment of the student ought to be at its optimal state in order to learn (Dansereau et al., 1979a). Support strategies assist the student in maintaining this state. These strategies may include learning to plan and schedule their working time, using concentration techniques, and most importantly, monitoring what they are learning. This monitoring consists of stopping frequently while learning and asking themselves what they have learned and if they understand what they are reading. This keeps the learners "on track" actively involved in their own learning. In order to develop effective teaching methods, instruction should reflect what is known about learning (Brown, Campione, & Day, 1981).

HOW STUDENTS LEARN

Jones, Palincsar, Ogle, and Carr (1987) outlined six propositions on how students learn.

1. **Learning is goal oriented.** Students have two goals while learning: (a) to understand the meaning of the task, and (b) to regulate their learning. They use prior knowledge and specific strategies to construct meaning and become independent learners.

2. **Learning is linking new information to prior knowledge.** Knowledge is stored in memory in knowledge structures called schemata. Schemata are highly interrelated and allow one to make inferences. If the information is unclear, disorganized, or lacking in meaning (impoverished text) or if the purpose for reading is not explicit then comprehension is affected.

Domain-specific knowledge is important to develop understanding. Not only is it necessary to have a repertoire of effective cognitive strategies but knowing how a specific domain is structured furthers comprehension (Resnick, 1984 cited by Jones et al., 1987). Consider, for example, the de Groot (1965) study where expert and novice chess players were given sequences of placements of the chess pieces to remember. The expert players' performances were superior to the novices. But, when the sequence did not relate to a sequence found in the game of chess, neither group remembered more than the other.

Inert knowledge also affects comprehension (Bransford, Sherwood, Vye, & Rieser, 1986 cited by Jones et al. 1987). Inert knowledge is knowledge which students possess but are unable to access because of the inability to relate incoming information with related information or lack of retrieval strategies.

Students must have prior knowledge and the ability to access this knowledge. Explicit cognitive strategy training to encode and elaborate information is required for retention and the ability to retrieve this information to apply to new situations (Jones et al., 1987).

3. **Learning is organizing knowledge.** This organization can exist "inside the head" (knowledge of organizational patterns) or "outside the head" (knowledge of the text). Consider the compare/contrast pattern used in texts. This pattern can exist both in the mind and on the page. Text structures exist for different genres (eg. fiction, stories, poetry). Also texts associated with expository texts may be compare/contrast, cause/effect, problem/solution, sequential, and concept/examples (Anderson & Armbruster, 1984).

4. **Learning is strategic.** Students not only require a knowledge of cognitive strategies but more importantly they need to know how and when to use them; the meta-cognitive aspect of learning. This corresponds to Dansereau's (1978) support (metacognitive) strategies.

5. **Learning occurs in phases but is recursive.** Prior knowledge is activated by skimming the text. The Understand phase of Dansereau's (1978) 1st degree MURDER involves skimming the text. This skimming process also

focuses the students' attention on the content, the text structure, and allows them to decide on an appropriate cognitive strategy (Mayer, 1984). The learners stop, analyze what has been read, check back into memory to see if it can be connected to something different, then they rethink the ideas (Vygotsky, 1934, 1962). This learning is not sequential but recursive.

6. **Learning is influenced by development.** Proficient learners and less proficient learners differ in the amount of prior knowledge available on a subject, the repertoire of cognitive strategies, and the knowledge of metacognitive strategy usage. There is substantial evidence that low-achieving learners can be taught to successfully use various cognitive strategies (eg. Feuerstein 1980, Holley & Dansereau, 1984; Weinstein & Underwood, 1985). Learning these strategies requires sufficient time, explicit training opportunities to use them, and corrective feedback (Garner, Hare, Alexander, Haynes, & Winograd, 1984). Derry and Murphy (1986) argue that cognitive strategy training is not enough. Students also require training in metacognitive processes.

Dansereau, Holley, Collins, Brooks, and Larson (1980) found it more advantageous to teach primary strategies prior to support strategies. The purpose of utilizing the

primary strategies was to encourage successive passes of the material to create a schema for the new material. Also, the use of the MURDER strategies provide interactions with the material to maximize the student's learning potential (Dansereau, Collins, McDonald, Holley, Garland, Diekhoff, & Evans, 1979a). This present study emphasized training in each of the three sub-strategies; paraphrase/imagery, networking, and analysis of key concepts and once the researcher felt the students were knowledgeable of the strategy then the metacognitive (support) strategies were incorporated with the strategy learned. Each of these sub-strategies are defined in the sections that follow.

PARAPHRASE/IMAGERY

Paraphrasing is the transformation of textual material into the learners' own words after reading a portion of the text, without looking at the text (Mayer, 1980; Spurlin, Dansereau, & Brooks, 1980). Students explicitly taught to summarize have been found to perform significantly better on recall measures than those using their own study methods or those using a read, re-read strategy (Anderson & Biddle, 1975; Dansereau, 1978; Doctrow, Wittrock, & Marks, 1978; Ross & DiVesta, 1976).

Spurlin, Dansereau, and Brooks (1980) compared the effects of frequent summarizations (every 600 words) to

non-frequent summarizations (every 1200 words). His study showed that frequent summarization was better if the outcome performance was to develop a microstructure (details - Kintch & van Dijk, 1978) and non-frequent summarization was better if the outcome performance was to develop a macrostructure (organization, gist, main ideas - Kintch & van Dijk, 1978). Frequent summarizations produced higher quality notes but the students using this form did not do well on essay writing.

In this study students used both methods of summarizing depending on their goal; note taking or essay writing. When the students were required to write an essay they learned to make notes of the main concepts and then elaborate and interconnect the concepts so as to generate the gist of the content. When they were required to remember specific details the students made notes more frequently on the material.

IMAGERY

Levin (1976) and Reese (1977) distinguished between **imposed** imagery and **induced** imagery. Imposed imagery is imagery provided by the teacher or experimenter and the learner uses this image to associate items. This was found to be useful for kindergarten and first graders. Induced

imagery is imagery generated by the learner and was found to be beneficial for sixth graders and adults. Those who were able to generate their own images (induced imagery) were distracted by those images which were suggested by others (imposed imagery).

Imagery improves listening and reading comprehension of students at all levels (Pressley, 1977). It has been found that mature readers use imagery spontaneously. Imagery is an effective strategy in learning paired associates using the keyword method (Pressley & Levin, 1978). In this method a familiar concrete word that resembles the unfamiliar vocabulary word is found and an interactive image is created between the keyword and the to-be-learned definition.

Shriberg, Levin, McCormick, and Pressley (1982 cited by Peters & Levin, 1986) were the first to apply the keyword method to learning prose for Junior High students. They found that the students benefited significantly in using imagery. Other studies (Levin, 1982) using imagery to learn prose were successful and it was found that recall was not only significant immediately after instruction but also one week later. One important point which this study revealed is that low-achievers need to know which elements of a passage are important enough to be included in their images.

Imagery was used in this study to remember lists and also to elaborate, where feasible, ambiguous prose so that difficult concepts were interrelated to prior knowledge.

NETWORKING

Quillian (1968, cited by Holley & Dansereau, 1984) suggested that human memory may be organized as a network consisting of ideas or concepts and relationships between concepts. Schema theory also supports this thesis (Cole & Sticht, 1981).

Networking assimilates the concept of schema theory by spatially reorganizing the information into a scaffold creating connections (links) between main ideas and supporting details (nodes). It is often referred to as a node-link map and used as an outlining technique. Collins and Quillian (1969) developed a three-level memory structure in which the hierarchical concepts are expressed using the "isa" relationship (e.g. a cocker spaniel is a dog). The attributes are associated to these nodes using unlabeled arcs. Rumelhart, Lindsay and Norman (1972) developed a complex system based on experimental results and incorporated episodic memory. Based on these two models Holley et al. (1979) developed a network in which thirteen links were identified but it was found that they were too unwieldy for the students and they tended not to use the networks. Holley et al. (1979) reduced this

number to six links: part (of) link, type (of) link, leads to link, analogy link, characteristic link, and evidence link. An example of each is shown in figure 2.1.

These graphic outlines or visual maps reflect the key ideas and text structures. Depending on the text structure, several configurations are constructed such as the spider map which has the main point in the center surrounded by supporting details, a chain map used to show steps sequentially, and the hierarchy which reflects multiple levels (see figure 2.2). These maps not only reflect the content but also the pattern of the content.

Students from kindergarten to college level, applying various versions of the networking technique, have performed significantly better on text processing tasks than those using their own methods (Dansereau et al., 1979a ; Dansereau et. al., 1983, Dansereau, 1985; Holley et al., 1979). Armbruster (1979) found that networking was more beneficial for students with low Grade Point Average (GPA) scores.

The networking strategy was used in the present study to develop spatial representation of information when it was beneficial to see all of the interconnecting links between concepts.

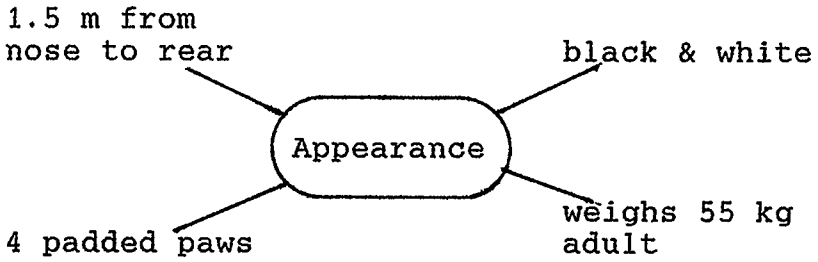
Figure 2.1 **Link types and structure types employed with the networking technique.**

STRUCTURE	LINK	DESCRIPTION
Hierarchy	part (of) body head	The content in a lower node is part of the concept, idea, contained in higher node.
Hierarchy	type (of) company oil	The content in a lower node is a member of or example of the class or category of concepts, ideas, contained in a higher node.
Chain	leads to scab scar	The idea, concept, process in one node leads to or results in the idea, concept, process in another node.
Chain	analogy scab protective bandage	The idea, concept, process, in one node is similar to or like the object, idea, concept, process in another node.
Cluster	characteristic Panda bear black & white	The idea, concept, process, in one node is a trait or aspect, feature, or characteristic in another node.
Cluster	evidence thief finger prints	The idea, concept, process, in one node provides evidence or confirmation in another node.

Adapted from "Networking: The Technique and the Empirical Evidence" by C. D. Holley & D. F. Dansereau, 1984, Spatial Learning Strategies p. 85.

Figure 2.2 **Different map configurations of a network.**

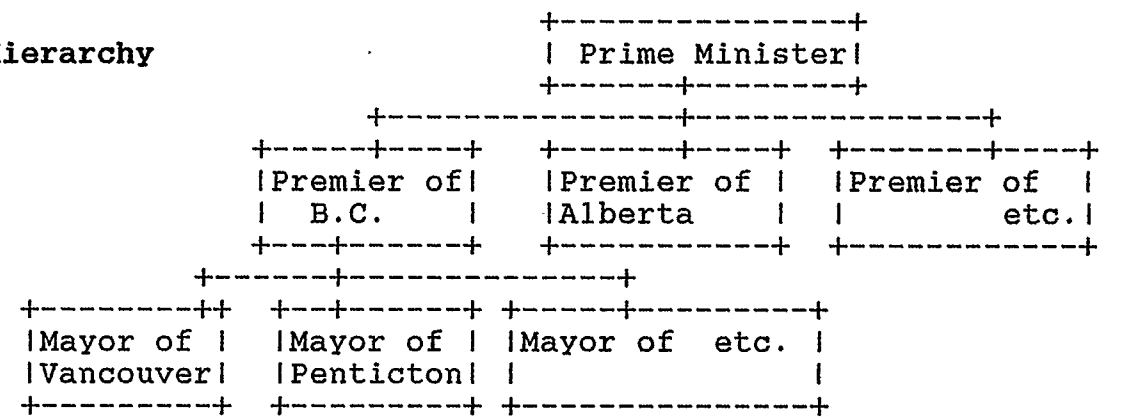
Spider Map



Sequential

Chains	Stages
stage 1	caterpillar spins cocoon
stage 2	moth is formed inside

Hierarchy

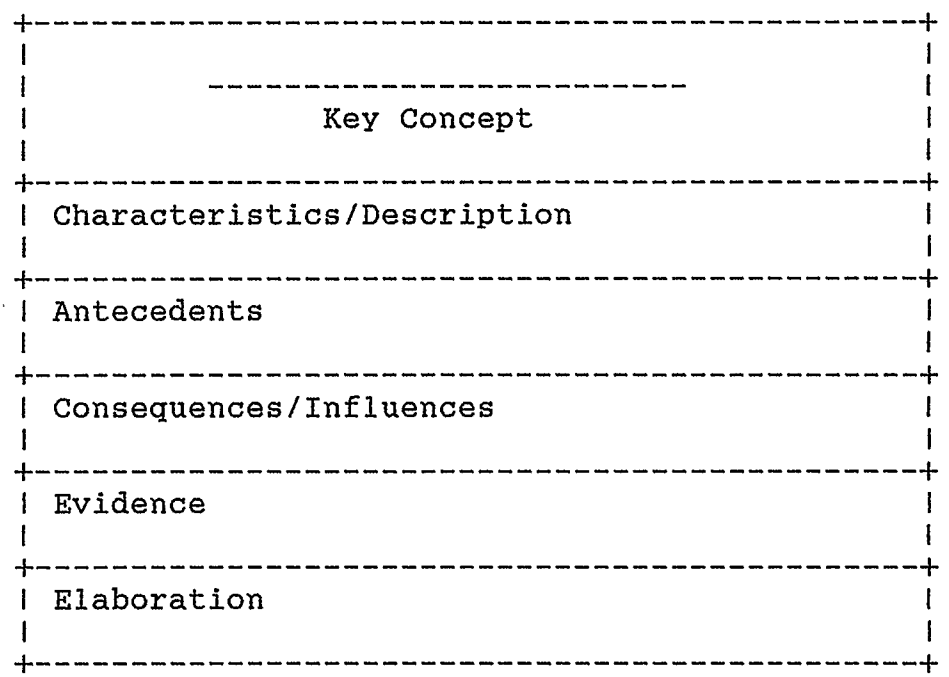


Adapted from Strategies Teaching and Learning: Cognitive Instruction in the Content Areas by Jones, Palincsar, Ogle, & Car, 1987, p. 39.

ANALYSIS OF KEY CONCEPTS

Analysis of key concepts is an alternative to the networking technique. This cognitive strategy is also known as the Node Acquisition and Integration Technique (NAIT). (Diekoff, Brown, & Dansereau, 1982). Key ideas or concepts are identified, they are defined, and examples and applications of the concepts are considered. The interrelationships between important pairs of concepts are identified. Students are given worksheets which they use to elaborate the key concepts (see figure 2.3).

Figure 2.3 **Sample definition worksheet.**



Adapted from "A Prose Learning Strategy Training Program Based on Network and Depth-of-Processing Models" by G. M. Diekhoff, P. J. Brown, & D. F. Dansereau, 1982, Journal of Experimental Education, 50(4), p. 181.

These relationships in Figure 2.3 parallel the same relationships that were used by authors of introductory natural and social sciences. Relationships for other domains are developed for the same purpose by identifying the textual structure.

There are four stages which the student follows when using the analysis of key concepts technique (Diekhoff, Brown, & Dansereau 1982).

Stage one: **Identify key concepts** which can be accomplished by selecting the italicized terms, terms used in headings, or subheadings, terms identified by the author, or those in glossaries, etc.

Stage two: **Build a semantic network** around each of the key concepts by finding information linking the concepts using the relationships correlated with the domain.

Stage three: **Elaborate the information**. This elaboration stage consists of thinking of examples or potential applications of the information.

Stage four: **Write a brief summary** on the worksheet of how various concept pairs are related.

Students receiving three hours of training in the use of the key concept analysis showed significantly better

long-term (one-week) retention and retrieval of academic information than those in the untrained control group (Diekhoff, et al.,1982).

Paraphrase/imagery, networking, and analysis of key concepts are all techniques based in part on learning strategy theories: information-processing theory, schema theory, and depth-of-processing theory. These techniques aid in developing frameworks and elaborations compatible to memory structures. They allow students to comprehend impoverished material by connecting prior knowledge to the new material; improving retention and utilization of the material. In order to apply these three strategies students need to be able to identify the main ideas and supporting details in the subjects they are studying.

Identification of Main Ideas

It has been found that low-achieving students have difficulty in determining which ideas are important and finding the gist of what they read (Kennedy, 1985; Winograd, 1984 cited by Draheim, 1986). It is not because they do not apply a method. Students are often consistent in determining what they consider important points but these ideas do not match what a successful reader finds important (Singer & Donlan, 1985). The lower achiever has not been taught explicitly how to determine the main points. Based on the summarization model proposed by van

Dijk and Kintsch (1977) and on summarization protocols of children and adults, Brown and Day (1983) established a set of six steps which they found effective in identifying the main ideas. According to the summarization model, information to be included in a summary is determined by macro rules for deletion, generalization, and integration. The six rules by Brown and Day (1983) utilize these macro structures.

Two of the rules involve the deletion of unnecessary material. Trivial and redundant material is deleted. Two of the rules involve generalization by substituting a superordinate. For example, if the text contains a list such as cats, dogs, gold fish, gerbils and hamsters then the term pets is substituted for this list. Also the integration rule can be applied. For instance, "Sally went to Tahiti"; as a substitute for "Sally bought a ticket", "Sally went to the airport", etc. The last two rules provide a summary of the paragraphs by selecting a topic sentence which is the author's summary of a paragraph. Or, if there is not topic sentence, the students invent their own.

Draheim (1986) conducted a study with first year university students using (1) directed reading-thinking activity (DRA), (2) conceptual mapping (networking), (3) a combination of the two, and (4) reading and

underlining techniques. It was found that low aptitude students using a combination of DRA and mapping recalled significantly more main ideas than students who used DRA alone or mapping alone. None of the approaches had a significant effect on the ability of recall for high aptitude students.

ADJUNCT VERSUS SIMULTANEOUS COGNITIVE STRATEGY TRAINING

There has been some controversy as to whether cognitive strategies should be taught in adjunct courses so that the learning of these skills do not interfere with the learning of the content (Dansereau, 1985; McCombs, 1981; Weinstein & Underwood, 1985) or if cognitive strategies and content should be taught simultaneously (Jones et al., 1985, 1987; Sticht, 1979).

The cognitive strategy training in this present study consisted of teaching the strategies adjunct to the content but the practice of the strategies was done with the material that was used in class. This would encourage transfer of the skills and increase motivation in using the strategies as the subjects became successful comprehending material they were studying.

APPLICATION TO PRESENT STUDY

The present study closely replicated a combination of Callahan's (1979), Weinstein's (1978) and Dansereau's et al. (1979) studies. It assessed the appropriate strategies for a given outcome generalizable to a variety of areas, the display presentation, and it considered the effects of these strategies in terms of the students' abilities. The processes the students used during comprehension tasks were also analyzed. The cognitive sub-strategies used were paraphrase/imagery, networking, and analysis of key concepts. Students were taught to analyze the material using the 1st degree MURDER strategy. This enabled the students to make multiple passes of the text using different techniques each time. Metacognitive strategies were incorporated into the **Mood** segment of the strategy. They were also taught to use the 2nd degree MURDER strategy as a systematic means of retrieving information from long-term memory. The material used was from the students' own studies. To verify which strategy a subject used while comprehending the textual material in this study, a protocol analysis was done.

PROTOCOL ANALYSIS

Protocol analysis is a set of techniques used to analyze verbal reports (Ericcson & Simon, 1980). When a process cannot be observed directly, the protocol analysis

technique provides this information by asking subjects to "think-aloud" while they work through a specific task. The comments they relate aloud are verbal protocols and the techniques used to analyze these verbal reports are protocol analysis.

Protocol analysis has been employed since the early 1900's by psychologists to gain an understanding of how humans mentally process information. These introspective methods require that the subjects undergo extensive training so that it does not interfere with their thought processes (Johnson, Zaulkerman, & Garber, 1987). This method has been criticized because of the difficulty in verifying whether subjects were explaining the actual processes they were going through in relating their thoughts after the fact, or if they were making inferences. In the 1970's the move from behaviorism towards cognitive processing inspired researchers like Newell and Simon (1972, cited in Johnson et al., 1987) to change the method of the traditional introspection to what they termed concurrent protocol analysis. This involves "thinking aloud" as information is processed.

Based on a study by de Groot (1965, cited in Johnson, et al., 1987), Newell and Simon (1972) asked chess players to think aloud without attempting to rationalize their problem solving activities. This concurrent protocol

removed some of the earlier criticisms associated with the traditional method. It contributed to the development of the human information processing theory (Johnson, et al., 1987 see page 20 of this study).

When given instructions to "think-aloud", the subject verbalizes the information which they attend to in short-term memory (STM). Verbalizing information affects the cognitive processes of the subject only if they are required to verbalize information that they would not attend to otherwise. Subjects would be forced to make inferences rather than remember their mental processes explicitly (Ericsson & Simon, 1980).

Levels of Thought Processes

Ericsson and Simon (1984) describe three different levels at which a subject can verbalize his/her thought processes. **Level one verbalization** is the vocalization of covert articulatory or oral encodings. There are no intermediate processes; the subject vocalizes what s/he is thinking as s/he is thinking it to perform a task. For instance for recall or recognition, "My I. D. number is 234078." "That's an aardvark."

Level two verbalization involves a description or an explication of the thought content. One or more mediating processes occur between attention to and delivery

of the information. At this level subjects may verbalize their thoughts just after they have occurred. "We should be golfing instead of working." Also at this level, the internal representation in which the information was originally encoded may not be in verbal code but is translated into that code. Additional processing is required to find referents understandable to others (Werner & Kaplan, 1963, cited in Ericsson & Simon, 1980) and new information is brought into STM. "The aroma reminds me of our trip to Italy."

Level three verbalization is the explanation of his/her thought processes. It requires linking information attended to earlier. At this level subjects are asked to consciously recall and to explain why s/he is thinking in a certain way. For instance, subjects may be asked to explain why they feel it is important to start with addition prior to teaching multiplication.

Forms of Probing

To gain information on the subjects' internal state different forms of probing may be used. The first, which is the more direct and widely used probe is to instruct the subjects to "think-aloud" or "talk-aloud". The heeded information is verbalized through direct articulation or by verbal encoding of the information originally stored in a non-verbal code.

In a second procedure the subjects are asked to verbalize specific information concurrently while they perform a task. Subjects may be asked to report the procedure they are using while learning concepts or discriminating ideas. This technique stems from the subjects' actual sequence of thought processes. In this process the theorizing is left to the experimenter.

A third type of probing procedure is retrospective. Subjects are asked for information after the process is completed. A form of retrospective probing is called interpretive probing, in which subjects are probed at the completion of an experimental session. Ericsson and Simon's model (1980, 1984) predicts that some of the heeded (attended to) information will still be in STM but if other information is in LTM the verbal protocols may not reflect the exact process which they used. Retrospective probing may cause subjects to remember some parts of the process they used but they may also draw on other prior knowledge and make inferences which causes difficulties in interpreting the information. This method of gathering data is subject to criticism because it probes for information on prior behavior. The subjects do their own theorizing on how they processed the information.

During the sessions where subjects are thinking aloud the best reminder to have them talk aloud while they are

working on a task is to say "Keep talking". Instructions to "Please, think aloud", or "Please, tell me what you are thinking" are more likely to elicit a self-observation process or require the subject to directly answer the experimenter, both of which may interfere with his/her thought process (Ericsson & Simon, 1984).

It has often been asserted that eliciting verbal reports changes the course and structure of the cognitive processes. Ericsson and Simon (1980) address the possibility of affecting the cognitive processes when the subjects are required to report periodically during experimental sessions; that is, concurrent with the task performance. In their information processing model, Ericsson and Simon (1984) assert that articulation of oral encodings (level 1) or verbal recording of non-propositional information without additional processing (level 2) will not change the course and structure of the cognitive processes. At level 2 information processing may be slowed down but the course and structure will remain largely unchanged. When subjects are asked for reasons for their actions and the information is not normally available (level 3), the information processing model predicts that the effects of verbalizing why a subject thought in a certain way, would be prominent.

Newell and Simon (1972) and Ericsson (1975) compared solutions to the same problems of think-aloud subjects with subjects under silent conditions. There was no difference between the search strategies of both groups but Ericsson (1975) stated that the silent group may have spent more time planning and thinking ahead as the think-aloud group made several false starts in order to arrive at a solution.

Assessing Verbalizations

To assess whether the verbalizations are pertinent to the solution process, Ericsson and Simon (1984) postulate three criteria as necessary conditions to be satisfied by verbal data used to infer cognitive processes.

Relevance Criterion: The verbalizations should be relevant to the given task. A task analysis reveals what information is relevant to the performance of the task (Newell & Simon, 1972 cited in Ericsson & Simon, 1984).

Consistency Criterion: The verbalizations should be logically consistent with the verbalizations that just preceded them. This implies a high level control and organization of the processes underlying verbalizations. Judging consistency again requires analysis of the verbalizations.

Memory Criterion: A subset of the heeded information during task performance will be remembered. Much of the information that is attended to during a think-aloud or retrospective report will be remembered. This can be tested by questioning recall or recognition of the information. (Ericsson & Simon, 1984, p. 171)

If subjects articulate information that is directly available to them, then thinking aloud will not change the course and structure of the cognitive process (levels 1 & 2). But if they are asked to explain why they performed a specific task (level 3) then the course and structure of the cognitive processes are affected.

In the present study the purpose of the protocol analysis was to determine which, if any strategy, was used by the students to comprehend the text. They were asked to "think-aloud" and describe how they located the main ideas and related them to each other in order to remember them. This question is at a level 2 probing technique which, according to the work done by Ericsson and Simon (1984), should not have affected their cognitive processes.

PEARSON AND JOHNSON'S QUESTIONING TAXONOMY

In order to assess the subjects' comprehension on the expository texts the Pearson and Johnson's (1978) questioning taxonomy was used.

The Pearson and Johnson's (1978) questioning taxonomy is a classification of relations that exist between questions and responses related to the content of expository texts. "Essentially, our scheme is based upon the data source that must have been used by the reader to generate that particular response" (p. 163). Pearson and Johnson (1978) identified three relationships: textually explicit, textually implicit, and scriptually implicit.

Textually explicit question-answer relationships are those which can be found within the text and cued by the language of the text. For example, if the text read: "John made his fortune selling stocks" the answer to the question "How did John make his fortune?" is explicitly stated in the text.

Textually implicit question-answer relationships are those in which both the question and the answer are within the text but there is no logical cue tying the two together. For example, if the text read: "The animal crept cautiously into the yard. The fox stole a chicken from the barnyard." The majority of people reading this text would infer that the animal who crept into the yard was the fox although it does not necessarily have to follow.

Scriptually implicit question-answer relationships are those in which the readers need to use their background

knowledge; the knowledge for which they have schemata. A plausible answer not found in the text is given to a question derived from the text. Pearson and Johnson (1978) refer to this as "reading beyond the lines". For example, if the text read:

> In China the fisherman use a bird with a long neck and beak to help them catch fish. The fisherman ties a rope tightly around the bird's neck and holds onto the rope while the bird dives for fish. When a fish is caught the bird is unable to swallow the fish. The fisherman pulls the bird to the boat and keeps the fish. After he has enough fish he allows the bird to eat some. The smart bird gets a free meal. So does the clever fisherman!

If the response to the question "Why did the bird get a free meal?" was "The bird proved its worth to humankind", then this would be considered scriptually implicit. The student has used his/her background knowledge to give a plausible answer to the question which was not included within the text but is related to the text.

UTILIZATION OF THE COMPONENT DISPLAY THEORY AS A DIAGNOSTIC TOOL TO ASSESS THE ADEQUACY OF THE MATERIAL

The second factor, after considering the cognitive strategies, which affects what the learner processes is the structure of the material. Lexical and semantic information necessary for comprehension is often omitted in many texts; especially those used in post graduate study (Stein & Trabasso, 1982). In the present study the material used by adult learners in an upgrading program was analyzed to determine the degree to which the material is impoverished. In this processes a decision can be made as to how well it is organized, how coherent it is, or how well it is written. Merrill, Olsen, and Coldeway (1976) have developed a technique for assessing the consistency and adequacy of instructional materials. As a result of empirical research investigating the effects of instructional displays on student performance, the Component Display Theory (CDT), formerly referred to as the Instructional Strategy Diagnostic Profile (ISDP), was developed.

Merrill (1987) has continued development of the Component Display Theory to better address such aspects of pedagogy as discovery learning, and studying through simulations, as well as permitting the construction of an instructional design expert system. The most recent

version is now referred to as the Component Design Theory and has been developed to address computer assisted instruction. Therefore, for the purpose of this present study the extensions were not considered relevant and the earlier version was used as a basis to test the degree of impoverishment of the material used by the adults in the upgrading program.

Component Display Theory is based on the following propositions (Merrill, Olsen, & Coldeway, 1976):

1. Primary Presentation Forms. A segment of the instruction should include all three of the primary presentation forms: rule, example, and practice. A segment is defined as that instruction designed to teach a given concept, procedure, or principle. Presentation forms are the methods by which information is imparted. For example, this may be through a lecture, a text, a slide/tape, or a workbook format.

2. Primary Presentation Form Sequence. The primary presentation forms for a given segment should be sequenced in some variation of rule-example-practice. Acceptable variations include the use of a reference example simultaneous with or previous to the presentation of the rule. Such

presentations should include additional examples following the presentation of the rule.

3. Primary Presentation Isolation. The primary presentation forms for a given segment of instruction and accompanying elaboration should be identified and isolated in such a way that a student can easily locate, skip, or review a given form.

4. Learner Control. The student should be able to select the number of primary presentation forms they require to master the material.

5. Generality Representation. The rule should be restated, represented in other than verbal form, and/or elaborated via a mnemonic or an algorithm.

6. Mathemagenic Information. Example displays should be elaborated via mathemagenic information prompting or simplified representation. Practice displays should include mathemagenic information or simplified representation forms. (p. 11)

The process of determining whether or not the presentation does contain the necessary information, emphasizes two prescriptions of relevance to the current

study: presentation adequacy and presentation consistency (Merrill, Reigeluth, & Faust, 1979; Merrill, Richards, Schmidt, & Wood, 1977).

Presentation Adequacy

An assumption of Component Display Theory is that a given presentation can be divided into a series of distinctive displays. These displays consist of primary presentation forms, secondary presentation forms, process displays, and procedure displays. Primary presentation forms consist of a generality or an instance (example) which may be presented in an expository (telling) or in an inquisitory fashion (asking) (see figure 2.4).

Figure 2.4 **Primary Presentation Forms**

	Tell or Expository	Question or Inquisitory
Generality	Rule or Generality	Practice or Test
Instance	Example	Practice or Test

Adapted from "Component Display Theory" by M. D. Merrill, 1983, in C. M. Reigeluth (Ed.) Instructional Design Theories and Models: An Overview of their Current Status, p. 306.

Secondary presentation forms elaborate the primary presentation forms. This elaboration is accomplished

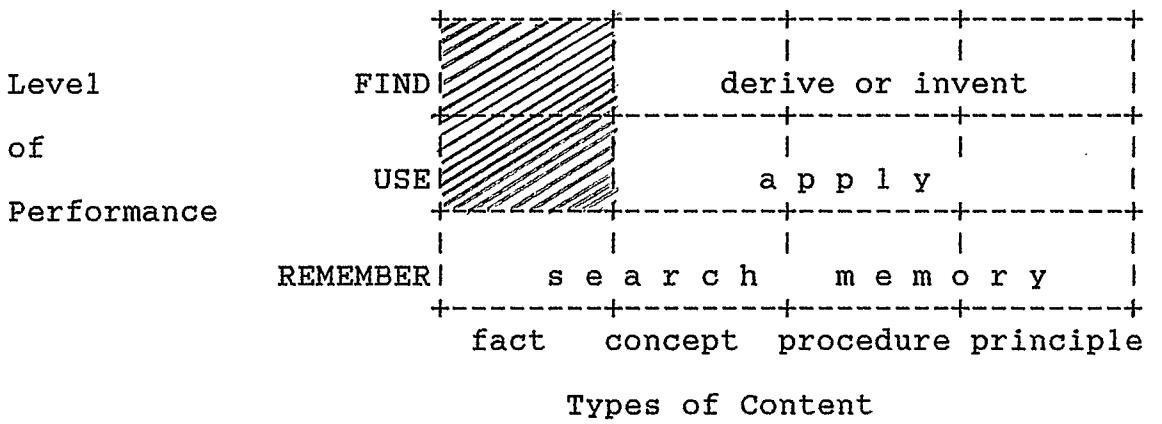
through the use of focusing devices such as arrows, color, or boldface, or the use of mnemonics, analogies, or corrective feedback.

Process displays indicate to the student how to consciously process the to-be-learned information. For example, "Close your eyes and try to create a mental image relating these two objects."

Procedure displays indicate to the student how to manipulate the delivery system. For example, "turn on the tape recorder now."

Learning outcomes are classified on two dimensions in CDT; the task level required by the student and the type of content involved. This is called the task/content matrix (see figure 2.5).

Figure 2.5 **Task/Content Matrix**



Adapted from "Component Display Theory" by M. D. Merrill, 1983, in C. M. Reigeluth (Ed.) Instructional Design Theories and Models: An Overview of their Current Status, p. 286.

The four types of content indicated are fact, concept, procedure, and principle. A fact is a one-to-one association between objects, events, or symbols. A concept is a class of objects, events, or symbols that share critical attributes. A procedure is a series of performances required to produce a specified outcome. A principle is some relationship (usually cause/effect) between two or more concepts.

There are three task levels: (1) a **remember** level where the student is required to remember an example or generality verbatim or in some alternate form; (2) a **use** level where the student is required to implement or apply a generality; and (3) a **find** level where the student is expected to discover a generality (Merrill et al., 1981). This study tested at a remember-a-generality level to determine if the cognitive strategies used were beneficial in obtaining the main ideas but it also tested the students at a use level to ascertain whether the students could apply what they learned.

Presentation Consistency

For each task level, according to CDT, there is an appropriate combination of presentation forms which should be used in the presentation: (1) for objectives and test items at the remember a generality level the rule and rule practice are needed, (2) for objectives and test items

classified at the use a generality level, the rule, some instances, and instance practice are the primary presentation forms needed (see figure 2.6).

Figure 2.6 **Consistency Table**
This shows which primary presentation forms should comprise an instructional presentation so that it is consistent with its test items.

PRIMARY PRESENTATION FORM

	Generality	Instance	Instance Practice	Generality Practice
Use a Generality	tell, illustrate, show examples		ask for new examples	
Remember a Generality (verbatim/ paraphrase)	tell example			ask for generality /paraphrase
Remember an Instance (verbatim/ paraphrase)		give examples	ask for alternative	

Adapted from Component Display Theory and Study Strategies, by E. Callahan, 1979, p. 48.

The Component Display Theory was used as a tool to establish the degree to which the material was impoverished. Two of the three factors which determine how students process information have been discussed; the cognitive strategies used and the degree of impoverishment of the materials used.

MEASURING STUDENT ABILITY

The third factor affecting what is processed by the learner is the ability of the student, which is defined by McConkie (1977) as the verbal ability to comprehend text and skills to use a variety of cognitive strategies.

The subjects' verbal abilities were tested in this study to determine at which grade level they were comprehending at and to analyze if strategy training was useful to learners who had comprehension difficulties.

Mulcahy (personal communication 1988) recommended the use of the standardized Woodcock Reading Mastery Test-Revised (WRMT-R 1987) to determine the verbal ability of the subjects. Form G was used to evaluate the student's verbal ability.

The WRMT-R is a comprehensive battery of tests which are administered individually to students and measure several aspects of reading ability. Included in these are reading readiness (Visual Auditory Learning & Letter Identification), basic skills (Word Identification & Word Attack), and Reading Comprehension (Word Comprehension & Passage Comprehension). It can be administered to obtain a "short scale" total reading score or a "full scale" total reading score. The short scale may be used as an estimate of overall reading ability when a full scale is not required or if time is of the essence. Due to time

constraints and the fact that all subjects had to be tested individually, the short scale was administered in this study. Norms for this test are provided for grade levels from kindergarten to college senior and for adults to age 75 and older (see Appendix A).

The short scale consists of two tests: Word Identification and Passage Comprehension which are fundamental components of reading ability (Woodcock, 1987). Word Identification requires the subject to identify isolated words. The subject does not need to have encountered the word previously but has to be able to use syntactic knowledge to decode the word. The Passage Comprehension test is a modified cloze procedure which measures the student's ability to study a short passage and identify a key word missing from the passage. The test items were selected so that the subject is required to understand the whole passage in order to respond with an acceptable key word.

The items in these tests have been drawn from a variety of reading materials, including text books, newspapers, household and business documents. The normative data for the WRMT-R were gathered from a diverse population in the United States from various socio-economic backgrounds and ages from kindergarten to those over 80. According to Woodcock (1987) the reliability coefficients

are high for adults; .97 for Word Identification and .92 for Passage Comprehension. The validity scores are also high for these tests. Contributions from outside experts, including experienced teachers and curriculum specialists were used to develop the items for the WRMT-R.

The relative speed in which to obtain a verbal ability score, the high reliability and validity of the tests, and the extended norms for adults were the criteria used in selection the Woodcock Reading Mastery Tests-Revised for the present study.

SUMMARY

Much of the available instructional material is inadequate judged against the prescriptions of Component Display Theory (Merrill, 1983). One way to compensate for this inadequacy is to redesign the instruction but Merrill (1984) contends that a more profitable way is to train the student in specific cognitive processing strategies providing students with "learner control" to compensate for the incomplete instruction. This theory of increasing the comprehension of low achievers through modelling techniques used by successful readers is supported by the work done by Feuerstein (1980 -cognitive modifiability) and more recently Flaro (1989 -cognitive ability patterning).

The purpose of this study was to provide adult learners with a means of controlling their own learning by training them in meaningful cognitive processes to comprehend impoverished expository materials independently. It is intended that the student will become an analyst, analyzing the instructional presentation and based on that analysis establishes which cognitive strategy will facilitate comprehension (Weinstein et. al., 1979).

Low achieving students do not develop effective cognitive strategies without explicit strategy training (Jones, 1982). Explicit instruction improves comprehension (Dansereau 1978, 1985; Jones et al., 1987; Segal, Chipman, Glaser, 1985; Weinstein, 1978; Weinstein and Mayer, 1986). Durkin (1979, cited by Jones, 1982) distinguished between comprehension instruction; which is to understand the meaning of the unit, and comprehension assessment; which is to ask students the "who", "what", "where", "why", "when", and "how" questions without giving them help in comprehending the text. Comprehension instruction may be achieved by fitting the structure of the text to the structure retained in long-term memory. Utilization of the empirically based training program developed by Dansereau et al., 1979 provided this comprehension instruction as well as the explicit instruction.

CHAPTER III

METHODOLOGY

This chapter will describe the subjects and facilities used in the study as well as the procedures used to teach the skills and to test the hypotheses: Adult students in an upgrading program learning detached cognitive strategies will be able to learn the strategies, will perform better than those not taught the strategies, and will apply them to new content areas. The research methodology, sample population, instrumentation, data collection will be described, and the limitations noted.

SUBJECTS

The population from which the sample was taken for this study consisted of adult students (18 years or older), who were upgrading their educational skills.

The sample consisted of nineteen adult female students ranging in age from 19 to 44. It was not the intention of this study to be limited to female students but only females enrolled in the daytime upgrading classes. Since gender was not included as a variable in this study, the generalizability of results may be limited as noted later in this chapter (page 102). All subjects were enrolled in the high school upgrading program at the Alberta Vocational College (AVC) in Calgary. Some of the students worked

part-time as well as attending school full-time and were upgrading their skills to gain different employment.

This sample was selected because they were students responsible for a large portion of their own learning taking courses to upgrade their own knowledge. By the time learners become adults they may have acquired strategies through trial and error rather than by explicit instruction. The literature indicated that teaching strategies can be effective when students lack strategies to comprehend expository text (Dansereau, 1985; Weinstein, 1982; Palincsar, 1986). The purpose of this study was to test the efficacy of employing efficient strategies to compensate for impoverished text by the subjects who were both aware and unaware of such strategies.

The subjects were randomly assigned to one of three groups (two treatment and one control) using the probability sampling method. Surnames were arranged alphabetically, and starting from the first name, each was given a number running consecutively from 001 up. Using a table of random digits, the subjects were placed in one of two treatment groups or a control group.

INFORMED CONSENT

A proposal to conduct the study was reviewed by the ethics committee at the Alberta Vocational College (see

Appendix B). The teacher of the Communications and English courses, in which these students were enrolled, was approached about the research project and readily agreed to have her students take part. The researcher and the teacher were in contact daily so that the materials used with the treatment groups and control group were the same.

A letter explaining the student's involvement in this study and a consent form was given to the subjects (see Appendix C). Care was taken to keep the subjects' names confidential. The tapes were used for analysis only and will be erased following completion of this thesis.

FACILITIES AND EQUIPMENT

Testing, before and after the treatment, took place on an individualized basis in small offices allowing for complete privacy. Subjects were provided with paper and pencils to map out the cognitive strategy they used during the testing.

The researcher taught the cognitive processes to the subjects in the two treatment groups together in a classroom separate from the control group. The two treatment groups were trained as one class because the **teaching** of the cognitive processes did not differ. The different roles of these two treatment groups occurred in the **testing.** One group was instructed to use the

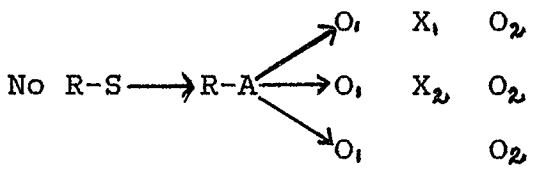
strategies taught and the other treatment group was not given such instruction in order to determine if the students would revert to their previous methods used to comprehend text or if indeed they had learned the strategies and used them.

RESEARCH DESIGN

This was a quasi-experimental design (Cook & Campbell, 1979). The subjects were drawn from an intact group of adults enrolled in an upgrading high school program.

The experimental design was multiple group/single intervention, pre/post-test control group design (see figure 3.1).

Figure 3.1 **Multiple group/single intervention, pre/post-test control group design.**



No R-S = a random sample was not done

R-A = random assignment was done

Adapted from the time-series designs in Smith & Glass (1987) Research and Evaluation and the Social Sciences.

The independent variables were the cognitive strategies: paraphrase/imagery, networking, and analysis of

key concepts, used to compensate for impoverished text. The dependent variable was the comprehension test scores gained from answers to the questions on the pre- and post-informal reading tests.

The procedures for the pre-test, the training of the cognitive processes, and the post-test used in this study are outlined in figure 3.2 (see Chapter 2 for a more in-depth explanation of each section).

Table 3.1 **Outline of procedures and methods used for this study.**

---

1. **Pre-test**

   All 19 students were tested individually using:

   (a) -the short-scale Woodcock-G revised test of verbal ability,

   (b) -"talk-aloud" protocol using an informal expository text containing 2500-3000 words,

   (c) -orally tested <u>immediately</u> after completion of studying the text using the Pearson & Johnson (1978) questioning taxonomy.

Table 3.1 continued on the next page

2. **Strategy Training**

The control group used the same subject material but were taught by their teacher and were **not** taught the cognitive processes. The two treatment groups were taught together in the same classroom by the researcher. They were taught the cognitive processes using the same textual material as the control group. The cognitive processes consisted of training in using:

-paraphrase/imagery,

-networking,

-analysis of key concepts,

-meta-cognitive strategies,

-incorporating the above four using the MURDER strategy.

---

3. **Post-test**

All subjects were tested individually using informal expository text containing 2500-3000 words.

(a) -researcher observation of indicators that the students were using cognitive processes,

(b) -tested orally using the Pearson & Johnson (1978) questioning taxonomy (after absence of material of 72 hours).

INSTRUMENTATION

The three factors considered relevant to this study were the verbal ability of the student, the presence/absence of impoverishment of the materials, and the ability to use the cognitive processes learned to comprehend the materials. As part of the pre-test session, verbal ability was tested using the "short scale" portion of the Woodcock-G Revised Standardized Test of Comprehension (1987). The short scale includes word identification and passage comprehension tests, two tests from the total battery of six. The researcher was allowed two days in which to individually test all nineteen subjects. The short scale was used because it took approximately twenty minutes to administer and the tests involved are indicators of fundamental components of reading ability (Woodcock, 1987).

The pre- and post-tests required students to read a 2500-3000 word expository text; a different one for each test. The subjects were given 60 minutes in which to read the material and the tests included factual and inference questions conforming to the Pearson and Johnson's (1978) taxonomy categories: textually explicit, textually implicit, and scriptually implicit (see Chapter 2 pg. 69).

Textually explicit question-answer relationships are those which can be found explicitly within the text.

Textually implicit questions are answered by making inferences using the text.

Scriptually implicit question-answer relationships are those in which the reader needs to use their background knowledge to answer the question.

The pre-test was conducted immediately after the student read the passage. This had to be done because of a time factor; the students were required to commence their studies within three days. This only allowed two days to individually test all nineteen subjects.

The post-test was more rigorous in that the expository text was taken away from the students over a 72 hour period. They were then allowed to spend 15 minutes reviewing the text and/or their notes prior to answering the questions on the post-test.

Three external reading "experts" evaluated the materials. They considered the impoverishment of the expository texts used in the pre-and post-tests and they categorized the questions as either textually explicit, textually implicit, or scriptually implicit. All three have taken courses in reading and have been involved in teaching reading to students with learning difficulties over the last twelve years. As a further check, the researcher used the criteria as outlined in the Component

Display Theory (see Chapter 2 p. 72) to further determine if in fact the pre-and post-test expository textual material was impoverished. The adequacy and consistency of the textual presentation was judged against the propositions of the Component Display Theory (CDT). The material lacked the criteria of CDT and was declared to be impoverished.

A protocol analysis was used to identify which processes the students used while encoding the expository test. The pre- and post-test situations were taped so that neither the students nor the researcher became distracted by recording of answers on paper. In order to acquaint the subjects with the experimental situation and to allow them to become accustomed to the microphones and tapes, they were given initial warm-up problems. These problems were in areas unrelated to the topic being studied to help the subjects understand the method using familiar material and gain confidence in talking aloud (Mulcahy, 1988 (personal communication); Ericsson & Simon, 1984). The instruction given by the researcher was as follows (adapted from Ericsson & Simon, 1984).

Researcher: In this experiment we are interested in what you say to yourself as you perform some tasks that we give you. In order to do this I will ask you to TALK ALOUD as you work on the problems. What I mean by

talk aloud is that I want you to say out loud everything that you say to yourself silently. Just act as if you are alone in the room speaking to yourself. If you are silent for any length of time I will remind you to keep talking aloud. Do you understand what I want you to do?

Good, before we turn to the real experiment, we will start with a couple of practice problems. I want you to talk aloud while you do these problems. First, I will ask you to multiply two numbers in your head. So talk aloud while you multiply 32 times 5.

Good!

Now I would like you to solve an anagram. I will show you a card with scrambled letters. It is your task to find an English word that consists of all of the presented letters. For example, if the scrambled letters are DOWO, you may see that these letters spell the word WOOD. Any questions? Please "talk aloud". TNPATRE = PATTERN

Good!

In this session I would like you to generate as many words as possible using the letters ONDTERH.

Good!

Now we will start working on the experiment remember to TALK ALOUD.

This talk-aloud procedure was used in the pre-test but was discontinued for the post-test since it proved to be counter-productive. The subjects felt uncomfortable using the talk aloud procedure in the pre-test and protested to the researcher. Although the subjects were tested individually they felt very self-conscious about using the talk-aloud procedure. The subjects refused to use it in the post-test and so as not to jeopardize the study the talk-aloud protocol was dispensed with but since each subject was tested individually the researcher was able to observe the overt strategies used by the subjects. For example, the researcher watched the students to see if they read the text more than once. Also, the notes were given to the researcher over the 72 hour period prior to testing and the researcher analyzed them to verify if the students used one of the three sub-strategies.

The teaching time was extended by AVC from 15 hours to 25 hours. This was done because the subjects took two classes (English 23 and Communications 23) from the same instructor. It was felt that since both classes lent themselves to the use of the cognitive processes that the extra time would allow students more exposure to them. This also lessened the possibility of contamination by

keeping the control and experimental groups separated. The other courses the subjects took were typing, word processing, and math.

All three sub-strategies: paraphrase/imagery, networking, and analysis of key concepts, were taught one at a time to the two treatment groups. After the initial training of the sub-strategies time was spent reinforcing their use with classroom material. Networking was taught first because it relates to schema theory and key ideas are visually represented. It took approximately five hours of training with practice using their own classroom material. Paraphrase/imagery were split apart and each was taught separately. Imagery was taught first and took approximately four hours of training. Paraphrase training took six hours. Analysis of key concepts was the last strategy to be taught. It did not take long for the students to learn this technique as it is similar to the networking. (see Appendix D for examples of the material used in the lessons taught, for the procedures used see below).

The post-test took place two weeks after the conclusion of instruction. In the post-test one treatment group was directed to use one or all of the strategies taught to them. The second treatment group was tested without any direction on strategy use. The control group

did not receive any training but took the pre- and post-tests to evaluate the efficiency of using their own strategies compared to the two treatment groups.

CLASSROOM PROCEDURES

In this study students were taught that incomprehension results from lack of effective strategies, not from lack of effort. This is in contrast to some researchers (eg. Diener & Dweck, 1978 cited by Paris & Oka, 1986) who taught children that failure was due to insufficient effort. This procedure only succeeded in confirming to the students that they have low ability thus causing some students to not extend further effort. A more effective teaching strategy is to alter students' beliefs on the effectiveness of cognitive processes to cope with failure (Cullen & Borsma, 1982 cited by Paris and Oka, 1986).

The activities used in the current study were as follows:

1. **Motivation** using the strategies of metacognition. Prior to instruction the students were given an outline of the concepts to be taught. Motivation is increased if the students find the work purposeful (Weinstein, 1986).

To reinforce the idea that the students' comprehension was due to the effective cognitive strategies used and to motivate them to try new strategies, they were given a short history of the loci method for memory and encouraged to use this method to recall various lists.

2. **Conceptual level information.** Schema theory and how it relates to their own knowledge structure was explained. An analogy to finding paths to their school was used. They were shown, visually, that usually when you first go to a location you often follow one path but as you become familiar with the area you will find other paths to use, shorter or longer, to go to the same location. Later you expand your map by connecting the paths to new locations. They were also shown some paragraphs and phrases to exemplify this theory; to reinforce the idea that they used their background knowledge (their schemata maps) to comprehend the context.

3. **Strategy Instruction.** The students were taught the first degree MURDER primary strategy (see Chapter 2 page 36). The students applied this acronym in order to comprehend the expository material. As noted in Chapter 2 the **M** is Mood;

the students need to have a purpose for reading the material. The **U** is Understand; the student creates a scaffold of what is being conveyed by underlining main points, keying into italicized words and carefully reading all charts and diagrams. The **R** - recall strategy involves using one of the substrategies: paraphrase/imagery, networking, and analysis of key concepts to help recall the main ideas. **D** - digest is to go over the material picking up any ideas previously missed. **E**- expand is the process by which the student asks him/herself what ideas are missing, what else would they like to know, and **R** -review is the process of going over the material which they still do not understand after the test is done. Then they were taught the sub-strategies as part of the first degree MURDER strategy.

Although the consent form stated that there would be 15 hours of training, the researcher was asked to teach two and sometimes three classes a day because they were taking two different subjects from the same instructor. Over the two week period the subjects actually received 25 hours of instruction and practice. This allowed for the training to be more extensive and created a greater opportunity for the strategies to reach mastery level.

Networking was the first of the sub-strategies to be taught because it best emulated schema theory graphically. During training, the following "modelling" approaches, found successful by Dansereau (1985) and his associates, were incorporated into the sessions.

1. The subjects used textual material from their courses of study to practice a particular strategy. Following the learners' attempts at processing the material, the researcher provided an example of the use of the strategy as feedback.

2. Real-time modelling was provided by the researcher. This involved the researcher providing a verbal protocol demonstrating the correct application of the strategy.

3. Interactive peer modelling was also used. This involved one partner attempting to process the material orally, using one of the cognitive strategies appropriate to encode the textual structure, while the other commented on the procedures used. Then the roles were reversed.

When the students were able to use the networking strategy successfully, they were taught the second and later the third substrategies: analysis of key concepts and

paraphrase/imagery. Cognitive strategies have to be well in hand before confronting new strategies (Weinstein, 1978). The determination of the student's ability to use the strategies confidently was done intuitively through observation by the researcher.

As part of the paraphrase sub-strategy the students were taught the six summarization strategies by Brown and Day (1983). These involved the deletion of trivial and redundant information, the generalization of concepts when possible, and the selection of the author's topic sentence. If a topic sentence did not exist the students invented their own. (See Chapter 2 page 60 for more detail on these six strategies).

Dansereau (1985) and his associates explored two possibilities in the sequence of training in the cognitive strategies: (1) the building block approach and (2) the gestalt approach. In the building block approach each sub-component of the strategy is learned first, using simplified training materials. These sub-components are combined to form the overall cognitive strategy. For example, the "part (of)" link from networking (see Chapter 2 p. 53) is applied to single sentences, then paragraphs, then larger texts. This approach was advocated by Gagne, (1977). The disadvantages of this approach are that: (1) the process may be effective for simplified material but

may not be effective for actual texts, (2) the students' motivation may suffer if the materials and exercises are not related to their current work, and (3) the students may have difficulty acquiring a synthesis of the separate elements of the strategy (Dansereau, 1985).

An alternative approach, which was applied in this study, is to communicate the gestalt of the cognitive strategy and then later add the details and precision. For example, utilizing the networking strategy, the important concepts are identified spatially without concern for precise relationships between concepts. As the students become more confident in graphically representing the concepts they then are taught to be more precise. One advantage of this approach is that the target material is used almost from the beginning. After learning the sub-strategies the students were shown how to retrieve the stored information utilizing the 2nd degree MURDER strategy (see Chapter 2 p. 40).

The support strategies (see Chapter 2 p. 46) were incorporated into teaching of the sub-strategies. The researcher facilitated the students' awareness of the use of the strategy by encouraging them to set their mood to study, and to continually monitor their understanding as they read. They were encouraged to be cognizant of when

they were unsure of their comprehension of the text and to use strategies to rectify this.

All strategy training consisted of teaching the declarative (what the strategy was), the procedural (how to employ the strategy), and the conditional (under what conditions to use the strategy) knowledge of the cognitive strategies.

4. **Strategy application.** The students were given guided practice using the modelling techniques as described above. They utilized these strategies to compensate for the impoverishment of textual material used in their own classes.

5. **Feedback on the strategy application.** The researcher provided constructive feedback. For example, the correct usage and potential pitfalls were indicated by the researcher for the students. This feedback procedure was supplemented by student discussion which "provides social reinforcement" (Dansereau, 1978).

DATA COLLECTION AND RECORDING

After reading the passages during pre- and post-tests, the subjects were asked to respond orally to the recall and inference questions. This oral procedure allowed the researcher to obtain more information using W/H probes

(who, what, where, when, why, how) to determine why the subjects answered the way they did. Their answers were recorded on a tape recorder so as to avoid the subjects from being distracted or concerned about what was being recorded on paper.

LIMITATIONS

Although not intended, the study was limited to female students. Nothing was found in the literature to suggest that there are differential effects due to gender and it was not considered as a variable when the study was conceived. However, the possibility of it affecting the generalizability of the study is recognized.

Although the time was extended for training and practicing by 10 hours (from 15 to 25 hours) some subjects had stated that they had to learn a lot in a short two week period. Time may not have been adequate to teach the cognitive processes to criterion which may have affected the possibility of a strategy being applied.

There were two changes in the testing methodology; a time lapse was used in the post-test, and the talk-aloud protocol was dispensed with in the post-test. The pre-test was given immediately after the subjects read the passage but the post-test was given 72 hours after reading the passage. This delay in time actually made the post-test

more conservative than the pre-test and it provided an opportunity to test the effectiveness of the cognitive processes over time.

The subjects found the talk-aloud protocol in the pre-test difficult and refused to use it in the post-test. So as not to alienate the subjects and compromise the study the talk-aloud procedure was not used in the post-test.

SUMMARY

In summary, the students were pre-tested and the strategies they used were analyzed. The students in the two treatment groups received cognitive processing training which includes specific cognitive strategies as well as metacognitive strategies. In the post-test one treatment group was instructed to use the strategies taught to them and the other treatment group received no instruction on the strategies to use. The control group, who received no treatment, were also tested. The strategies used by all three groups were analyzed.

The questions on the pre- and post-tests were divided into three types using the Pearson and Johnson (1978) taxonomy; textually explicit, textually implicit, and scriptually implicit. The subject's responses were analyzed in each category.

Although a random assignment was done it was found that the mean ages of experimental group # 2 was higher than the other two groups. On a Pearson Correlation it was found that verbal ability scores significantly correlated with textually implicit and scriptually implicit questions. In order to strengthen the internal validity of this study, the variables of age and verbal ability scores were covaried.

CHAPTER IV

RESULTS OF THE STUDY

INTRODUCTION

The results of the study are included in this chapter. In general it was found that the subjects, both those taught explicitly to do so as well as those who were not given instruction to use the learning strategies taught to them, did use the strategies in order to comprehend impoverished test. It was also observed that some of the control group used elements of the strategies.

GENERAL DESCRIPTION OF THE SUBJECTS

The total group consisted of nineteen adult females who ranged in age from 19 to 44 years old. The subjects were enrolled in the High School Upgrading program at the Alberta Vocational College (AVC, see Chapter 3). Since these subjects were all females, gender was not considered a variable in this study. However, both age and verbal ability were considered and treated as covariates. Because verbal ability was considered relevant to the performance of the tasks involved, the Woodcock-G Revised Standardized Test of Comprehension was administered. This test generates a grade equivalent score which includes two sub-components; word identification and passage comprehension.

WOODCOCK-G REVISED STANDARDIZED TEST OF COMPREHENSION

The Woodcock-G Revised Standardized Test of Comprehension was given to determine the verbal ability of all of the subjects. The raw scores of the Word Identification test and the Passage Comprehension test are combined and converted into Grade Equivalent scores. The means, standard deviations, and ranges for each group as well as the total group are reported in the following Tables 4.1., 4.1.1, 4.1.2, and 4.1.3.

The grade equivalent scores for the total number of subjects ranged from 7.2 to 16.9 with a mean of 12.35 and a standard deviation of 3.10.

Table 4.1
Descriptive Statistics for the Total Group of Subjects on the Woodcock-G Revised Standardized Test of Comprehension

	X	S. D.	Range	
Word Identification	10.82	3.12	10.80	
Passage Comprehension	13.48	3.78	10.40	n = 19
Grade Equivalent	12.35	3.10	9.70	

(maximum possible score 16.9)

Table 4.1.1
Descriptive Statistics for the Control Group on the Woodcock-G Revised Standardized Test of Comprehension

	X	S. D.	Range	
Word Identification	11.23	3.30	10.80	
Passage Comprehension	14.69	3.37	7.10	n = 7
Grade Equivalent	13.37	3.19	9.30	

(maximum possible score 16.9)

Table 4.1.2
Descriptive Statistics for Experimental Group # 1 on the Woodcock-G Revised Standardized Test of Comprehension

	X	S.D.	Range	
Word Identification	11.77	2.85	7.70	
Passage Comprehension	13.35	3.99	8.50	n = 6
Grade Equivalent	12.83	3.17	7.80	

(maximum possible score 16.9)

Table 4.1.3
Descriptive Statistics for Experimental Group # 2 on the Woodcock-G Revised Standardized Test of Comprehension

	X	S.D.	Range	
Word Identification	9.40	3.18	9.10	
Passage Comprehension	12.22	4.23	10.40	n = 6
Grade Equivalent	10.68	2.68	8.00	

(maximum possible score 16.9)

TEST FOR EQUIVALENCE OF MEANS ON VERBAL ABILITY

An analysis of variance was calculated to test whether the differences in means among groups for Word Identification, Passage Comprehension, and the total Grade Equivalent were statistically significant. No statistically significant between-group differences were found, indicating that in terms of verbal ability the groups were equivalent (see Table 4.2).

Table 4.2
One Way ANOVA for the variables Word Identification, Passage Comprehension, and Grade Equivalent

	Sum of Squares	DF	Mean Square	F Ratio	F Prob.
Word Identification	18.64	2	9.32	0.95	0.41
Passage Comprehension	19.85	2	9.93	0.67	0.53
Grade Equivalent	25.37	2	12.69	1.37	0.28

SUBJECTS' AGES

As well as verbal ability, the age of the subjects was analyzed, with means shown in Table 4.3. The ages of the subjects ranged from 19 to 44. Although the subjects were randomly assigned to the three groups an ANOVA found that the ages of the groups were significantly different (see Table 4.3.1).

Table 4.3
Descriptive statistics of the Groups for Age in Years

	X	S. D.
Control Group	26.24	5.64
Experimental # 1	29.46	10.21
Experimental # 2	39.64	3.91

Table 4.3.1
One Way ANOVA of the Groups for Age in Years

	Sum of Squares	DF	Mean Square	F Ratio	F Prob.
Age	616.27	2	308.13	6.26	0.01 **

* p < .05
** p < .02

To identify the location(s) of the between group differences for age, a Newman-Keuls post-hoc analysis was calculated (see table 4.3.2).

Table 4.3.2
Newman-Keuls Post-Hoc Analysis for Age in Years

Age Subset 1

Group	Control Group	Experimental Group # 1
Mean	26.24	29.46

Subset 2

Group	Experimental Group # 2
Mean	39.64

The ANOVA and the Newman-Keuls procedure indicated that the mean age of the subjects in Experimental Group # 2 was significantly higher than the other two groups. Due to this significance and because of the possibility that age might have some systematic effect, age was subsequently covaried out of the statistics of the pre- and post- tests to reduce any effect it might have on the test results (see Tables 4.9, 4.9.1, 4.9.2, 4.9.3, and 4.17, 4.17.1, 4.17.2, 4.17.3 below).

PRE-TEST ANALYSIS

Since the pre- and post-tests had different numbers of test items, the raw scores on the pre-test and the post-test were transformed to a score out of ten prior to performing the statistical analysis to compensate for the difference in the raw score totals. According to Minium (1970, 1978) linear transformation of the data does not affect the shape of the distribution. Linear transformation is defined by Minium (1970, 1978) as the "transformation of scores performed by adding, subtracting, multiplying, or dividing by constants. The major property of a straight-line transformation of scores is that it preserves the proportionality of interscore distances and hence the "shape" of the distribution" (p. 129). Since the transformation of the scores was linear the results would

not be affected by rescaling the data. The subsequent analyses were performed on rescaled data.

DESCRIPTIVE STATISTICS FOR THE PRE-TEST

Table 4.4 summarizes the pre-test descriptive statistics for the three groups. As well Tables 4.5, 4.6, and 4.7 provide means for each of the three types of questions asked: (1) textually explicit, (2) textually implicit, and (3) scriptually implicit. Textually explicit questions are ones for which the answers are stated directly from the text, textually implicit questions are answered by making inferences from the text, and scriptually implicit questions are ones whereby the answers come from the subjects background knowledge of "scripts"; that is, how concepts are interrelated. (For a further explanation see Chapter 2 p. 69).

Table 4.4
Descriptive Statistics for the Total Scores on the Verbal Pre-tests

	X	S. D.	Range
Total Group	14.28	4.47	15.00
Control Group	15.45	5.79	13.92
Experimental Group # 1	13.56	2.67	6.42
Experimental Group #2	13.56	4.59	10.71

(maximum possible score 30, minimum 0)

The overall mean for the pre-test total for all three groups was 4.76 and the standard deviation 1.49. An ANOVA (Table 4.4.1) confirmed that there was no significant differences between the groups on the total scores.

Table 4.4.1
ANOVA for the Total Scores on the Verbal Pre-test

	Sum of Squares	DF	Mean Square	F	Signif of F
pre-total	1.75	2	0.88	0.37	0.70

The descriptive statistics for each of the sub-tests: Textually Explicit questions, Textually Implicit questions, and Scriptually Implicit questions are shown in Tables 4.5, 4.6, and 4.7 respectively. The ANOVA's (Tables 4.5.1, 4.6.1, 4.7.1) indicated, there was no significant differences on the pre-test scores among the group means on any sub-test.

Table 4.5
Descriptive Statistics of Textually Explicit Questions on the Verbal Pre-test

	X	S. D.	Range
Total Group	3.36	2.47	7.50
Control Group	3.75	3.31	7.50
Experimental Group # 1	2.92	1.51	3.75
Experimental Group #2	3.33	2.46	7.50

(maximum possible score 10, minimum 0)

Table 4.5.1
ANOVA for the Textually Explicit Questions on the Verbal Pre-test

	Sum of Squares	DF	Mean Square	F	Signif of F
pre T. E.	2.25	2	1.12	0.17	0.85

Table 4.6
Descriptive Statistics of Textually Implicit Questions on the Verbal Pre-test

	X	S. D.	Range
Total Group	4.83	2.07	6.67
Control Group	5.00	2.10	6.67
Experimental Group # 1	4.17	1.83	5.00
Experimental Group #2	5.28	2.45	5.00

(maximum possible score 10, minimum 0)

Table 4.6.1
ANOVA for the Textually Implicit Questions on the Verbal Pre-test

	Sum of Squares	DF	Mean Square	F	Signif of F
pre T. I.	4.05	2	2.02	0.44	0.65

Table 4.7
Descriptive Statistics for Scriptually Implicit Questions on the Verbal Pre-test

	X	S. D.	Range
Total Group	6.05	2.09	7.50
Control Group	6.79	2.02	6.25
Experimental Group # 1	6.67	1.88	5.00
Experimental Group #2	4.58	1.88	5.00

(maximum possible score 10, minimum 0)

Table 4.7.1
ANOVA for Scriptually Implicit Questions on the Verbal Pre-test

	Sum of Squares	DF	Mean Square	F	Signif of F
pre S. I.	18.98	2	9.49	2.53	0.11

INTERRELATIONSHIPS BETWEEN VARIABLES ON THE PRE-TEST

A Pearson Product Moment Correlation was conducted to explore possible interrelationships among the following variables (see Table 4.8): Word Identification, Passage Comprehension, Grade Equivalent, Age in years, pre-test on textually explicit questions, pre-test on textually implicit questions, pre-test on scriptually implicit questions, and pre-test total for all three tests. (see chapter 3 for further explanations of these tests).

Table 4.8
Pearson Correlation Coefficients on the Verbal Pre-tests

	Textually Explicit	Textually Implicit	Scriptually Implicit	Total
Word Identification	0.05	0.11	0.37	0.24
Passage Comprehension	0.20	0.45 *	0.47 *	0.56 **
Grade Equivalent	0.13	0.43 *	0.63 **	0.57 **
Age	0.23	0.18	-0.35	0.08

* $p < .05$
** $p < .02$

There was a significant correlation between grade equivalent and two sub-tests: Textually Implicit and Scriptually Implicit questions. There was also a significant correlation between passage comprehension and the same two variables. However, since grade equivalent is derived from the combination of passage comprehension and word identification this correlation was to be expected.

It was speculated that the high correlation between textually implicit material with the grade equivalent might have been due to the fact that the ability for one to understand a passage increases that subject's ability to infer indirect meanings from the text.

It was also speculated that scriptually implicit questions are answered using the subject's background knowledge and the more background knowledge one has the better his/her ability to understand the passage. This may explain the significant correlation between passage comprehension and scriptually implicit questions.

As noted above an ANCOVA was performed to determine the main effects of group on the pre-test scores with age and grade equivalent as covariates (see Table 4.9, 4.9.1, 4.9.2, 4.9.3).

Table 4.9
ANCOVA of the Pre-test scores for Textually Explicit Material
with the covariates Age and Grade Equivalent (GRE)

	Sum of Squares	DF	Mean Square	F	Signif of F
Covariates	8.04	2	4.02	0.60	0.56
(Age)	6.22	1	6.22	0.93	0.35
(GRE)	2.06	1	2.06	0.31	0.59
Main Effects (Group)	7.42	2	3.71	0.55	0.59
Explained	15.46	4	3.86	0.58	0.69

Table 4.9.1
ANCOVA of the Pre-test scores for Textually Implicit Material with the covariates Age and Grade Equivalent (GRE)

	Sum of Squares	DF	Mean Square	F	Signif of F
Covariates	17.13	2	8.56	2.27	0.14
(Age)	3.01	1	3.01	0.80	0.39
(GRE)	14.54	1	14.54	3.85	0.07
Main Effects (Group)	7.13	2	3.56	0.94	0.41
Explained	24.26	4	6.06	1.60	0.23

Table 4.9.2
ANCOVA of the Pre-test scores for Scriptually Implicit Material with the covariates Age and Grade Equivalent (GRE)

	Sum of Squares	DF	Mean Square	F	Signif of F
Covariates	39.54	2	19.77	7.15	0.01 *
(Age)	8.47	1	8.47	3.06	0.10
(GRE)	29.94	1	29.94	10.82	0.01 *
Main Effects (Group)	0.67	2	0.34	0.12	0.89
Explained	40.21	4	10.05	3.63	0.03 *

* $p < .05$

Table 4.9.3
ANCOVA of the Total Pre-test scores with the covariates Age and Grade Equivalent (GRE)

	Sum of Squares	DF	Mean Square	F	Signif of F
Covariates	13.27	2	6.63	3.64	0.05
(AGE)	0.39	1	0.39	0.21	0.65
(GRE)	13.02	1	13.02	7.13	0.02 *
Main Effects (Group)	1.00	2	0.50	0.27	0.76
Explained	14.27	4	3.57	1.96	0.16

* $p < .05$

The ANCOVA indicated that the effect of the grade equivalent score was significant on the results of the test for scriptually implicit questions. This makes intuitive sense given that subjects with a high grade equivalent probably had a greater background of scriptual knowledge.

With Grade Equivalent and Age covaried the effects on the group were non-significant on the sub-measures of the pre-test which can be interpreted to indicate that there was no difference among the groups prior to the treatment.

EVIDENCE OF EQUIVALENCE OF GROUPS FROM THE PRE-TEST STATISTICAL DATA

The ANCOVA of the pre-test scores with age and grade equivalent covaried indicated that there was no significant difference so that these variables did not affect the pre-test scores. The analysis also indicated that there was no significant differences among the groups on total test scores nor on any of the sub-tests for textually explicit, textually implicit, or scriptually implicit questions. These statistics are interpreted to indicate that the groups were equivalent prior to any treatment.

PRE-TEST OBSERVATIONS USING PROTOCOL ANALYSIS

During the pre-test the subjects used the talk-aloud protocol analysis (see Chapter 2 p. 57) to determine which strategies they applied when comprehending expository material. None of the strategies they used were the ones subsequently taught to the experimental groups though reading headings, maps, charts, and re-reading passages formed part of the strategies taught.

Table 4.10 Strategies Employed During the Pre-test and Number of Subjects Applying Each

	Control Group (7)	Experimental #1 (6)	Experimental #2 (6)
Read all headings	1	0	3
Studied Map	0	3	1
Reread entire passages	2	2	1
Asked themselves questions	3	3	2
Normally re-reads	2	5	3

STRATEGIES USED BY SUBJECTS UNDER OTHER CIRCUMSTANCES

Although the subjects did not use any of the target strategies during the pre-test which were taught to the two experimental groups, it was conceivable that some or all of the strategies might have been part of their repertoire but not employed during the pre-test. Therefore, to control for this possibility, the researcher asked the following question after the subject had answered the comprehension questions in the pre-test. "Is there anything that you normally do when studying on your own but didn't feel comfortable doing in this testing situation?"

During the testing the subjects were audio-taped so that all verbal responses were recorded. The following are

analyses of the responses from the tapes of the strategies used during the pre-test and the responses to the question stated above. The observations and responses given by each subject are stated for each group; Control group, Experimental group # 1, and Experimental group # 2.

Strategies used by the Control Group during the Pre-test

Subject # 1's strategy during the pre-test was to read the passage once and answer the questions. In the protocol she often backtracked a few sentences at a time for clarification. Subject # 1's response to her normal procedure was to re-read the entire passage only if she was going to get a mark for her report card. She also said that if she were to receive a mark she would have divided the reading of the passage into three sessions; once on the train on the way home, once later on, and one more time after that. She commented that she would not have made any notes.

Subject # 2 read the passage for the pre-test once and asked if she could re-read it, which she did. She wrote four points and then decided she would rather read the passage without making notes. When asked how she normally studied, Subject # 2 explained she read an article once, picked out the main points and wrote them down.

Subject # 3 had taken a speed reading course from the Learning Centre at AVC six months prior to this study. She read the passage in approximately 20 minutes compared to one and one-half hours by the other students. She did not re-read the passage nor take any notes and stated she normally read a passage once and sometimes took one or two notes.

Subject # 4's process during the protocol analysis was to read a few words from the passage aloud every so often and to make comments such as "I didn't know that!" Subject # 4 indicated that she normally read a passage once without any breaks and then did a second read where she highlighted some words.

Subject # 5 read a few words aloud from the passage. She stated that her normal procedure was to read a passage once and "take it all in".

Subject # 6 identified the main ideas in her own words. She often backtracked but did not take notes although she said that she normally took notes as she read a passage.

Subject # 7 summarized the main ideas in her own words as she read and commented that it was "Too much information at one sitting." She did re-read the article which was a

normal procedure for her and asked herself questions as she read.

Strategies used by Experimental Group # 1 during the Pre-test

Subject # 1 read small portions of the passage or whole sections word for word. She stated that she didn't really concentrate because she usually re-read a passage and "jotted down notes" neither of which she did during the pre-test.

Subject # 2 spent a lot of time concentrating on the passage but would not talk-aloud. She made comments such as "My mind keeps wandering" or "I'm just nervous". She stated that she normally re-read a passage but did not do so this time.

Subject # 3 re-read the passage once and said she often re-read a passage several times, underlining or circling dates and key words.

Subject # 4 read the passage once and said this was normal except she would have highlighted as she went and "put down the important stuff".

Subject # 5 re-read the passage once but said she normally re-reads a passage several times without taking notes.

Subject # 6 preferred not to speak out loud. She said she normally re-reads when she doesn't understand and would only make notes if it was a homework assignment to do so.

Strategies used by Experimental Group # 2 during the Pre-test

Subject # 1 took a long time to read the passage once, she did not re-read the article and she commented that she felt everything was important. Subject # 1 indicated that she usually liked to go through the passage quickly the first time and then re-read it two to four times copying sentences directly from the text.

Subject # 2 read the passage quickly and summarized some sections in her own words. She said she normally re-reads only if she feels she needs clarification.

Subject # 3 quickly re-read the article. She commented that she normally has trouble concentrating and is "Not a big reader". As a normal procedure she said she normally reads short sections from a passage at a time.

Subject # 4 did not talk very much out loud but a couple of times asked herself a question about the subject and then read to find the answer. She said she normally re-reads the passage underlining key ideas but does not take notes.

Subject # 5 said she felt uncomfortable talking out loud. She said she normally writes a lot more and does usually re-read.

Subject # 6 had difficulty decoding words. She did not re-read but stated that re-reading was a normal procedure.

SUMMARY OF THE STRATEGIES USED BY THE CONTROL GROUP AND THE TWO EXPERIMENTAL GROUPS

Of the seven subjects in the control group, one looked at the headings, one did not look at any headings, and the other five looked at some of the headings. When asked by the researcher why it was beneficial to read the headings, all subjects knew that headings often give a clue on which to concentrate when reading a section and they attested to the fact that they had been told this in their English class the previous year. Two of the subjects took a cursory look at the geographical map which denoted pertinent information. The others did not look at the map commenting that "It didn't interest me", or stating they would only look at one if they had to write about it. The subjects made comments to the researcher about the difficulty they had talking-aloud while reading the passage.

From the two experimental groups which involved twelve subjects, three looked at the headings and as the control group indicated, they had learned in their studies the previous year that it was beneficial to read the headings. Two of the subjects looked at the geographical map. The subjects had commented on the difficulty of talking-aloud while trying to concentrate on the content.

POST-TEST ANALYSIS

Modification to the Research Design

It was necessary to make two changes in the research design prior to giving the post-test. First, the protocol talk-aloud analysis had to be dispensed with during the post reading test. One reason was that the talk-aloud protocol proved counter-productive in that the subjects found this task too difficult. During the pre-test, of the nineteen subjects involved from the control and experimental groups, six read the entire passage aloud, word by word and eight subjects read short sections aloud, word by word. Three subjects summarized the key ideas into their own words as they read and two made a few comments such as "Isn't that awful!", or "H-m-m, I didn't know that!". It was difficult to assess from the protocol analysis what strategies the students were using when they were just reading the passage aloud or only reading short sections.

The second factor which brought about the decision to dispense with the talk-aloud was that a day prior to the post testing session the students indicated to the researcher their reluctance, once again, to talk aloud and informed the researcher they would not to use it. Since the subjects would be tested individually and the researcher would be observing which strategies the subjects would be using during the testing situation (for example, they may re-read the passage or use one of the three sub-strategies: paraphrase/imagery, networking, or analysis of key concepts), the decision was made to dispense with the simultaneous talk-aloud protocol in favour of a recall protocol. Due to the students' strong feelings on this matter, using the protocol analysis would have been counter-productive and dispensing with it was preferable to jeopardizing the entire study.

A second change was conducted in this study due to time constraints. The teaching sessions were to commence within three days of meeting the subjects. In order to test all the subjects, which took two hours for each subject, and to do this prior to any training, the pre-test was given <u>immediately</u> after the students read the passage. But at the end of the study there were five days in which to test the subjects. To determine if the detached strategies helped subjects to retain concepts over time, the post-test was conducted <u>72 hours after</u> the reading of the passage.

The passage was taken away from the subjects during this 72 hour period. This meant that the post-test was more stringent than the pre-test in that the time lapse rendered opportunities for the subjects to forget the material they had studied. The probable effect of this delay in testing is that the scores after 72 hours would be lower than they would have been immediately after testing, but data are not available to verify this.

HYPOTHESIS # 1

Adult students in an upgrading program who learn detached strategies will apply these strategies to content areas.

Keeping in mind the small sample size and the fact that the subjects in Experimental Group # 1 were directed to use cognitive processes, Table 4.11 appears to support this hypothesis. All six subjects in Experimental Group # 2 who were not directed to use the strategies still used them. The control group followed the same strategies or lack of strategies which appeared in the pre-test.

Table 4.11
Strategies Employed during the Post-test and the Number of Subjects Applying Each

	Control n = 7	Exp. # 1 n = 6	Exp. # 2 n = 6
Re-read passage	3	5	6
Re-read parts	1	1	
Did not re-read	3		
Underlined key ideas	3	4	6
Underlined sporadically	2	2	
Underlined everything	1		
Notes in key words	2	1	
Notes in key words using			
-networking		2	2
-key concept analysis		2	2
-paraphrase/imagery		1	2
Notes in complete sentences	1		
No notes	4		

As observed in Table 4.11, all but one of the subjects in both experimental groups chose to use a key strategy of either networking, key concept analysis, or paraphrase/imagery which had been taught to them (see Appendix E for an example of the networking strategy used on the post-test by one of the subjects). Therefore Hypothesis # 1 was confirmed; the subjects did apply the

strategies taught to them but one must be cautious in over generalizing these results.

Those in the experimental groups also re-read the passage and underlined key words. As noted, some of the subjects in the control group chose to re-read the passage and underline key words although these same subjects had not used these strategies in the pre-test. This may have been due to the fact that at AVC the subjects took other classes together and the researcher overheard some discussion between the control and experimental groups as to what the researcher had been teaching the experimental groups. This may have actuated the "John Henry" effect. That is, the control group may have worked harder to compete with the treatment group thus reducing the difference in treatment effect between the treatment groups and the control group. An alternative explanation might be that the control group may have tried some of the techniques such as underlining or skimming. But, the specific and more encompassing strategies of networking, key concept analysis, and paraphrase/imagery took time to learn so that the control group did not learn nor use these on the post-test.

HYPOTHESIS # 2

Adult students in an upgrading program who learn the detached strategies will perform better than those who were not taught the strategies.

DESCRIPTIVE STATISTICS FOR THE POST-TEST

The post-test design was similar to the pre-test. It involved reading a passage but unlike the pre-test the passage for the post-test was taken away by the researcher over a 72 hour period and then the students were given 15 minutes to review their notes after the 72 hour period and prior to answering the post-test questions. On the post-test the control group and the Experimental group # 2 were free to use any method of study to retain the information. Experimental group # 1 was requested to use the strategies taught to them. The overall post-test total results have a mean of 6.7 and a standard deviation of 1.51. The ANOVA showed no significant differences between the group means for the total test scores but there was a significant difference shown on the subtest for textually implicit material.

Table 4.12
Descriptive Statistics of the Total Scores on the Verbal Post-test

	X	S. D.	Range
Total Group	20.10	4.53	15.84
Control Group	17.13	4.68	14.16
Experimental Group # 1	21.96	2.40	6.66
Experimental Group #2	21.66	4.74	11.67

(maximum possible score 30, minimum 0)

Table 4.12.1
ANOVA for the Verbal Post-test Total Scores

	Sum of Squares	DF	Mean Square	F	Signif of F
post Total	10.71	2	5.35	2.82	0.09

The following tables indicate the descriptive statistics for each of the sub-tests; Textually Explicit, Textually Implicit, and Scriptually Implicit as well as the ANOVA for each.

Table 4.13
Descriptive Statistics for the Textually Explicit Questions on the Verbal Post-test

	X	S. D.	Range
Total Group	5.94	1.81	5.71
Control Group	5.51	1.78	5.71
Experimental Group # 1	6.19	1.48	3.57
Experimental Group #2	6.19	2.33	5.71

(maximum possible score 10, minimum 0)

On the post-test scores the ANOVA test indicated a significant difference on the sub-test for textually implicit material (see Tables 4.14 and 4.14.1).

Table 4.13.1
ANOVA for Textually Explicit Questions on the Verbal Post-test

	Sum of Squares	DF	Mean Square	F	Signif of F
post T. E.	2.05	2	1.02	0.29	0.76

Table 4.14
Descriptive Statistics for the Textually Implicit Questions on the Verbal Post-test

	X	S. D.	Range
Total Group	6.71	1.94	6.88
Control Group	5.27	2.19	5.63
Experimental Group # 1	7.81	0.66	1.88
Experimental Group #2	7.29	1.61	4.38

(maximum possible score 10, minimum 0)

Table 4.14.1
ANOVA for Textually Implicit Questions on the Verbal Post-test

	Sum of Squares	DF	Mean Square	F	Signif of F
post T. I.	23.88	2	11.94	4.35	0.03 *

The ANOVA indicated a significant difference of $p < .05$ so in order to determine where the differences lie between the groups a Newman-Keuls procedure for multiple variance was conducted with the following results shown in Table 4.14.2.

Table 4.14.2
Newman-Keuls Post Hoc Analysis for Textually Implicit Questions on the Verbal Post-test

SUBSET 1

Group	Control Group	
Mean	4.21	
	Experimental Group # 2	Experimental Group # 1
Group Mean	5.83	6.25

Both experimental groups performed better than the control group on the Textually Implicit questions for the post-test. Textually Implicit questions are questions for which the answers are not directly found in the written text but can be inferred from the content. The strategies taught require the subjects to make connections between important facts and so they become aware of the inferences.

Table 4.15
Descriptive Statistics of Scriptually Implicit Questions on the Verbal Post-test

	X	S. D.	Range
Total Group	8.42	1.80	5.00
Control Group	7.38	1.89	5.00
Experimental Group # 1	8.61	1.64	3.33
Experimental Group #2	9.44	1.36	3.33

(maximum possible score 10, minimum 0)

Table 4.15.1
ANOVA for Scriptually Implicit Questions on the Verbal Post-test

	Sum of Squares	DF	Mean Square	F	Signif of F
post S. I.	14.073	2	7.037	2.55	0.11

INTERRELATIONSHIPS BETWEEN VARIABLES ON THE POST-TEST

A Pearson Product Moment Correlation was conducted on the post-test to determine the interrelationships between the following variables; age, word identification, passage comprehension, grade equivalent, post-test of textually explicit questions, post-test on textually implicit questions, post-test on scriptually implicit questions, and post-test totals (see Table 4.16).

Table 4.16
Pearson Correlation Coefficients on the Post-tests

	Textually Explicit	Textually Implicit	Scriptually Implicit	Total
Word Identification	0.10	- 0.01	- 0.04	0.28
Passage Comprehension	0.24	0.16	- 0.34	0.14
Grade Equivalent	0.27	0.09	- 0.24	0.13
Age	0.20	0.36	0.49**	0.40*

* p < .05
** p < .02

There was a significant correlation between age and scriptually implicit questions at a $p < .02$ level. Since scriptually implicit questions rely on background knowledge or "scripts" it is conceivable to conclude that as people get older their background knowledge increases. This significance exhibited enough of a concern to co-vary age out (see Tables 4.17, 4.17.1, 4.17.2, 4.17.3).

The researcher's observation was that subjects who were over 27 years of age were generally more motivated to learn for many had raised their children and had returned to finish their grade 12 on their own. Therefore, as a whole, this group scored higher than the other subjects. Secondly, it was noted that the significant correlation between passage comprehension and scriptually implicit questions which appeared in the pre-test no longer appeared significant in the post-tests. In fact, there was a negative correlation ($r = -0.34$ see Table 4.16).

Comparing the correlations between the pre-test and post-test some differences were noted. There were significant correlations between the grade equivalent scores and two sub-tests: Textually Implicit and Scriptually Implicit questions on the pre-test but no significant correlations on the post-tests. This was interpreted to mean that after the subjects received the

treatment, grade equivalent scores no longer affected their ability to interpret the material.

SUBJECTS' AGE AND GRADE EQUIVALENCE

As indicated at the outset of this chapter, age was a significant variable and grade equivalent scores were found to correlate with textually implicit and scriptually implicit questions. Both age and grade equivalent scores were covaried on the pre-test sub-measures (see Tables 4.9, 4.9.1, 4.9.2, 4.9.3) and they were also covaried on the post-test sub-measures (see Tables 4.17, 4.17.1, 4.17.2. 4.17.3).

Table 4.17
ANCOVA of the Verbal Post-test scores for Textually Explicit Material with the covariates Age and Grade Equivalent (GRE)

	Sum of Squares	DF	Mean Square	F	Signif of F
Covariates	6.76	2	3.38	0.94	0.41
(Age)	2.57	1	2.57	0.72	0.41
(GRE)	4.41	1	4.41	1.23	0.29
Main Effects (Group)	2.24	2	1.12	0.31	0.74
Explained	9.00	4	2.25	0.63	0.65

Table 4.17.1
ANCOVA of the Verbal Post-test scores for Textually Implicit Material with the covariates Age and Grade Equivalent (GRE)

	Sum of Squares	DF	Mean Square	F	Signif of F
Covariates	9.70	2	4.85	1.73	0.21
(Age)	9.12	1	9.12	3.25	0.09
(GRE)	0.75	1	0.75	0.27	0.61
Main Effects					
(Group)	18.80	2	9.40	3.35	0.06
Explained	28.51	4	7.13	2.54	0.09

Table 4.17.2
ANCOVA of the Verbal Post-test scores for Scriptually Implicit Material with the covariates Age and Grade Equivalent (GRE)

	Sum of Squares	DF	Mean Square	F	Signif of F
Covariates	16.76	2	8.38	3.01	0.08
(Age)	13.50	1	13.50	4.85	0.04 *
(GRE)	2.82	1	2.82	1.02	0.33
Main Effects					
(Group)	2.49	2	1.25	0.45	0.65
Explained	19.25	4	4.81	1.73	0.20

* $p < .05$

Table 4.17.3
ANCOVA of the Total Verbal Post-test scores with the covariates Age and Grade Equivalent (GRE)

	Sum of Squares	DF	Mean Square	F	Signif of F
Covariates	7.34	2	3.67	1.95	0.18
(Age)	6.65	1	6.65	3.54	0.08
(GRE)	0.85	1	0.85	0.45	0.51
Main Effects (Group)	7.40	2	3.70	1.97	0.18
Explained	14.74	4	3.69	1.96	0.16

When age and grade equivalent scores were covaried with the post-test scores it was found that (a) the correlation between these and the three types of questions dropped, and (b) the scores were no longer significant. It was however observed that the scores for textually implicit questions were approaching significance after the covariance of grade equivalent scores. It is conceivable that if the sample size had been larger statistical significance would have been achieved. This leads one to believe that as stated in Hypothesis # 2, the teaching of detached strategies may be effective. It certainly indicates an avenue worth further pursuit.

HYPOTHESIS # 3

Adult students in an upgrading program matching the characteristics of the students at AVC can be taught detached strategies.

The subjects did learn to use the strategies taught to them. The researcher compiled the results of the study and spent a morning at AVC three weeks after the study discussing the results individually with the subjects. The researcher questioned the subjects as to how they felt about the strategies, if they were still using them, and the length of the training period.

Eleven of the twelve subjects in the experimental groups were still using the key strategies. Two preferred to use the key concept analysis, three preferred to use the networking strategy and the others used a combination of all three strategies depending on the content being studied. All subjects commented that they were using imagery to memorize materials in list form and then to recall these lists. All but one felt these strategies gave them a systematic method by which to read material more efficiently.

The subjects had been taught the three key strategies as part of the recall phase of the MURDER acronym (see Chapter 2). A great deal of discussion as to setting one's mood prior to reading and teaching other metacognitive

strategies such as self-monitoring one's comprehension was done as part of training the strategies. The subjects told the researcher that this step was important and did affect how well they were motivated to read the passage.

RESULTS OF FOLLOW-UP MEETING

The researcher met with the subjects to discuss the results of the study with the students three weeks after completion. Eleven of the twelve subjects in the treatment groups reported that they continued to use the cognitive processes. Two of the students preferred to use the sub-strategy of analysis of key concepts, three preferred the networking strategy and the others used a combination of all three after they analyzed the situation and used their metacognitive strategies to decide which sub-strategy would be most effective in which situation.

SUMMARY

The students in the upgrading program did learn the strategies and used them in new content areas. All but one of the students from the two experimental groups used the strategies taught to them whether they were directed to do so or chose to do so.

On the pre-test it was found that there was a significant correlation between grade equivalent scores and

textually implicit questions. As well there was a significant correlation between grade equivalent scores and scriptually implicit questions. These significant correlations were no longer apparent in the post-test scores. This was construed to mean that after the subjects received the treatment grade equivalent scores did not appear to be a factor in the ability of the students to comprehend the material.

After the grade equivalent scores were covaried with the post-test scores textually implicit questions were approaching significance. It is possible that if the sample size had been larger a statistical significance would have been realized.

Two changes from the pre- to the post-test were conducted in this study. The protocol analysis was dispensed with in the post-test because of its potential damage to the study. The second change was an elapse of time of 72 hours between reading the passage and the post-test which was not available during the pre-test making the post-test more rigorous than the pre-test. It is plausible that if the same rigor was applied to the pre-test there would have been greater significant differences between the pre- and post-test scores.

Through discussion three weeks after the end of the study, the students said they were still using the

strategies on new content. One change noted by the researcher was the students' gains in self-confidence in reading new material.

CHAPTER V

CONCLUSIONS

The purpose of this study was to determine if learning conscious cognitive processes would promote comprehension of impoverished text among adult learners in an upgrading program. That is, expository material which is ambiguous or contains inconsistent information which causes difficulty in comprehension for the reader. The cognitive processes involved teaching three sub-strategies: networking, paraphrase/imagery, and analysis of key concepts; used to clarify the meaning of the text and the teaching of metacognitive strategies. The metacognitive strategies or conscious part of the cognitive processes was to encourage a self-awareness of how the students themselves learned and to encourage strategies in order to self-monitor the effectiveness of their learning.

The participants in the study were nineteen adult female students enrolled in a high school upgrading program. Research of the studies in which the students were involved in a strategies training program (Dansereau et. al., 1975; Weinstein, 1978; Callahan, 1979; Palincsar, 1986) involved university undergraduate students, elementary, or junior high students. This study was concerned with students who were returning to their studies after a lapse of time. For some, this was after twenty

years. All the adults were females ranging in age from 19 to 44. When the study was first accepted by the ethics committee at the Alberta Vocational College (AVC) they had expected over forty students to enroll and to include both female and male students. This course took place during the day and started in August. There was some speculation by the administrators at AVC that perhaps the lack of male representation may have been due to the fact that they were employed and would be taking their upgrading in the fall in the evenings. This was the first time that the program had started in the summer and the administrators were surprised at the lack of numbers. The purpose of the early start was to allow the students to finish their first semester and exams before Christmas rather than in January, to help take some pressure off studying over the holidays.

It would have been desirable to have at least thirty participants, ten in each of the control and treatment groups, in order to increase the power of the statistical tests. Albeit, the participants did appear to have learned the cognitive processes and used them successfully. The researcher returned three weeks after the study to interpret the results to the participants. Many of the students were still using the strategies but they also said they would have liked to have been able to learn the strategies over a longer period of time; training for 25

hours over a two week period was too intensive for some of the participants.

Teaching the acronym, **MURDER**, appeared to give the students a sequential method by which to cover the expository texts. It permitted a multiple pass of the text which promotes learning. The first time through provides a "scaffold" or "structure" of the main concepts (Ausubel, 1968) and this in turn activates a schema from prior knowledge which is imperative to the acquisition of new knowledge (Anderson, Spiro, & Montague, 1977).

Due to time constraints, the testing and training sessions were restricted to a three and a half week period. Learning the three sub-strategies; networking, paraphrase/imagery, and analysis of key concepts, along with when and how to apply them took a lot of concentration on the part of the students.

During the pretest the students were asked to use a talk-aloud protocol. This they found extremely difficult and intimidating. Although they were given a practice session, time did not allow participants to become comfortable with this procedure. The students refused to use the process during the post-test so the procedure was dispensed with during the post-test so as not to jeopardize the study.

In the pre- and post-tests three types of questions: textually explicit, textually implicit, and scriptually implicit, as delineated by Pearson and Johnson (1978), were used.

The post-test was more conservative than the pre-test. The testing in the pre-test took place immediately after the students had read the textual material but the post-test took place 72 hours after the students read the material. During this lapse time the textual material and notes the participants made were taken away from them. The pre-test had to be done immediately after reading because the time between the pre-test and the commencement of training was limited to three days which only allowed time to test the nineteen participants consisting of two hours of testing for each student.

DISCUSSION OF RESULTS

Based on the researcher's observations and self-reporting of subjects, the students did learn to use the strategies taught to them and to apply the cognitive processes to new content areas. During the post-test the researcher observed the the subjects using strategies including re-reading the passage and making notes. The passages and notes were given to the researcher after studying. The subjects in the experimental groups had used one or a combination of the sub-strategies:

paraphrase\imagery, networking, or analysis of key concepts.

The lapse of time of 72 hours in the post-test made the post-test more rigorous than the pre-test. The students had to remember the information over a longer period of time. The cognitive strategies taught to them, which they used, helped them to organize the information, relate it to prior knowledge, and elaborate on the concepts learned for easier storage in long-term memory.

In the pre-test a significant correlation was found between the students' grade equivalent scores and their ability to answer textually implicit and scriptually implicit questions. In the post-test there was no significant correlation between grade equivalent scores and these two types of questions. This may be a strong indication that learners of lower ability are able to successfully learn new strategies in order to help them comprehend and retain expository material over time.

In the post-test the students in the treatment groups performed better on textually implicit questions than those in the control group. Answers to these questions are inferred from the content. Although a significant difference was not realized, the scores for the textually implicit questions were approaching significance. This

increased performance by the experimental groups may have been due to learning the sub-strategies; networking and analysis of key concepts, which visually connect new information with prior knowledge which facilitates the relationships among inferential information.

One area in which the researcher noticed a considerable change was in the attitude of the students. Most of the students, particularly the older students who were raising children and were returning to school after many years, were highly motivated to be in class. They listened carefully, questioned often, and completed their assignments on time but they appeared to lack confidence in their own abilities.

Over the two weeks of training the researcher noted that the students' confidence in themselves grew. Prior to the study the students either did not re-read a passage unless they were going to have an exam and when they did re-read passages they either underlined everything or re-read taking down a few notes but weren't sure of what was important and how to take notes so ideas interconnected. After learning the cognitive processes the students felt they had a systematic method of reading to understand expository text and they were able to extract, interconnect, and remember the concepts. As well, the metacognitive strategies gave them control over their own

learning. Baker and Brown (1984) stated that those who receive cognitive strategy training without metacognitive skills do not use the strategies effectively.

When the researcher was explaining the use of the loci method as a process of using imagery to remember lists or concepts, the students were very skeptical. They commented that they were too old to conjure images and all they saw when they closed their eyes was blackness. It did not take long to convince the students otherwise. They not only learned to use this procedure well but they applied them to new lists which they were required to learn after the study was completed. These students learned not only the "what" to study but also the "how" to study. As the successes grew throughout the training period their attitudes toward reading improved.

RECOMMENDATIONS FOR FURTHER RESEARCH

Due to the methodological changes which had to be made in the course of this study, it would be valuable to do a second study. (One change was the elimination of the protocol analysis in the post-test, the second was the lapse time included in the post-test but not in the pre-test, and the third was the need to rescale the scores from the questions to equalize the number of questions in the pre-and post-tests). This consistency between the pre- and

post-tests would strengthen the internal validity of the research. A fourth change would require at least one other analyst to review the tapes.

This study was conducted with nineteen subjects and although the statistics proved to be non-significant the treatment appeared to be beneficial. The subjects expressed that they felt more confident in reading and identifying key ideas and relating these ideas to other ideas. A larger sample size might have achieved statistical significance, however, the researcher suspects that the effect size would not have varied much. A second study with the same parameters would likely produce similar results. Therefore there is a need to probe the effect following a different methodology. It may be useful to use a smaller group of three or four students in a case study design. The subjects for the case study could include students from a college who had returned to school to upgrade their education after being out of school for some time. The smaller numbers would enable the researcher to examine, in more detail, the strategies used prior to the treatment and also, it would provide the opportunity to determine if the strategies are transferable to new content areas.

The training sessions in the present study included 25 hours over a two week period and as indicated by the

students they found this quite intensive. The case study could be carried out twice weekly, approximately four hours per week, over a period of six weeks. This extension in time would allow more opportunity for individual guidance, the subjects would have more time to integrate the strategies developing them from a conscious to automatic level of processing (Derry & Murphy, 1986).

The procedures used for the training sessions could be the same but both testing sessions should be parallel. To make both the pre-and post-test sessions conservative, to test the usefulness of the strategies over time, a lapse time of 72 hours after reading and prior to testing could be used.

The use of the protocol talk-aloud was difficult for the students and unless the researcher felt that there was time to train students in this procedure so they were comfortable using it then it should be eliminated. This means that the researcher would have to use observation and questioning techniques to determine the strategies the students used during testing. The case study design would provide the researcher with the opportunity not only to observe the strategies used by the subjects during testing but also to observe the strategies they use to comprehend the material in their daily studies during the training sessions.

The students in this study were taught to be aware of metacognitive strategies and through informal discussions it was found that the students used them and they found them to be beneficial. It may be advantageous to determine what cognitive strategy deficiencies the students have, what study practices the students use, and what their attitudes are towards studying. Weinstein, Zimmermann, and Palmer (1988) developed a Learning and Study Strategies Inventory (LASSI) which addresses these issues. This instrument could be used as a basis for deciding which cognitive processes in which the students are deficient and teach those skills.

The total number of questions on the pre- and post-test were re-scaled out of ten to equalize them. The number of questions should be equal for both the pre- and post-tests.

The subjects' verbal abilities were tested using the Woodcock-G Revised. It would have been interesting to determine if their grade equivalent scores altered after training. There is a parallel test, Woodcock-H Revised, also with adult norms which could be used for this purpose.

Although the subjects did say they were still using the strategies, it would be interesting to ascertain whether after learning the cognitive processes if they

initiate their use on their own over a lapse of one month, three months, or longer and, determine if the strategies become automatic.

Munro and Rigney (1977) identified 66 learning strategies and it is conceivable that training in other strategies would achieve gains in comprehension. The more strategies the students have to choose from the better their ability to find strategies that are efficient and effective for their own learning styles.

Teaching strategies which empower learners to control their own learning may build confidence in the student's ability to overcome impoverished text. "The role of reinforcement, reward, or gratification is universally recognized by students of human nature as a crucial one in the acquisition and performance of skills and knowledge" (Julian B. Rotter, 1966 p. 609). Rotter (1966) developed a scale to determine how students perceive outcomes. They either view reinforcement as not due to their own actions but more a result of luck, chance, or fate which Rotter (1966) labeled external control. Or, they perceive that an event is contingent upon their own actions and Rotter labels this as internal control. His scale is called The Rotter Internal/External Locus of Control Scale. It may be interesting to note how the students view their ability to comprehend the text prior to training and determine if

their motivation changes after they meet success with the training.

A question of whether these strategies could be embedded in the instruction or if it is better to let the students determine which strategies are beneficial to them using their own detached strategies would aid in designing instructional units. A further question related to this one which may be useful to study would be: "Would teaching detached strategies be more appropriate for the mature readers and embedded strategies more effective for slower learners?"

In conclusion, training conscious cognitive processes to adult students who have difficulty comprehending text which may or may not be impoverished appears to give them greater learner control.

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APPENDIX A

Norms for the Woodcock Reading Mastery Tests-Revised

NORMS FOR THE TOTAL READING SCORE - SHORT SCALE

Woodcock, Richard W. (1987). Woodcock Reading Mastery Tests -Revised: Examiner's Manual. Toronto: Psycan. p. 147 Table D.

Total Reading - Short Scale

W Score	S E M	Grade Equivalent	Age Equivalent
		61	61
545	3	16.9	33
		59	60
544	3	16.9	33
		57	59
543	3	16.9	33
		55	58
542	3	16.9	33
		53	57
541	3	16.9	33
		51	55
540	3	16.9	33
		50	54
539	3	16.9	33
			53
538	3	16.5	33
			52
537	3	16.1	33
			51
536	3	15.6	33
535	3	15.2	26
534	3	14.8	23
533	3	14.3	20
532	3	13.9	19
531	3	13.4	18-8
530	3	12.9	17-11
529	3	12.3	17-4
528	3	11.7	16-9
527	3	11.1	16-4
526	3	10.7	15-11
525	3	10.3	15-6
524	3	10.0	15-2
523	3	9.6	14-10
522	3	9.3	14-6
521	3	9.1	14-3

NORMS FOR THE TOTAL READING SCORE - SHORT SCALE (continued)

Total Reading - Short Scale

W Score	S E M	Grade Equivalent	Age Equivalent
520	3	8.8	14-0
519	3	8.5	13-9
518	3	8.3	13-6
517	3	8.0	13-3
516	3	7.8	13-0
515	3	7.6	12-10
514	3	7.4	12-7
513	3	7.2	12-5
512	3	7.0	12-3
511	3	6.8	12-1

This scale continues up to a w score of 582 and down to a w score of 476. For the purposes of this study the students scores ranged between 511 and 545.

NORMS FOR THE WORD IDENTIFICATION TEST

Woodcock, Richard W. (1987). Woodcock Reading Mastery Tests -Revised: Examiner's Manual. Toronto: Psycan. p. 123 Table A.

Word Identification

Raw Score	W Score	S E M	Grade Equivalent	Age Equivalent
			86	83
106	581	11	16.9	33
			78	76
105	571	10	16.9	33
			71	69
104	564	7	16.9	33
			65	64
103	560	6	16.9	33
			61	60
102	556	5	16.9	33
			57	57
101	553	5	16.9	33
			54	54
100	551	5	16.9	33
			51	51
99	549	4	16.9	33
98	547	4	16.3	28
97	545	4	15.4	24
96	543	4	14.4	20
95	541	4	13.5	18-9
94	539	4	12.9	17-9
93	537	4	12.0	17-1
92	536	4	11.3	16-5
91	534	4	10.7	15-11
90	532	4	10.2	15-5
89	531	4	9.8	15-0
88	529	4	9.4	14-8
87	528	4	9.0	14-4
86	526	4	8.7	14.0
85	525	4	8.4	13-8
84	523	4	8.1	13-4
83	521	4	7.8	13-1
82	520	4	7.5	12-10
81	518	4	7.1	12-7
80	517	4	6.7	12-4

NORMS FOR THE WORD IDENTIFICATION TEST (Continued)

Word Identification

Raw Score	W Score	S E M	Grade Equivalent	Age Equivalent
79	515	4	6.3	12-1
78	513	4	6.1	11-10
77	512	4	5.9	11-7
76	510	4	5.7	11-4
75	508	4	5.5	11-1
74	507	4	5.3	10-10
73	505	4	5.2	10-7
72	503	4	5.1	10-4
71	501	4	4.9	10-2
70	500	4	4.8	10-0

The scale continues down to a raw score of 0 but for the purposes of this study the adult students did not score lower than 70.

W scores are intermediate scores designed to eliminate working with negative numbers. They were derived as a result of a mathematical transformation of raw scores into Rasch-based ability scores.

Standard Errors of measurement (SEM) is not a test score. It is and index of the precision of a test score. Mathematical procedures using the Rasch model were used to obtain a unique estimate of the SEM for each individual test and cluster score available, (Woodcock, 1987 p. 38).

NORMS FOR THE PASSAGE COMPREHENSION TEST

Woodcock, Richard W. (1987). Woodcock Reading Mastery Tests -Revised: Examiner's Manual. Toronto: Psycan. p. 127 Table A.

Passage Comprehension

Raw Score	W Score	S E M	Grade Equivalent	Age Equivalent
			96	92
68	570	11	16.9	36
			91	86
67	561	10	16.9	36
			85	80
66	553	7	16.9	36
			79	75
65	549	6	16.9	36
			74	71
64	545	6	16.9	36
			70	67
63	542	5	16.9	36
			66	64
62	539	5	16.9	36
			62	61
61	537	5	16.9	36
			58	59
60	534	4	16.9	36
			55	56
59	532	4	16.9	36
			52	53
58	531	4	16.9	36
				51
57	529	4	16.5	36
56	527	4	15.6	29
55	525	4	14.7	24
54	523	4	13.9	21
53	522	4	13.0	19
52	520	4	12.9	17-4
51	519	4	10.7	16-3
50	517	4	9.8	15-4

NORMS FOR THE PASSAGE COMPREHENSION TEST (Continued)

Passage Comprehension

Raw Score	W Score		Grade Equivalent	Age Equivalent
49	515	4	9.0	14-7
48	514	4	8.4	13-11
47	512	4	7.9	13-3
46	510	4	7.4	12-8
45	509	4	6.9	12-4
44	507		6.5	11-11
43	505	4	6.1	11-4
42	503	4	5.7	10-9
41	502	4	5.3	10-4
40	500	4	4.9	9-11
39	498	4	4.6	9-8
38	496	4	4.2	9-5
37	494	4	3.9	9-2
36	492	4	3.7	9-0
35	490	4	3.5	8-10

The scale continues to a raw score of 0 but for the purpose of this test the adult students did not score below 35.

APPENDIX B

Proposal to the Ethics Committee at the Alberta Vocational College

May 15, 1988

To the Ethics Committee at the Alberta Vocational College

Title of Proposed Study: The Effects of Conscious Cognitive Strategies Used to Compensate for Impoverished Text

Researcher: Patricia G. Peebles (Trish)

Time Frame: The testing sessions will be done individually with each student which will involve 1 & 1/2 hours each for the pre-test and 1 & 1/2 hours for the post-test.

The training will involve 21 hours for each of the experimental groups; 7 hours for each of the three strategies.

Purpose:

- to test the use of cognitive strategies: specifically paraphrase/imagery, networking, & analysis of key concepts to compensate for expository material which is not structured for easy comprehension

- to test the training of these strategies to increase reading comprehension

- to test whether learning these strategies are more beneficial for low-ability or high-ability students

Population: 30 volunteer students from the High School Upgrading program

Methodology: Students will be assigned randomly to one of three groups; two experimental groups and one control group. The control group will take part in the pre and post tests but will not receive any training using the strategies.

The experimental groups will receive 21 hours of strategy training using expository text material from their classes. The training would involve teaching the students in two groups of 20 at a time separate from their regular studies.

The pre-test session will consist of two sub tests, word comprehension and passage comprehension, from the standardized test, Woodcock g-Revised.

The second part of the pre-test and the post-test will consist of students using the strategies to comprehend expository material. This part of the testing will be audio-taped and the tests will be done orally in order to analyze which strategies the student is in fact using.

Confidentiality: The purpose of the study is to test the strategies not to test the students' abilities. Their names will not be published in conjunction with the study. The audio-tapes and the pre and post tests will be destroyed after the analyses are complete.

Data Sharing: I will discuss the results of this study with the students involved in the study and I will submit a summary of the findings to the Ethics Committee at the Alberta Vocational College.

APPENDIX C

An introductory letter explaining the student's involvement in the study and the consent form

Dear Student,

My name is Trish Peebles, I am a graduate student from the University of Calgary working towards a Master's degree in Instructional Design and Technology.

Many of you read technical material on your own as required for your job, to upgrade your knowledge in an area of interest to you, or to advance your position in your job. Much of this material is difficult to understand. I am researching the possibility of teaching adult students three strategies to use so that you have processes by which to extract the meaning from this material.

This study will involve 1 1/2 hours of pre-tests, 15 hours of instruction during the month of August, and 1 1/2 hours of post-tests. The testing will be done individually and will be taped privately with a researcher present.

The purpose of the study is to test the usefulness of the strategies **not** to test your ability to learn them. Your name will **not** be used in conjunction with the study. The audio-tapes will be erased after the analysis is complete.

Thank you for your cooperation.

Yours truly,

Trish Peebles

The Effects of Conscious Cognitive strategies Used to Compensate for Impoverished Materials

Principal Investigator: Trish Peebles
Department of EDCI

The University Of Calgary

Telephone Number: 220 - 7138

Consent Form

I,_____, hereby give my consent to take part in 15 hours of strategy training and three hours of testing. I understand the nature of my involvement, that is giving both written and audio-taped recorded answers to the prestructured and open questions about the use of these strategies. I am assured that my answers will be kept strictly confidential and will be analyzed in conjunction with the responses of other participants. At no time during future analysis will my name be identified or made public in connection with this study.

I understand that I may withdraw this consent at any time without penalty.

_____ _____

Date Signature of Participant

_____

Researcher

APPENDIX D

Sample materials used for the lessons taught at the Alberta Vocational College during the study

The researcher taught the use of the three strategies using the material from the English 23 and the Communications 21 B
courses in which the students were enrolled.

The following are excerpts from this material.

Sample A:

Prologue to Prototypes

If we were to build an entrepreneur from scratch we'd have a hard time coming up with the parts. No one stocks them all. There isn't an entrepreneur in operation who came fully loaded with all the characteristics and skills needed to launch a venture. They all started with what they had and learned the rest.

Entrepreneurs come in all shapes and sizes. From all walks of life. They're everyday, down to earth, real people, people who at some point in their lives decided to go out and make it on their own.

This article consisted of 17 pages and included headings such as: Self-employment is self-direction, entrepreneurs are made, not born, is time on your side, etc. The students constructed headings for their network which included prototype, characteristics, support, definition, and resources. From the article the students extracted the key information and wrote it on their web using point form.

Sample B:

Developing Skills in Critical Reading

Recognizing Statements of Fact and Statements of Opinion

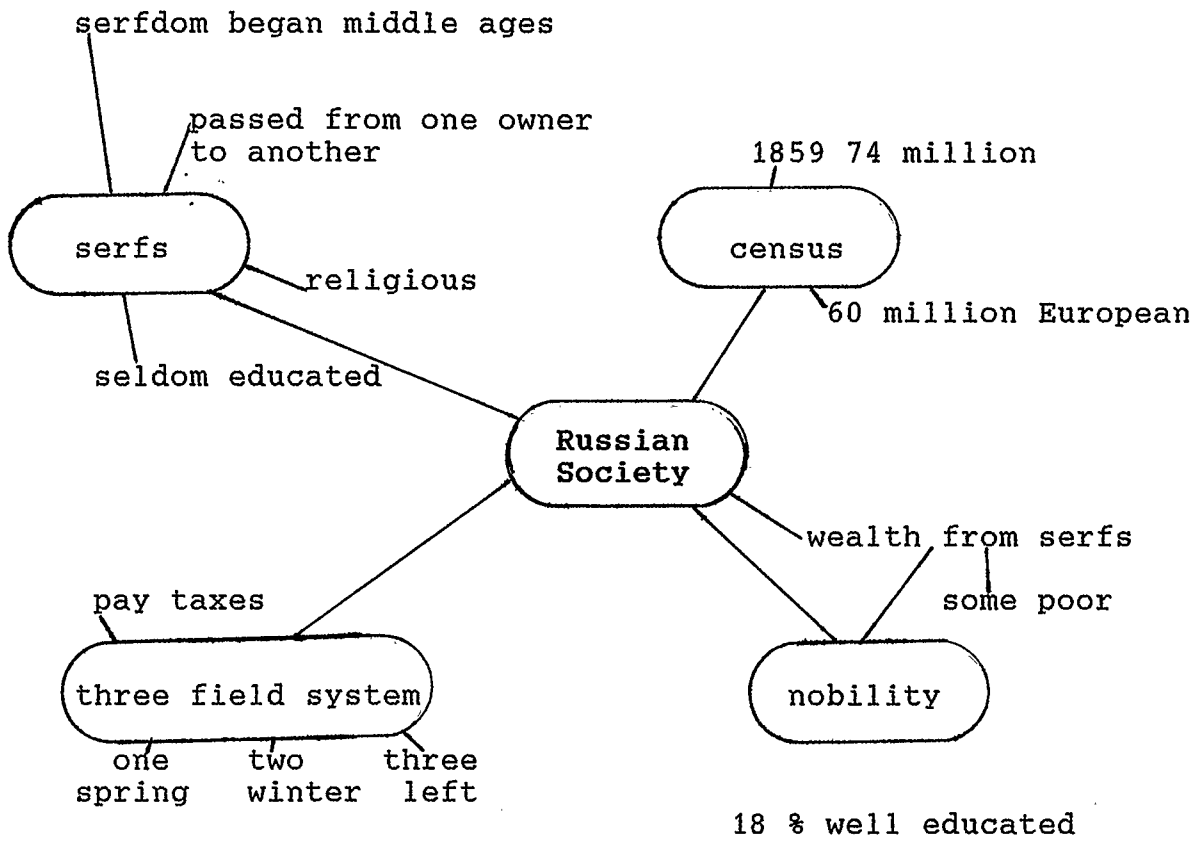
A statement of fact contains information that can be proved true or false. It contains information about things that have happened in the past or are happening in the present. Fro example, here are three statements of fact.

> Miles Davis is a jazz musician.
> Many people came to hear Davis play his trumpet.
> Miles Davis was born in 1926.

This article consisted of 27 pages which included definitions and exercises on several skills including; forming valid opinions and conclusions, recognizing stereotypes, recognizing sweeping statements and irrelevant evidence, and more. The students paraphrased the definitions and included examples.

APPENDIX E

Sample portion of a network used by one of the subjects on the Post-test


serfdom began middle ages
passed from one owner to another
serfs
religious
seldom educated
1859 74 million
census
60 million European
Russian Society
wealth from serfs
some poor
pay taxes
three field system
one spring
two winter
three left
nobility
18 % well educated