



Reflective judgment and the adult learners use of metacognitive learning strategies
by Alan Eichi Yabui

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

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Abstract:

The relationships between adult learners' placement in reflective judgment stages and use of learning strategies and between selected demographic variables and use of learning strategies of adult learners were examined. The study also investigated whether there were groups of adult learners who think and learn in a similar manner. Volunteer participants from Malmstrom Air Force Base, Montana were surveyed between September 1991 and March 1992.

Learning strategy information was collected using the SKILLS survey instrument that had respondents selecting 18 responses to learning strategy questions on 4 learning scenarios. A second survey instrument, the RJQ used four problem scenarios to solicit reflective judgment stage responses for participant stage placement on the Reflective Judgment Model. Two hundred one participant surveys were used in the discriminant analyses and 197 surveys were used in the cluster analysis. Two discriminant analyses and a cluster analysis were to determine the relationship between learning strategies and education, gender, age and learning strategies and reflective judgment. The cluster analysis was used to determine if distinct groups of adult learners had similar patterns of learning and thinking.

Three distinct reflective judgment groups were identified using discriminant analysis. Five cluster groups were identified using cluster analysis. High reflective judgment group members indicated resource management use of human resources and identifying resources along with metacognition adjusting and critical thinking conditional acceptance were important learning strategies. Low learners identified metacognition monitoring and planning and metamotivation reward and attention as major learning strategies. Age and education were important variables for the high reflective judgment learners. Use of human resources, identifying resources, adjusting, and conditional acceptance were learning strategies associated with the high reflective judgment cluster groups. Planning, monitoring, and reward were important learning strategies of low reflective judgment cluster groups.

On the basis of the analysis, it was concluded that there were three distinguishable learner groups identified by reflective judgment stages, cluster groups identified learners who thought and used learning strategies in a similar manner, and among adult learners there are discernible learning strategy patterns associated with different reflective judgment stages.

**REFLECTIVE JUDGMENT AND THE ADULT LEARNER'S USE
OF METACOGNITIVE LEARNING STRATEGIES**

by

Alan Eichi Yabui

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ABSTRACT

The relationships between adult learners' placement in reflective judgment stages and use of learning strategies and between selected demographic variables and use of learning strategies of adult learners were examined. The study also investigated whether there were groups of adult learners who think and learn in a similar manner. Volunteer participants from Malmstrom Air Force Base, Montana were surveyed between September 1991 and March 1992.

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Three distinct reflective judgment groups were identified using discriminant analysis. Five cluster groups were identified using cluster analysis. High reflective judgment group members indicated resource management use of human resources and identifying resources along with metacognition adjusting and critical thinking conditional acceptance were important learning strategies. Low learners identified metacognition monitoring and planning and metamotivation reward and attention as major learning strategies. Age and education were important variables for the high reflective judgment learners. Use of human resources, identifying resources, adjusting, and conditional acceptance were learning strategies associated with the high reflective judgment cluster groups. Planning, monitoring, and reward were important learning strategies of low reflective judgment cluster groups.

On the basis of the analysis, it was concluded that there were three distinguishable learner groups identified by reflective judgment stages, cluster groups identified learners who thought and used learning strategies in a similar manner, and among adult learners there are discernible learning strategy patterns associated with different reflective judgment stages.

CHAPTER 1

INTRODUCTION

Adult Problem Solving

In the richer problems of every life, one rarely finds that the problem can be constructed as a puzzle, and one of the most difficult aspects of realistic problem-solving is the determination of whether or not a solution has occurred Another way of saying the same thing is that in social problems like pollution and poverty, there is no authorized source for terminating the inquiry. (Churchman, 1971, p. 144)

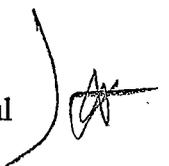
Adults solve problems in daily routine that are often complex and ill-structured, i.e., problems that have no one right answer. A puzzle as described in the Churchman quote is a well-structured problem, i.e., all the elements necessary for a solution are known and knowable. Stated another way, puzzles have a single right or wrong answer which is available to the problem-solver. Wood (1983) defined a puzzle as "a situation for which there exists a single correct answer. In such situations the information needed to solve the problem is entirely contained in the problem instructions" (p. 250). In puzzles, the final solution is perceived to be complete and sufficient by qualified individuals because the solution adheres to explicit rules for formulation and inference within the context of the puzzle situation.

Commenting about IQ tests, a form of academic puzzle solving, Sternberg observed that tasks in IQ tests "are formulated by other people, are of little or no intrinsic interest, have all needed information available from the beginning, and are distant from an individual's ordinary experience." Different skills are needed to problem solve on IQ tests than for solving real-world problems. According to Sternberg (1986), Neisser coined the term "practical intelligence" to describe "intelligent performance in natural settings." Practical intelligence was defined as "responding appropriately in terms of one's long-range and short-range goals, given the actual facts of the situation as one discovers them" (p. 211).

Adult problems are rarely puzzle-like; therefore, puzzle solving methodology is limited in scope and of little value in the daily decision-making activities of an adult. Cavanaugh, Kramer, Sinnott, Camp, and Markley (1985) observed that adults make decisions based on "what they believe, how they feel, how motivated they are, and an assessment of their own knowledge and situational factors" (p. 147).

The adult who faces real-world problems is often confronted with the dilemma of choosing or devising a strategy among many perceived possible strategies to resolve a given ill-structured situational problem. Ill-structured problems are problems with poorly defined structures and ones in which the outcomes of a given act are not known with certainty (Wood, 1983, p. 251).

Although the problems are unique, many real-world problems or dilemmas have similar characteristics so that resolution strategies are often repetitive or modifications of previously used strategies. The adult's prior success in solving a

like problem, perception of situational reality, and how he/she conceptualizes truth and knowledge contribute greatly to the decision-making process. Strategy choices range from looking for advice and possible solutions from an expert to a thoughtful personal examination of one's knowledge base and the known evidence. 

Kitchener and King (1981) developed a seven-stage Reflective Judgement Model outlining how individuals justified decisions based on assumptions about knowledge. The stages in the Kitchener and King model are sequential and hierarchical. It begins with Stage 1, in which an individual accepts knowledge absolutely and believes knowledge to simply exist, to Stage 7, in which the individual conceptualizes that knowledge gained by critical inquiry can be used to create an approximation of reality that is held constant across several domains. Each reflective judgment stage is qualitatively different, and each stage represents an organization of thought based on an understanding of the nature of inquiry and perception of knowledge. The Reflective Judgment Model stages are further explained in Chapter 2.

As an individual progresses through the reflective judgment stages, thinking processes also increase in complexity. The cognitive processes used by an individual to solve problems basically constitute selecting strategies that are perceived to be useable to attain some type of acceptable solution. The individual strategy selection an individual uses often is an intrapersonal mental process or what Flavell (1976) termed "metacognition." According to Flavell, metacognition

refers to "one's knowledge concerning one's own cognitive processes and products or related to them" (p. 232).

Gavelek and Raphael (1985) indicate that metacognition has two major concerns. First, it assumes that the learner is an active organism and that metacognitive knowledge enables learners "to behave proactively or to influence the input that in turn influences the activity." Second, metacognition addresses "transfer or generalization of what has been learned . . . it is reasoned that to the extent individuals know what and how they know, such higher-order knowledge should be utilizable across different settings" (p. 129). The concept of metacognition is covered in more detail in the Literature Review, Chapter 2.

Statement of the Problem

Thinking individuals process information to derive opinions and make decisions. The technique of integrating new information with presently held knowledge and how one justifies belief in the accepted knowledge affect how an individual goes about seeking additional data. How adults use their present knowledge base and how they transform and develop their decision-making skills are acknowledged as important questions in the education of adults. Until recently, the relationship between the use of decision-making strategies and reflective thinking has been rarely mentioned in the research literature. Most of the studies about decision making and problem solving that refer to reflective thinking have been categorized under the label "critical thinking." Kitchener (1983) stated that

critical thinking studies usually fall under two general categories: studies that group themselves around the hypothetic-deductive method and studies that examine critical thinking as a process of inquiry. Both approaches assume the use of a set of critical thinking skills, i.e., assume a close relationship between problem solving processes and the scientific method (p. 78). Kitchener further argued that to view reflective thinking as a subset of the logic-based scientific method fails to recognize that there are different sets of assumptions about knowledge involved in reflective thinking. Paraphrasing Dewey, Kitchener (1983) stated,

Reflective thinking can only take place when there is an awareness that a true problem exists and that uncertainty about a solution is at the basis of that awareness. Not all epistemological assumptions acknowledge such uncertainty. (p. 78)

Mezirow (1990), in discussing reflection and adult education, commented that research in the area of adult learning has basically ignored studying "the process of reflecting back on prior knowledge to determine whether what we have learned is justified under present circumstances" (p. 5). Mezirow referred to reflection as "a generic term for those intellectual and affective activities in which individuals engage to explore their experiences in order to lead to new understandings and appreciation" (p. 5). He further speculated that reflective action may be an integral part of decision making. He defined reflective action as "action predicated on a critical assessment of assumption," which may be interpreted as "the process of correcting distortions in our reasoning and attitudes" (p. 6, 7).

The process of individual critical assessment of knowledge address both the issues of "What do I presently know?" and "How do I best resolve the situation being encountered?" These questions are basically metacognition questions. The problem is that we have little research data on the relationship of learning processes to such reassessment of knowledge.

Purpose of the Study

This study was conducted to determine the relationship between reflective judgment and adult learning. Few studies have explored the use of King and Kitchener's Reflective Judgment Model to determine if an adult's placement at different stages affects the use of different learning strategies in problem solving. Many studies assume adults have some level of knowledge to design potential resolutions for day-to-day problems that often do not have definite solutions. Most adults, however, accept best alternatives as solutions that temporarily or permanently alleviate problems without having the information or the know-how necessary to collect information to make a "good" decision. Real-world problems which adults encounter have no given solution as one finds in a puzzle, and there are many possible alternative solutions to ill-structured problems. How does an adult choose the best solution? The Reflective Judgment Model places adults at different stages of justification of knowledge and reality perception that impact acceptance of alternative solutions in decision making. The relationship of

reflective judgment and an adult's use of learning strategies in problem solving situations was explored in this study.

The purpose of this study was to investigate whether individuals at various stages of reflective judgment use different learning strategies. Secondly, the study investigated whether individuals at various stages of reflective judgment were different demographically in levels of education, age, and gender and different in the use of learning strategies. Thirdly, this study investigated whether there were grouped clusters of people who think and learn in a similar manner. Participants for this study were selected from individuals who work at Malmstrom Air Force Base, Montana.

Relationships were examined between a participant's individual reflective judgment score derived from a Reflective Judgment Questionnaire (RJQ) designed as part of this study and the participant's use of learning strategies measured by the Self-Knowledge Inventory of Lifelong Learning Strategies (SKILLS) developed by the Center for Adult Learning Research at Montana State University. The demographic factors were level of education, gender, and age. Education factors included highest level of education completed in a post-secondary education program.

Research Questions

This study investigated the relationship between learning strategies measured by SKILLS and reflective judgment scores measured by the Reflective Judgment

Questionnaire of military and civilian personnel who were stationed or worked at Malmstrom Air Force Base in Great Falls, Montana. Three research questions were tested in the study.

Research Question 1: Among Malmstrom Air Force Base personnel is it possible to discriminate among the participants with the highest Reflective Judgment Questionnaire scores, the participants with approximately the middle Reflective Judgment Questionnaire scores, and the participants with the lowest Reflective Judgment Questionnaire scores based on measurements of learning strategies scores on SKILLS?

Research Question 2: Among Malmstrom Air Force Base personnel is it possible to discriminate among the participants with the highest Reflective Judgment Questionnaire scores, the participants with approximately the middle Reflective Judgment Questionnaire scores, and the participants with the lowest Reflective Judgment Questionnaire scores based on measurements of learning strategies scores on SKILLS and demographic variables?

Research Question 3: Is it possible to identify distinct clusters among Malmstrom Air Force Base personnel based on learning strategies scores on SKILLS, Reflective Judgment Questionnaire scores, and demographic variables.

Significance of the Study

Information about an adult learner's use of learning strategies and the relationship of learning strategies to reflective judgment stages has the potential of impacting adult education programs in a significant manner. Knowledge about student learning strategies and reflective judgment scores could be used by instructors and program administrators to provide better educational learning environments for students. Do varied approaches to teaching, programming, and learning relate to intellectual development? Should programs be structured to encourage reflective judgment development? Would training in the use of learning strategies promote intellectual development? This study lays the basis for such considerations by determining whether there is a relationship between reflective judgment, learning strategies, and certain demographic variables.

The development of higher order thinking skills involves challenging one's basis for assumptions about knowledge. King and Kitchener hypothesize that epistemological changes most likely will occur as a student accepts responsibility for investigating and accepting the relative nature of knowledge and uncertainty. With the commitment and responsibility for investigating and acceptance of the reality of one's judgment of knowledge, students may be able to choose more alternatives during situations of decision making.

Brookfield (1987) stated that the ability to consciously reflect on one's learning style is a crucial element in an adult's ability to develop critical thinking habits (p. 83). Brookfield further stated that,

Becoming aware of our learning styles, and learning how to adjust for weaknesses and emphasize strengths, is not a pedagogic exercise of interest only to academics. It is a fundamentally liberating way by which we can free ourselves of tendencies and inclinations that act to prevent us from becoming critical thinkers. (p. 85)

Smith (1982) commented in his book, Learning How to Learn, that adult learning intersects with learning how to learn in such a way that as an adult learns, the learning impacts on his/her motivation for further learning, which affects the adult learners potential of being a more efficient, effective, and meaningful learner (p. 58).

Definition of Terms

Judgment Sampling: Non-random sampling method in which the researcher's judgment is used in deciding which elements of a universe to include in a sample. The researcher selects "typical" individuals or groups to represent the population (Hamburg, 1987, p. 177).

Knowledge: "The act of having a clear and justified grasp of what is so or of how to do something. Knowledge is based on understanding or skill, which in turn are based on thought, study, and experience" (Paul, 1990, p. 557).

Learning Strategies: "The techniques and skills that an individual elects to use in order to accomplish a specific learning task. Such strategies vary by

individual and by learning objective. Often they are so customary to learners that they are given little thought; at other times much deliberation occurs before a learning strategy is selected for a specific learning task" (Fellenz & Conti, 1989, p. 1).

Memory: "The capacity of humans to retain information, to recall it when needed and recognize its familiarity when they later see it or hear it again" (Wingfield & Byrnes, 1981, p. 4).

Metamemory: Term to describe how an individual uses "knowledge about how, when and why" to intentionally store and retrieve information from memory (Leal, 1987, p. 35). Flavell and Wellman (1977) describe the attributes and properties of metamemory as "[An] individual's knowledge of and awareness of memory, or of anything pertinent to information storage and retrieval . . . [for example,] a person has metamemory if he [or she] knows that some things are easier to remember than others, is aware that one item is on the verge of recall, while another is wholly irretrievable at present" (p. 4).

Metamotivation: Learner control of motive strategies in a learning situation. McClelland (1987) defines motive as "a recurrent concern for a goal state based on a natural incentive--a concern that energizes, orients, and selects behavior" (p. 590).

Problem Solving: A thinking strategy that starts with the recognition by the learner that a "discordant situation" exists that needs some type of resolution. It involves the process of clearly identifying the nature of the problem,

establishing a plan to resolve the problem, and acting on the plan to meet the need to resolve the problem (Beyer, 1987, p. 28).

Resource Management: Individual strategies used in gathering data and resources to be applied in conjunction with familiar and known problem solving techniques in a learning or problem resolution situation.

Skill: "The ability to execute or perform in an expert, rapid, accurate way . . . [when associated with cognitive or thinking operations, synonymous with] recalling, analyzing, detecting fallacies . . . also refers to discrete, thinking operations such as clarifying, detecting bias, synthesizing" (Beyer, 1987, p. 25).

Thinking Operation: The use of skills and strategies to analyze, evaluate and resolve discordant situations (Beyer, 1987, p. 33).

Assumptions and Delimitations

An assumption in this study was that the Reflective Judgment Questionnaire, a paper and pencil survey, used in this study approximated the Reflective Judgment Inventory, an interview-type instrument used in the King and Kitchener Reflective Judgment Model.

Participants were administered the SKILLS and RJQ under both controlled and uncontrolled situations. In the uncontrolled situation, the instruments were handed out to participants at their respective work centers and the participants were requested to return the instruments to a central location at their work centers.

In the controlled situation, the instruments were administered by the researcher or an instructor to selected college and military education courses at the Malmstrom Air Force Base Education Center. It was assumed that the participants answered both instruments under both conditions truthfully and in an unbiased manner. All participants in this study volunteered to respond and complete the RJQ and SKILLS instruments.

The study was delimited to civilian and military personnel who worked at or were assigned to Malmstrom Air Force Base between September 1991 and April 1992. Volunteer participants were chosen from work centers which represented a high percentage of the civilian work force at the base and from military and college courses which had enlisted and officer personnel as students.

CHAPTER 2

REVIEW OF RELATED LITERATURE

Introduction

In the 1970's cognitive psychologists working with children and adults demonstrated that immature learners had a tendency to use little or no strategy to aid their learning. After being taught specific strategies to improve their learning skills, the immature learners were not able to use newly learned strategies very efficiently. Only after specific instructions were given on how to use the learning strategies on specific tasks did learning improve. This led researchers to examine learners' awareness of their own memory processes and how individual learners used memory processes when studying subject matter, how learners used memory during the learning task, and how learners used memory in the application of learning strategies. Flavell coined the phrase "metamemory" to explain this area of cognitive research, which basically asked the question, "What might a person conceivably come to know, or know how to find out, concerning memory as a function of cognitive growth and learning experience?" (Brown, Bransford, Ferrara, & Campione, 1983, pp. 82-83). Research in metamemory eventually progressed into a wider range of cognitive concerns referred to as "metacognition."

Of major importance in this study is the relationship of the learner's knowledge, the learner's learning process, and the strategies that the learner uses to perform a learning task. Metacognitive concepts and the Reflective Judgment Model were used to examine this relationship. Although the concept of metacognition is not clearly defined among adult educators and cognitive psychologists (Fellenz & Conti, 1989; Gavelek & Raphael, 1985; Reynolds & Wade, 1986), the examination of metacognition strategies and reflective judgment stages may shed light on an adult's process of learning and decision making. The components of the Self-Knowledge Inventory of Lifelong Learning Strategies (SKILLS) instrument are explained under metacognition as the "meta" strategies fall under the category of "thinking about" memory or motivation. Resource management and critical thinking also imply the use of "meta" skills.

This review will examine SKILLS strategies associated with metacognition, memory, metamemory, resource management, and critical thinking. Additionally, Kitchener and King's Reflective Judgment Model will be reviewed.

Metacognition Strategies

Overview

As stated in Chapter 1, Flavell (1976) defined metacognition as "one's knowledge concerning one's cognitive processes and products or anything related to them, e.g., the learning-relevant properties of information or data." He further added that the processes of metacognition involve "the active monitoring,

consequential regulation, and orchestration of these processes in relation to the cognitive objects on which they bear, usually in the service of some concrete goal or objective" (p. 232). Flavell's definition in essence refers to self-monitoring on specific cognitive tasks.

Flavell (1979) identified four classes of phenomena that were required for cognitive monitoring to occur: metacognitive knowledge, metacognitive experiences, goals (or tasks), and actions or strategies. Metacognitive knowledge refers to a person's stored world knowledge. Metacognitive experiences are any conscious or affective experiences that pertain to a person's intellectual activity. He added that "metacognitive experiences are especially likely to occur in situations that stimulate a lot of careful, highly conscious thinking" (p. 908). Flavell believed that conscious metacognitive strategies can affect either cognitive or metacognitive goals by adding, deleting, or revising metacognitive knowledge. Goals (or tasks) are the objectives of the cognitive activity, and actions are the behaviors that are used by a person to achieve goals (p. 906).

Flavell (1979) stated that metacognitive knowledge concerns the interactions or combinations of interactions among person, task, and strategy. He described metacognitive knowledge as "knowledge or beliefs about what factors or variables act and interact in what ways to affect the course and outcome of cognitive enterprises" (p. 907). He identified three variables of metacognitive knowledge: person, task, and strategy. As used by Flavell, the term "person" referred to the nature of people (self and others) as cognitive processors. Individual referred to

reference of oneself (intrapersonal). Others referred to how individuals relate to others (interpersonal) and how individuals used cognitive strategies (universals of cognition) in the learning process. To explain the use or belief in universals of cognition, Flavell used the example of a child using various degrees of remembering, attending, and problem solving to address a learning situation. However, even if the child used such strategies, the child could have learned that failure to understand may be the end result because the use of metacognitive strategies had not guaranteed the problem situation would be understood correctly, or that the variables of the problem would be presented coherently (p. 907). Task was concerned with information availability to a person during a cognitive enterprise, and strategy was concerned with ways or procedures an individual used in attaining a goal.

Yussen (1985) stated that "metacognition is that mental activity for which other mental states or processes become the object of reflection . . . metacognition is sometimes referred to as thoughts about cognition, or thinking about thinking" (p. 253).

Yussen (1985) clarified Flavell's description of metacognitive knowledge and experiences by stating, "Metacognitive experiences are here-and-now reactions to the ongoing cognitive activity, whereas metacognitive knowledge consists of stored concepts (declarative and procedural) which are called up from memory to guide the cognitive activity" (p. 256). He attributed to Brown the refining of the definition and description of metacognitive knowledge through her belief that there

are two kinds of metacognitive knowledge: static and strategic. According to Brown's definition, static knowledge consisted of the verbalizable things people state about cognition and strategic knowledge consisted of those steps that individuals actually used to regulate and modify the progress of a cognitive activity as it actually occurred. Brown (1985) identified four basic strategies: "planning--figuring out how to proceed; predicting--estimating some quantitative aspect of the outcome of the cognitive activity; guessing--taking a stab at an answer prior to reaching a complete cognitive answer; and monitoring--taking stock of how well one has progressed toward some goal in the cognitive activity" (p. 256). Brown (1978) emphasized the importance of metacognitive processes when she stated that "the processes described as metacognitive are important aspects of knowledge, that what is of major interest is knowledge about one's own cognitions rather than the cognitions themselves" (p. 79).

Gavelek and Raphael (1985), in their research on metacognition within an instructional environment, believed that three questions should be asked to determine if a learner (child) [also may be applied to adults] is utilizing metacognitive knowledge:

- a. Does an individual give evidence of monitoring and/or regulating his or her cognitive performance?
- b. Is this individual's performance facilitated as a result of such activity?
- c. Does the individual engage in the metacognitive activity across multiple settings? (p. 107)

Kuhn (1983) noted that Flavell's description of metacognition failed to recognize two distinctions in metacognition in what she terms "executive 1", i.e., knowledge about the task or problem itself, and "executive 2" strategies, i.e., knowledge of whether a particular strategy is appropriate to apply in a given problem-solving situation. Executive strategies referred to the application of problem-solving skills to business situations.

Kitchener (1983) argued that the distinctions between the two kinds of "knowing about knowing" pointed out by Kuhn are obscured, especially the distinction between an individual's knowing about intrapersonal cognitive processes and when to apply them and knowing about knowledge and the validity of truth claims. Kitchener maintained that "a critical difference exists between knowing that a particular memory strategy is recommended under certain circumstances and knowing that for some problems we can never know a solution is absolutely true" (p. 223).

To clarify a problem situation, a person may ask questions. However, in order to ask questions that will increase comprehension of the situation, the questioner must know something about what is not known in order to ask an information-seeking question (Gavelek & Raphael, 1985). The dilemma, according to Gavelek and Raphael, is similar to a Plato dialogue in which Meno proposed the following problem to Socrates:

You argue that a man cannot inquire either about that which he knows or about that which he does not know; for if he knows, he has

no need to inquire; and if not, he cannot; for he does not know the very subject about which he is to inquire. (p. 113)

Sternberg (1986) stated, "Probably more problems remain unsolved because they are never recognized than because they are solved inappropriately" (p. 83). Reynolds and Wade (1986) stated that "Knowledge of how metacognition predicts and affects actual cognition performance is crucial if metacognition is to survive as a useful and important construct" (p. 311).

SKILLS Metacognition Learning Strategies

The three metacognition learning strategies are planning, monitoring, and adjusting. Flavell (1979) and Brown (1978) both contended that planning, monitoring, and adjusting of learning strategies were interactive and dependent on each other.

(1) Metacognitive planning refers to how an individual focuses on a learning task at hand by thinking about the processes that would most likely be employed in the task. This strategy encompasses anticipating what needs to be done, assessing the individual's possessed learning skills, and thinking about the best method to utilize in performing the task.

(2) Monitoring refers to the strategy of assessing how the learning is progressing during the process of the learning task. Monitoring keeps the individual relatively focused on the task at hand and provides feedback to the individual as the task progresses.

(3) Adjusting refers to the learner's ability to make corrections or change procedures as feedback is received regarding the accomplishment of the task. New information may also affect an adjusting strategy as new external information may alter the metacognitive plans mentally conceived before the task was started. Adjusting strategies point to the ability of learners to modify and adjust learning strategies as needed during the performance of learning tasks.

Memory Strategies

Overview

Salthouse (1982) stated that although memory is often thought of as a single process, memory consists of many diverse mental processes. For example, memory may be examined by investigating the distinctions between encoding, storage, and retrieval. Encoding, storage, and recall is also referred to as registration, retention, and recall (pp. 125, 133). Wingfield and Byrnes (1981) stated that "the term memory is an inclusive one that deals with our ability to acquire and retain information, to recall it when needed, and to recognize its familiarity when we see it or hear it again" (p. 17). Long (1983) stated:

The process of learning and memory are so closely related and interdependent that it is often difficult to determine whether we are concerned with one phenomenon or two . . . one who does not learn has nothing to remember, and without memory there is no evidence of learning. (p. 58)

According to Best (1986, p. 114), the information-processing theory of memory considers memory as a system of initial interrelated components: storage,

control processes, capacity, and decay. This short-term storage system was thought to be of limited duration and only have the capacity to develop memory codes that were acoustic, verbal, or linguistic. This memory was perceived as an individual's mental capability to store information in some storage mechanism using mental codes which could be transferred throughout one compartmented mental store (sensory register) through the use of cognitive codes. The combined total capacity of the sensory register determined the capacity of a person's short-term memory, and each sensory register was thought to be subdivided into specific areas where certain stimuli and perception senses stored specific information. Memory storage was thought to be of a short duration, about 30 seconds for unrehearsed material. As time passed, information not transferred to long-term memory was thought to decay.

The control process that permits transfer of information between short-term to long-term memory is rehearsal. Best (1986) defined rehearsal as cognitive operations that have two functions: procedures that refresh codes stored in short-term memory which assist codes storage in short-term memory and operations that help build up a close duplicate representation or memory trace of "the stored short-term storage codes in long-term storage." In short-term storage information is organized for storage according to acoustical or verbal codes, while in long-term storage codes are organized semantically by meaning (pp. 114-115).

Murdock used the term "recognition memory" to refer to the act of retrieval of information from memory. Recognition memory can take two forms: the

recognition of someone or something, or it can refer to an act of testing memory with several alternatives and making a judgment of familiarity. The utilization of information is in two stages, the inquiry of the memory trace by an encoded probe and the decision that the memory code is a match of the inquiry. Murdock explained that the process of memory for information retrieval is complex and similar to the process of electronic signal detection. Memory is probed for either old information or a signal distribution or a noise (new information). If the probe is successful, the item is retrieved; if not, the probing continues until some decision criterion stops the process (pp. 2-8).

Wingfield and Byrnes (1981) stated that one way of distinguishing different kinds of questions about memory is to distinguish between memory-related questions about process and questions concerning memory structure. Memory structure questions relate to what information is stored, how long the information may last in memory, and how the information is organized in memory, while process questions examine factors such as acquisition, retention, and retrieval (p. 6).

SKILLS Memory Learning Strategies

The SKILLS memory learning strategies are organization, external aids, and application.

(1) Memory organization is the orderly and detailed strategy used by the learner to mentally organize information to facilitate storage and retrieval of information. It is the reordering and restructuring of data or information from an

original verbal or written presentation or an empirical experience. Mental organization of information assists the learner in recalling information. Information is thought to be organized in memory in such a way as to fit into an existing framework of knowledge or to fit into relationships of related items stored in memory, which makes it easier to retrieve when needed (Norman, 1982). In SKILLS it includes imagery, organization relating, and level of processing.

Extemporaneous speaking is an example of the use of imagery, mental organization, and level of processing. From the research of supporting materials, a speaker develops a written outline for informational or persuasive extemporaneous verbal presentation. Through the written outline and verbal rehearsal, the speaker prepares a mental imagery and strategy for an extemporaneous speech. As the extemporaneous speech is presented, the speaker's mental image is translated into a verbal picture for the audience and the speaker processes non-verbal feedback and modifies the speech to accommodate the audience, while at the same time sticking to a strategy to accomplish to purpose of the speech.

(2) The use of external aids to reinforce memory is effective in helping a learner remember information. Zechmeister and Nyberg (1982) maintained that external aids enable a learner to better process information for internal storage in both short- and long-term memory. In using external assistance, the learner attempts to correlate mental processes with the surrounding external environment, such as a contextual interaction with past or future events. Making mental notes of geographic features so one can later retrace a journey or remember where one

placed an object would be examples of contextual external aids. Making lists, using appointment calendars, or asking someone to "remind" one of something to do are other examples.

(3) Memory application refers to the deliberate use of past experiences to help the learner learn. Learners may use memory application to visualize steps they had previously used to solve puzzles. Remembrances and mental images are effective memory applications in real-life learning situations.

Metamotivation Strategies

Overview

McClelland (1987) stated that the subject area of motivation deals with a part of the "why" of behavior and deals with the "how behavior gets started, is energized, is sustained, is directed, is stopped" (p. 4). Metamotivation deals with a learner's thinking about the variables of motivation and how the variables affect learning outcomes.

Deci and Ryan (1985, p. 3) maintained that motivation has two essential components: energization and direction of behavior. Energization refers to needs satisfaction that McClelland (1987, p. 595-598) infers come from three basic human motives: achievement, power, and affiliation.

Motive is defined by McClelland (1987) as "a recurrent concern for a goal state based on a natural incentive--a concern that energizes, orients and selects behavior." Under this definition, a person focuses on goal states, that is, being

focused on the outcomes of specific tasks on a recurrent basis rather than an infrequent and sporadic basis. Goal states "pop into" a person's thinking often but not continuously (pp. 590-592). Learners using metamotivation techniques need to be constantly reinforced with the goal or goals of the learning task.

Direction of behavior may be explained by McClelland's use of the phrase "goal state." It is important because the outcomes of directed behavior of movement toward the goal state may be more important than the specific activities to attain the outcome. For example, a learner trying to improve work productivity by becoming more efficient in performing a given task would be satisfied with the final outcome of increased efficiency rather than with the accomplishment of the several tasks that led to the final outcome. According to this perception of motive, the outcome outweighs the importance of the achieved intermediate tasks.

Deci and Ryan (1985) referred to "intrinsic motivation" as an innate ability of an individual to muster capacities to pursue a held interest without the need of external rewards or environmental controls (p. 43). They asserted that intrinsic motivation was an important motivator of learning, growth, and adaption in a person's mental skills competency development. They also pointed out that without intrinsic motivation, an individual may exhibit negative behaviors: boredom, inactivity, and alienation.

Deci and Ryan (1985, pp. 229-230) used an information-processing model to explain intrinsic motivation. In their model information signals (information input) were processed by individuals in one of two ways: intuitive appraisal and reflective

judgment. Intuitive appraisal referred to the immediate decoding of the information input that was based on an individual's intuition and might lead to an uncertain decoding since this decoding was based on a "gut feeling." The example Deci and Ryan used to explain intuitive appraisal was an individual's feeling of being out of balance while standing. The signal which may lead one to self-correct this feeling of imbalance is to reach out to grab an object to protect against falling to the floor or ground. Reflective judgment referred to the ability of the individual in certain instances to respond to information with deliberation and reflection. For example, when an individual decides to buy an expensive piece of antique furniture, the decision to purchase is often based on a deliberate and reflective decision strategy.

Relevant intrinsic motivation information fed into an individual's need structure energizes behavior. The information signals come from both external environmental signs and an individual's internal physiological nervous system. Deci and Ryan (1985) explained that

the concept of an intrinsic need for competence and self-determination, which provides energizing inputs, is the element that makes [the] theory a truly active-organism theory, for it not only describes the energization of intrinsically motivated behavior but also the energization of the physiological processes involved in self-determined behavior. (p. 230)

Smith (1982) found that a very common problem in adult self-directed learners was "wavering" motivation. Unless a clear goal is established, initial enthusiasm falls prey to unexpected difficulties or time demands that divert the

learner from completing the project (p. 103). He observed that distinction between the novice and knowledgeable self-directed learner in the following description:

Knowledgeable learners expect cycles in motivation and plateaus in achievement. They monitor their learning behavior for clues as to patterns, tendencies, and potential pitfalls. They develop strategies for rekindling interest and commitment--varying the learning tasks, changing the pace or location of learning, assessing how far they've come as well as how far they have to go, granting themselves rewards They may review personal learning style in relation to resources and strategies. (p. 103)

SKILLS Metamotivation Learning Strategies

The SKILLS metamotivation learning strategies used in this study were attention, reward, and confidence.

(1) Attention refers to the learner's decision to focus on the materials to be learned. This factor is concerned with the attention that a learner places on a learning task. For example, the degree to which a learner focuses on developing a positive atmosphere conducive to learning or establishing a proper study time environment would be in this category.

(2) Reward describes the learner's metamotivation activity that anticipates or recognizes the value of learning specific materials, that is, accomplishing a desired learning outcome. Reward strategies reflect a learner's recognition that a learning task is either useful, relevant, or important in advancing toward a final positive learning outcome.

(3) Confidence is an important metamotivational factor because the perception that a learner has about the likelihood of success or failure has a direct

influence on performance. It is important that a learner have a sense of self-efficacy or personal responsibility. McClelland (1987) cites Atkinson's study in demonstrating that perceived success in performing a task influences what an individual does (p. 506).

Smith (1982) stated that expectation of success plays a major role in determining learning outcomes of adult learners in that most adult learners use self-directed strategies, a positive attitude, and realistic achievement expectations to accomplish learning tasks (pp. 68-69).

Resource Management

Overview

Resource management learning strategies refer to how a learner manages learning resources, specifically, how a learner identifies the appropriate information needed to perform the task, how the learner critically uses the information materials in the learning task, and how the learner uses human resources in the learning activity. The efficient use of learning resources makes a difference in the quality outcome of a learning task.

Shaaden and Raiford (1984) found that adults are ill-prepared educationally and informationally to cope with information associated with technological change, i.e., the use of computers and television, countless magazines, and "how to" books that are available from public and private sources. Shirk (1983) found in his research of adult learners that the information sources most often used by adults

were their own printed resources, their neighbors, or their friends, even though they admitted that these sources were not the most efficient. When Shirk asked what resources the learners would use on future projects, most respondents admitted that they would use the same resources. Based on Shirk's study, it appears that availability outweighs appropriateness when resources are considered.

In his research, Tough (1971) found that adult learners had major problems with learning resources. He stated, "Certain persons would not or could not give the required help, and certain printed materials were useless. Even when beneficial help was received from certain resources, much of it cost the learner a great deal of time, money, effort, or frustration" (p. 105).

In discussing "blocks and obstacles" to self-directed learning, Smith (1982) stated that unexpected barriers emerged during learning projects: written directions were difficult to understand, resources were hard to obtain, time to study was sparse, an important task was too difficult, and support from family members failed to materialize. He also noted that adult learners found "more printed or audiovisual materials available on a topic than they know what to do with." Adult learners also reported that the reading materials were "overly technical or too detailed" (p. 103).

SKILLS Resource Management Learning Strategies

The SKILLS resource management learning strategies used in this study were identification of potential resources, critical use of resources, and the use of human resources.

(1) Identification strategies identify a learner's awareness of a variety of learning materials and the willingness to use available learning resources.

(2) Critical use of resources refers to the ability of the adult to make insightful decisions in the selection of materials to use in a learning project. In many learning situations learners are confronted with the task of selecting the learning materials that will best suit their skills, allotment of time to accomplish the project, and ability to reject biased materials.

(3) Human resources refers to the use/choice of "experts" to help with the learning task. Interpersonal, small or large group contact sometimes is vital in completing a task. The face-to-face communication can be in the form of "formal" structured classes or individual consultations with teachers, hobbyist, friends, extension agents, or other experts.

Effective identification and critical selection of resources plus wise use of human resources appear to assist adults in becoming efficient learners.

Critical Thinking

Overview

There are numerous definitions of critical thinking. "Critical thinking is disciplined, self-directed thinking which exemplifies the perfection of thinking appropriate to a particular mode or domain of thought" (Paul, 1990, p. 33).

Ruggiero (1991) defined critical thinking as "reviewing the ideas we have produced, making a tentative decision about what action will best solve the problem or what belief about the issue is most reasonable, and then evaluating and refining that solution or belief" (p. 149).

Ennis (1985, p. 45) defined critical thinking as "reflective and reasonable thinking that is focused on deciding what to believe or do." Implied in the definition are the creative thinking strategy steps of problem definition, formulation of a hypothesis, questioning, developing alternatives, and developing of plans to evaluate alternative solutions.

Beyer (1987), citing Allen and Rott, distinguished critical thinking from problem solving by pointing out that:

Critical thinking begins with a previous claim, conclusion or product, and considers the question, "Of what truth or worth is it?" Problem solving, on the other hand, begins with a perceived problem and asks, "How might this difficulty be resolved?" (p. 33)

Additionally, Beyer described critical thinking as "careful, precise, persistent and objective analysis of any knowledge claim or belief to judge its validity and/or worth" (p. 271). Citing Fraser and West, he noted that critical thinking involves the

