Analysis of McCarthy Learning Styles and Integration of Critical and Creative Thinking

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ANALYSIS OF MCCARTHY LEARNING STYLES
AND INTEGRATION OF CRITICAL AND CREATIVE THINKING

A Thesis Presented

by

Lucille Nancy Maugeri McKain

Submitted to the Office of Graduate Studies and Research of the University of Massachusetts at Boston in partial fulfillment of the requirements for the degree of:

Master of Arts

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I would like to thank the members of my thesis committee for their encouragement and enthusiastic support throughout the process of writing this thesis. In particular, I wish to thank Dr. John Murray for modeling the virtues of patience and perseverance. His inspiration throughout my graduate course work is an exceptional experience that I will always remember.

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I dedicate this thesis to my husband Jim, and my children, James, Nancy, Katie, Abby, Jennie, Emelie, and Joseph who provided encouragement and inspiration. Their patience during this time will always be remembered.

I would also like to dedicate this thesis to my mother, Frances, who, on my behalf, made many sacrifices, which at long last, led to my attainment of this degree.
Bernice McCarthy has devised an instructional and organizational model that has been used in the United States since 1979. The model addresses an experiential cycle of learning that takes one from personal meaning to creativity. The use of this model helps people to understand and respect others, to communicate, and to think at higher levels.

This thesis offers the McCarthy model as a foundation for structuring learning experiences. It begins with a literature review which discusses the theoretical origins of McCarthy’s model. In evaluating this model for its inherent critical and creative thinking skills, however, the author finds several areas that could be improved. These areas are designing activities which intentionally teach specific thinking skills along with subject content and providing more opportunities for student metacognition along with identification of the thinking skills and processes. The author further recommends that the use of free/open ended exploration in the start of any activity or exercise, would improve self directed learning
along with critical and creative thinking skills and organizational skills. This may lead to greater student interest and learning.

Attention to these ideas is found in the author's restructuring of a McCarthy sample lesson. The author also fashions general guidelines for the further integration of thinking skill practices concerning individual styles of learning. Further application is provided for the reader in the author's development of one critical and creative thinking skills lesson that is imbedded in learning about chicken feathers. Lesson activities incorporate cooperative learning strategies that foster group decision making skills.

The fundamental requirements of our democratic society provide an effective rationale for focusing on thinking. Democracy, rests on informed, thoughtful, creative citizens. Teaching for thinking and creativity is essential and must include all learning styles. Teaching to this end can result with skilled thinkers, who are able to cope better with personal and societal problems, and furthermore, live as innovative lifelong learners who remain open to new experiences and ideas throughout life.
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A NOTE TO THE READER

On several occasions during the past several years, the author had the opportunity to visit the Mary Fiske School in Salem N.H., where she viewed teachers using the McCarthy model. She observed the merriment of children truly excited about their learning and their environment. The Mary Fiske School was unlike any other school she had visited.

As an educator, the author is grateful for the opportunity to thoroughly explore Bernice McCarthy's model. The author found great insight into the learning process through the study of her model. She has confidence that her readers will find that it offers something for all learners.

The author is both proud and privileged to present in this thesis her practical applications of critical and creative thinking within the McCarthy instructional model.
INTRODUCTION

Good teachers have consistently been concerned with improving the learning proficiency of their students. One means of accomplishing this task is through experiential learning. Experiential learning is based upon the premise that theoretical knowledge is complemented by direct experience with the subject, by dialogical discussion and by looking at the subject holistically. Because direct experience permits students to integrate the functions of a total beings thinking, feeling, perceiving, and behaving, it is especially vital not only for students who have difficulty with verbal reasoning, but also for all students. Experiential learning gives students a context for learning that stimulates more personal involvement. These experiences enable students to stretch their thinking and to develop learning strategies not acquired from ordinary textbook learning.

This thesis proposes that if a teacher's primary focus is to teach critical and creative thinking skills with the subject content, and if she is also intent on addressing the learning styles of students, she may be interested in taking a closer look at the author's instructional model. Using the McCarthy model as a prototype, the author provides a sample lesson that teaches thinking, labels skills and processes, and calls for more metacognition, three elements missing from the McCarthy model.

Chapter One of this thesis explores the theoretical framework of experiential learning philosophy that provides the foundation for McCarthy's instructional model. Chapter Two explains the
relationship between experiential learning and the McCarthy model; it also defines and fully describes the McCarthy model. Chapter Three evaluates the strengths and weaknesses of the McCarthy model in terms of the integration of critical and creative thinking skills. It identifies the three major missing components of this model as teaching thinking skills, labeling the kinds of thinking taking place, and incorporating more metacognition. The final missing component is the use of more open ended and free exploration for the development of interest, self-learning styles, and organizational skills. Chapter Four describes a sample lesson on Insects, written by another author, which is based on the McCarthy model. The author evaluates the strengths and weaknesses of this lesson with its critical and creative thinking skill components, and identifies the missing components. Concluding the chapter, the lesson is restructured by this author to create the optimal environment for the teaching and pragmatic application of critical and creative thinking. Chapters Five through Seven includes models designed by the author to integrate the teaching of thinking skills with a variety of learning modes, using the McCarthy model. Chapter Five provides general strategic guidelines for the integration of thinking skills and styles of learning as one deals with curriculum planning. Chapter Six provides a lesson for the teaching of both critical and creative thinking.

It is important to note that once a thinking skill is taught, practice through application and rehearsal is essential in order to retain these skills. Continued practice of these skills also helps the learner to transfer skill usage into other cognitive domains as well.
The final chapter contains a brief summary of the steps taken by the author, in this paper, to further enhance the use of the McCarthy model by integrating methods of teaching thinking with methods of meeting the needs of the various learning styles of individual students. The paper concludes with a statement asserting the value and necessity of educators giving priority to the development of students' critical and creative thinking skills as a foundation for life-long learning.
PART I: TOWARD AN EXPERIENCE BASED APPROACH TO CRITICAL AND CREATIVE THINKING

CHAPTER I

THE ORIGINS OF THE MCCARTHY MODEL: EXPERIENTIAL LEARNING PHILOSOPHY

David Kolb's Theoretical Structure:

The primary theoretical source of Bernice McCarthy's model is David Kolb's concept of the structure of learning. In his book, *Experiential Learning*, Kolb differentiates between experiential and behavioral theories of learning:

Experiential learning theory offers a fundamentally different view of the learning process from that of the behavioral theories of learning based on an empirical epistemology or the more implicit theories of learning that underlie traditional educational methods, methods that for the most part are based on a rational, idealist epistemology. From this different perspective emerge some very different prescriptions for the conduct of education, the proper relationships among learning, work, and other life activities, and the creation of knowledge itself (Kolb 1984, 20).

In his discussion of experiential learning, Kolb cites the work of theorists Kurt Lewin, John Dewey, and Jean Piaget. Furthermore, he emphasizes the importance that experience plays in the learning process. This differentiates experiential learning theory from cognitive and rationalist theories that tend to place primary emphasis on acquisition, manipulation, and recall of abstract symbols. Kolb's aim is to suggest a holistic, inclusive, perspective on learning that combines experience, perception, cognition, and
behavior. This type of experiential learning is the main feature of the McCarthy model; it is the deliberate reliance on requiring the learner to perform critical and creative thinking that solidifies the learning process.

Three theorists, Lewin, Dewey, and Piaget provide the conceptual origin of experiential learning. Therefore the author has chosen to discuss briefly their contributions to Kolb’s concepts. Periodically the author will integrate those findings by Kolb that pertain to the work being discussed.

**Kurt Lewin’s Model.**

The Lewinian model begins with the acknowledgment of an integrated process and a here-and-now concrete experience followed by a collection of data and observations about that experience. The data is analyzed and the conclusions are fed back to the actors in this experience for their use in modification of their behavior and in their choice of new experiences. Learning is viewed as a cycle of steps where immediate concrete experience provides the framework for observation and reflection. Observations are then assimilated into a theory from which new implications can be deduced. These implications then serve as guides in creating new experiences (Lewin, 1951).

Kolb claims there are two aspects of Lewin’s theory that are particularly notable. One is the emphasis on the concrete experience to test and validate abstract concepts, thus giving personal meaning to abstract concepts, and at the same time providing a common reference point for testing ideas shared in the learning process.
Immediate personal experience is the focal point for learning, enriching life, and providing the learner with abilities to form constructs and give texture to his world. Secondly, personal experience is the focal point not only for giving subjective personal meaning to abstract concepts but also for providing a common reference point for testing the hypotheses and the validity of ideas brought about during the learning process. Lewin claims that when people share an experience they do so fully, concretely, and abstractly.

Another noteworthy aspect of Lewin's learning model is its emphasis on action research and laboratory training based on feedback processes, a term Lewin borrowed from electrical engineering. This term implies a social learning and problem-solving process that generates valid analysis. Thus, the new learning begins with a concrete experience, which moves one to form observations and reflections. These lead to the formation of abstract concepts and generalizations, and lastly to the testing of implications of concepts in new situations. The progression follows in a clockwise direction, and forms a continuous loop.

The concept that learning is a continuous process whose roots are grounded in experience has important educational implications. It reinforces the concept that all learning is really a kind of relearning. It contradicts the norm of designing a course in which the learner's mind is thought of as a blank piece of white drawing paper (Kolb, 1984). Kolb realizes that everyone enters a learning situation with some ideas about the topic at hand. Some of these concepts are less developed than others. But to focus solely on the
refinement and validity of these ideas misses the point. The important point is that the people we teach have held these ideas or concepts, whatever their quality, and that until now they have used them whenever the situation called for them.

Consequently, Kolb believes an educator takes on the task not only of implanting new ideas but also of replacing or modifying old ones as well. The learner's resistance to new ideas stems from the conflict between new concepts and old beliefs. In light of research and theory in the field of cognitive psychology and critical thinking, however, the author thinks that one cannot implant ideas. It is the educator's role to provide and develop experiences that will aid the learner in forming the constructs to build knowledge on his own. The entire learning process is facilitated when a teacher begins the educational process by eliciting the learner's current beliefs and theories, and encouraging the learner to examine and test these concepts in light of new information. The learner's ability to challenge both old and new ideas is a vital part of the entire learning process.

This approach supports a critical thinking awareness because it acknowledges the learner's role in the dialogue process. The teacher acknowledges the concepts the learner thinks are important, and through dialogue, the student begins to first examine them and then polish and fine tune them. This happens in the student's exploration of old and new ideas and in his conversation with others about those ideas.

These are a few of the particular elements that form critical parts of the complete McCarthy instructional model which, in turn,
not only generates an atmosphere of critical thinking but also fosters an ambiance of respect and a valuing of the individual learner with all he brings to a learning environment. In summary, Lewin's contribution to cognitive learning theory was his conceptualization of learning as conflict between concrete experience and analysis.

John Dewey's Contribution.

In experiential learning, according to John Dewey, the relationship between the person and the environment is conveyed in the dual aspects of experience, namely the internal and the objective. These two forms of experience interrelate in very complex ways. Dewey describes his theory in this way:

Experience does not go on simply inside a person. It goes on there, for it influences the formation of attitudes of desire and purpose. But this is not the whole of the story. Every genuine experience has an active side which changes in some degree the objective conditions under which experiences are had...

The word "interaction" assigns equal rights to both factors in experience, objective and internal conditions. Any normal experience is an interplay of these two sets of conditions. Taken together... they form what we call a situation.

The statement that individuals live in a world means, in the concrete, that they live in a series of situations. And when it is said that they live in these situations, the meaning of the word "in" is different from its meaning when it is said that pennies are "in" a pocket or paint is "in" a can. It means, once more, that interaction is going on between an individual and objects and other persons. The conceptions of situation and of interaction are inseparable from each other. An experience is always what it is because of a transaction
taking place between an individual and what, at the time, constitutes his environment...

The environment, in other words, is whatever conditions interact with personal needs, desires, purposes, and capacities to create the experience which is had. Even when a person builds a castle in the air he is interacting with the objects which he constructs in fancy (Dewey, 1938, 39, 42, 43).

Dewey attempts to give special meaning to the word "in". The concept of transaction that refers to the relationship between the objective and subjective conditions of experience implies a fluent penetrating relationship between objective conditions and subjective experience. Once they become related they are both changed. Knowledge results from the transaction between social knowledge and personal knowledge. The result of this transaction between objective and subjective experiences is a process called learning.

Jean Piaget's Influence.

To understand knowledge, we must understand the psychology of the learning process, and to understand learning, we must understand epistemology, which is the origin, nature, method, and limits of knowledge (Kolb, 1984). Few learning and cognitive researchers other than Piaget have recognized the intimate relationship between learning and knowledge. David Kolb finds practical applications of the epistemological perspective relevant in his own teaching. For example, he takes into account the nature of the subject matter in deciding how to help students learn material. This paper will demonstrate in subsequent chapters how the
instructional model set forth by Bernice McCarthy links this epistemological perspective with the following Piaget's views.

Kolb in his book *Experiential Learning*, cites Elkind in 1970 stating that Jean Piaget has identified two methods by which an individual adopts new ideas. These two methods are integration and substitution. Ideas that evolve through integration seem to become highly stable parts of the person's conception of the world. However, when the content of a concept changes by means of substitution, there is always the possibility of a reversion to the earlier level of understanding and conceptualization. Kolb states:

> The process of learning requires the resolution of conflicts between dialectically opposed modes of adaptation to the world (Kolb 1984, 29).

It is interesting to note that each of these three models of experiential learning (Lewin, Dewey and Piaget), detail conflicts between opposing ways of dealing with the world. They suggest that learning results from resolution of these conflicts. The emphasis of the Lewinian model lies in two dialectics: the conflict between concrete experience and abstract concepts and the conflict between observation and action (Kolb, 1984 Freire 1974). The major dialectic for John Dewey is between the impulse that gives ideas their moving force and the reason that gives the will its direction. The twin processes of Piaget's framework, accommodation of ideas to the external world and assimilation of experience into existing conceptual structures, are the moving forces of cognitive development (Kolb, 1984).
Jean Piaget studied the developmental nature of human intelligence, and found that growth toward abstract reasoning follows the four age-related stages; this process moves from the concrete, seeking values and meaning, to abstract theoretical, more conceptual connections, to active problem solving, to reflection and new creations. Learners move from reflective activities such as feeling, touching, and handling to being captivated by the variations in the world with its many images. Learners then fall back on the concreteness of classifying and relating the physical things of the world, and finally move onto formal thinking, taking the form of making hypotheses, having the real invent the imaginary, and becoming aware of one's own thinking. In other words meanings and values are developed first. Next, conceptual connections are made, which lead the way for developing problem solving skills. Lastly, new creations are developed. Then the cycle goes on to repeat itself (McCarthy, 1987). Piaget defines intelligence as a product of interaction between a person and his environment (Kolb, 1984).

Piaget's developmental ladder shows that as humans grow there is a steady movement towards scientific rationality. McCarthy points out that this is not the end of Piaget's contributions. Theorist Jerome Kegan also places significance on Piaget's different levels of development which he calls learning styles. Since development is four dimensional, the learner develops in four ways. First higher values and meanings are developed, followed by deeper conceptual connections. Then we acquire more problem solving skills, and finally a better ability to create anew as people meld themselves and their unique experiences into what is being learned. From these four
different ways that people learn, McCarthy developed the concept of four quadrants to describe the various types or styles of learning in individuals.

Experience is the best teacher, folk wisdom invokes; and experience re-visited is even better. For Lewin, Dewey, and Piaget, experience is the source of learning and development. This thesis will proceed to demonstrate how McCarthy has incorporated these principles into her instructional philosophy.

Kolb’s Conclusions.

David Kolb maintains that new knowledge, skills, and attitudes are achieved through confrontation among four modes of experiential learning. According to Kolb, if learners are to be effective, they need four different kinds of abilities: concrete experience abilities (CE), reflective observation abilities (RO), abstract conceptualization abilities (AC), and active experimentation abilities (AE). They must be able to involve themselves openly in new experiences (CE), and be as free from bias as possible. This assumes a state of open-mindedness and an attitude that is conducive to critical and creative thinking. Next, they must be able to reflect on and observe their experiences from multiple perspectives (RO). They must be able to create concepts so as to integrate their observations into logically sound theories (AC), and further they must be able to use these theories to make decisions and to solve problems (AE) (Kolb, 1984). Kolb goes on to say that this ideal effect is hard to achieve because of the difficulty of being concrete and immediate as well as theoretical. How can one act and reflect at the same time? According to Kolb,
learning requires abilities that are polar opposites. The learner must continually choose which set of learning abilities he will use in any specific learning situation. Kolb cites two primary dimensions to the learning process. The first represents the concrete experiencing of events at one end and abstract conceptualization at the other. The other has active experimentation at one extreme and reflective observation at the other. Therefore within the process of learning, one moves in varying degrees from actor to observer, and from specific involvement to general analytic detachment. He goes on to point out that the manner in which learner's opinions are logically examined determines the level of learning that results. If conflicts are resolved by suppression of one mode, and the dominance of another, learning tends to be specialized around the dominant mode and limited in those areas suppressed by the dominant mode. Imitation is the result when accommodation processes dominate, and play the result when assimilation dominates. From a critical thinking point of view, the author believes that the metacognitive aspect of reflecting can and does occur before and after as well as even interrupting the action part of an activity. Therefore its constant reflection is an essential element of learning critical and creative thinking processes, and applying them to problem solving.

Interestingly, the processes of creativity and personal development emphasize the dialectic tension between abstract detachment and concrete involvement. At the highest levels of development, the adaptive commitment to learning and creativity produces a strong need for integration of four ability modes. The development in one mode seems to precipitate development in the
the increases in symbolic complexity refine and sharpen both perceptual and behavioral possibilities. Kolb concludes that complexity and the integration of dialectic conflicts among the adaptive modes lead to true creativity and growth (Kolb, 1984).

According to Kolb, adaptation is the key to understanding learning in humans whose existence depends both on reactively fitting into physical and social worlds, as well as proactively shaping them. An abbreviated description of his four distinct modes of adaptation are summarized in an indented format by the author below:

Concrete Experience (CE). The CE focus is on personal involvement in the immediate situation, with emphasis on feelings instead of thoughts, and on the uniqueness of present reality rather than theory. Approach to learning is intuitive rather than scientific, with ability to handle unstructured situations and relate to people well.

Reflective Observation (RO). The RO mode emphasizes reflection over action, theory over practice, and the derivation of meaning from ideas and environment. Individuals favoring the RO mode take time to form thoughtful opinions, although they rely on their own ideas and feelings.

Abstract Conceptualization (AC). The AC mode incorporates the use of logic, manipulation of abstract symbols, and quantitative analysis to build scientific theories and precise conceptual models.

Active Experimentation (AE). The AE mode focuses on doing and making things happen, with more concern pragmatically for what works, rather than for finding meaning or truth. Those favoring the AE mode value accomplishments and risk-taking (Kolb, 1984).

These four modes of adaptation (CE, RO, AC, AE) are directly incorporated by McCarthy into her model, appearing at the extremes
of two intersecting horizontal and vertical lines. A significant point made by McCarthy is that the cycle of learning begins only when the student subjectively connects a concrete experience to the outside world and processes it through his own personal filter. This acknowledgment of personal filters embodies a critical thinking attitude respectful of each individual. This kind of thinking is followed by the start of separation from the object or experience, with an opportunity to reflect on it, give it a name, and determine where it fits into the larger scheme of things, a reflective observational activity. The learner then moves on to become actively involved with the object (while critically or creatively thinking) and then practices using the new knowledge, in the abstract conceptualization stage. The learner's final task, to enhance or to find a new application for what has been experienced, constitutes the active experimentation segment. The author basically agrees with the theoretical framework of the McCarthy model, but how lessons are designed and implemented to achieve these stages determines how successful the instruction invokes critical and creative thinking.

David Kolb's research represents a breakthrough in the recognition and understanding of the learning process because it formulates learning style findings into model form. Kolb's contributions do not end with the model, however (Kolb, 1984). He further analyzes the different types of learners. He notes that our dominant learning abilities are the results of heredity, our particular life experiences, and the demands of our present environment. The
The author has paraphrased the following brief descriptions of each learner as Kolb identifies them below.

The Divergers are individuals who naturally engage in concrete experience and reflective observation, have imaginative ability, and an ability to form a gestalt, a unique awareness of seeing the whole rather than the parts. They are personable people, emotional people, influenced by their peers.

The Assimilators are predisposed to engage in abstract conceptualization and reflective observation. They thrive on working with theoretical models and abstract concepts. They are goal setting people, and systematic planners, but are not however interested in the practical use of theories.

The Convergers are individuals who readily engage in abstract conceptualization and active experimentation. They are deductive, and believe in the practical application of ideas. They prefer to work with things rather than people, believe in one single correct answer, and have narrow interests.

The Accommodators relish concrete experience and active experimentation. They are adaptive, intuitive, and use trial and error techniques often. They rely on other people for information, and are at ease with people. They are sometimes seen as impatient and pushy, and are influenced by peers (McCarthy, 26).

The author questions if learners can correctly be categorized into four types or if there may not be various combinations of these types. Also the question arises as to a learner's ability to change learning styles or progress through learning style changes. One might
further question if learning styles might be somewhat subject dependent.

Other Influential Contributors.

Other theorists, both historical and contemporary, have divided learning styles into types similar to those outlined by Kolb. Though McCarthy's primary source is Kolb, the influence of Jung, Lawrence, Merrill, and Hunt can also be seen in the McCarthy model.

Carl Jung, in his book Psychological Types, explored the differences in the way people process and perceive information. The author restates the four categories of learners Jung defines as:

1) Feelers, who transfer value from themselves to what they experience, and who validate what happens to them and what they perceive with emotions rather than intellect;

2) Thinkers, who arrange what happens and what they perceive into rational categories, a conscious act in which judgment reviews and monitors the rational categories and their content;

3) Sensors, who, even though they perceive consciously, do not assign values to what they sense, but let the sensations happen without imposing control;

4) Intuitors, who impose control on perceptions but in an unconscious way, and who understand what they see and feel in a kind of complete way, instinctively (Jung, 1976).
Theorist Gordon Lawrence invoked the work of Isabel Myers and Carl Jung by using the same four basic types of learners but giving different descriptions of each type. The author has summarized Lawrence’s four types which provide an interesting comparison to McCarthy’s.

1) Feeling Types, those who tend to be aware of other people and their feelings, really enjoy pleasing people, work for harmony and are sympathetic.

2) Thinking Types, those who tend to analyze and put things into logical order, do not easily display emotions and tend to make decisions impersonally.

3) Sensing Types, those who reach conclusions step by step, work more steadily when time lines are predetermined, and have the patience for details.

4) Intuitive Types, those who like solving new problems, reach conclusions quickly and follow their inspirations whether good or not (Lawrence, 1982).

McCarthy in *The 4MAT System: Teaching to Learning Styles with Right/Left Mode Techniques* discusses the contribution of Valerie Hunt, founder of the Creative Movement Laboratory at UCLA, author and educator. She identifies four body tension patterns which are striking in their relationship to all learning style research. They are:

- the assister, who absorbs reality. Type awareness = absorption or oneness with reality (stream of consciousness)
  Moving - thinking element = flow/direction
• the posturer, who forms reality. Type awareness = form or process of ordering reality (eliminating and reordering reality)

Moving - thinking element = shape

• the resistor, who edits reality. Type awareness = objectification or the naming of reality (editing what one sees, hears, tastes, touches, feels, or measures)

Moving - thinking element = thrust

• the percerverator, who enriches reality. Type awareness = coloring or the enriching of reality from self (embellishing or weighing words and concepts)

Moving - thinking = weight (McCarthy, 32).

Thus, one can see that the study of experiential learning has influenced many theorists in their quest to understand the learning process. Both historical and contemporary sources validate experiential learning upon which McCarthy's bases her model. Even though the purpose of this thesis is not to analyze what attributes McCarthy selected from the works of Kolb, Jung, Lawrence, and Hunt, it is interesting to note that McCarthy, Kolb, and Lawrence, construct their types more from a behavioral frame of reference than Jung does. His basis for types is constructed on how a person perceives others, events, and reality. From an educational point of view, it may have been more instructive to use a behavioral basis for developing lessons than a perception basis even though both are valuable.
CHAPTER II
THE MCCARTHY INSTRUCTIONAL MODEL

The Relationship to Experiential Learning.

Kolb and later McCarthy both come to the conclusion that the combination of how a learner perceives and how that same learner processes information forms the uniqueness of his learning style, which in other words, is that person's most comfortable way to learn. Through the learner's choices of experiences, he programs himself to grasp reality through varying degrees of emphasis on abstract or concrete perception, and to transform these to active or reflective processing. This self-programming, conditioned by experience, determines the extent of his emphasis on the four modes of adaptation (CE, RO, AC, AE). It is these modes, which McCarthy assigns to her quadrants, each equally valuable, that accommodate four types of learners, and go on to form her four step instructional cycle.

The Imaginative learners (quadrant one), prefer to learn by sensing/feeling and watching. They seek personal meaning. The Analytic learners, (quadrant two), prefer learning experiences that promote thinking and watching. They seek intellectual comprehension. The Common Sense learners (quadrant three), favor learning by thinking and doing. They seek solutions to problems. The Dynamic learners, (quadrant four) learn by sensing/feeling and doing. They seek hidden possibilities (McCarthy, 35-49).

McCarthy advocates that all learners need to be moved through her entire learning cycle and that the cycle itself is more important
than any segment alone. The model then teaches in all four ways, from experience, to reflection, to conceptualization, to experimentation, and back to experience. When designing instructional strategies, the movement through the major learning style dimensions creates the learning process itself. The model helps learners to make critical thinking connections between learning and life. Students learn to conceptualize because concepts are more useful than isolated facts. They learn to experiment as a way of grounding ideas into reality. Then they metacognitate on how they achieved this point. By making connections between the ideal and the real, students learn to create and think critically about editing their own realities. They improve their life with the thinking skills essential to lifelong learning.

Description of The Model.

Turning now to McCarthy’s four learner types, we can see them as an outgrowth of her own insights, influenced by other researchers. They are:

- Type One, the Imaginative Learner, seeks personal meaning. He judges things in relationship to values and functions through social interaction. He wants to make the world a better place, is cooperative, sociable, and respects authority, when it is earned.

- Type Two, the Analytic Learner, seeks intellectual competence. He judges things by factual verification and functions by adapting to experts. He needs to know “the important things”, and wants to add to the world’s knowledge. He is patient, reflective, and prefers chain-of-command authority.
• Type Three, the Common Sense Learner, seeks solutions to problems. He judges things by their usefulness and functions through kinesthetic awareness. He wants to make things happen, is practical and straightforward. He sees authority as necessary, but will work around it if forced.

• Type Four, the Dynamic Learner, seeks hidden possibilities. He judges things by gut reactions and functions by synthesizing various parts. He enjoys challenging complacency, is enthusiastic, adventurous, and tends to disregard authority (McCarthy 1987, 33).

McCarthy cites several premises upon which her model is based

• Human beings perceive experience and information in different ways. They also process information in different ways. The combinations formed by our own perceiving and processing techniques form our own learning styles.

• There are four major identifiable learning styles. They are all equally valuable. Students need to feel comfortable about their own unique learning style.

• Type One Learners are primarily interested in personal meaning. Teachers need to create a reason.

• Type Two Learners are primarily interested in the facts as they lead to conceptual understanding. Teachers need to give them the facts that deepen understanding.

• Type Three Learners are primarily interested in how things work. Teachers need to let them try it.

• Type Four Learners are primarily interested in self-discovery. Teachers need to let them teach it to themselves and to others.
• All students need to be taught in all four ways in order to be comfortable and successful part of the time while being stretched to develop other learning abilities. All students will "shine" at different places in the learning cycle, so they will learn from each other.

• The instructional cycle moves in sequence, teaching in all four modes, and incorporating the four combinations of characteristics. The sequence is a natural learning progression.

• Each of the four learning styles needs to be taught with whole-brain methodology processing techniques.

• Students will come to accept their strengths and learn to capitalize on them, while developing a healthy respect for the uniqueness of others, and furthering their ability to learn in alternate modes without the pressure of "being wrong".

• The more comfortable students are about who they are, the more freely they learn from others. (McCarthy 1987, 90).

McCarthy advocates that individuals develop in all four quadrants though each person varies in his degree of development within each quadrant. Individuals tend to have style preference abilities.

The following diagram (figure 1) is the author's visual model of McCarthy's learners preferences and styles. The author wishes to note the fascinating intersection of specific areas and their relationship to style preference.
Figure 1. McCarthy's Learner's Preferences and Styles.
Since learning is a continuous process grounded in experience, knowledge is acquired through continually interacting with experience. McCarthy states that equal emphasis should be placed on both her cycle and on Piaget’s stages of development. Educators, however, have traditionally focused on Piaget’s age-related stages and neglected the process of how one learns. Accordingly, the reflective and the abstract processes receive greater attention than the concrete and the active (McCarthy, 1987). The concrete step that McCarthy cites as most neglected is the process of knowing which originates through the lens of the person himself. Also neglected is the doing dimension of processing in favor of the reflecting dimension of processing. McCarthy highlights the importance of these neglected areas:

Manipulating learning, tinkering with what we are shown, experimenting with what the experts say - these processes transfer learning to our own lives, to the places where we live, so we can integrate them (McCarthy 1987, 59).

The movement through the instructional cycle is from experiencing to reflecting, to conceptualizing, to tinkering and problem solving, to integrating new learning into the self. As the process continues we emerge from embeddedness with the learning through our own thoughts and feelings, to a separation from it. Learners begin to release themselves from being subjective and personal about the learning so they can really begin to look at it objectively. Feelings and experiences begin the learning, followed by a standing back to examine the experience in an effort to comprehend it. This takes the learner from what he knows to the
facts that other people are presenting to him. Finding out if the facts are accurate, and what meaning he might make out of the experience, is next on the cycle; this is accomplished by using, practicing, and manipulating the learning. The cycle ends by bringing the learner back to an ever-renewing focus of finding uses for the new knowledge in one's life (McCarthy, 1987).

We begin then to see the learning as object -- as something interesting, something curious, something that intrigues us cognitively. We have separated ourselves from it. We symbolize it by naming it. We look at what others say about it, what others have done with it, and where it fits into the scheme of the larger world. We comprehend it. But comprehension is not enough. We must try it, tinker it, play with it, watch it work, and make it work; We must do it (McCarthy 1987, 62).

With the first step of distancing oneself from the material, the learner is reflecting not only on the content, but also on his thinking process. He is thus able to step back and analyze the experience. When a student asks reflective questions he is utilizing a form of metacognition. Research suggests that this deliberate awareness of one's thinking promotes transfer. This provides for student ownership and student responsibility for learning. Philosophers and other scholars spend most of their time in a reflective mode. Reflection, for example, is a major component of Matthew Lipman's Philosophy For Children program according to Arthur Costa (Costa, 1991).

Authors Swartz and Perkins place the simple awareness of one's own thinking first on their list of the techniques that improve thinking. The investment of effort into one's own thinking and one's
attitude about the importance of thinking is also identified as significant. These authors cite the fact that good thinking is not enough. Instead of just learning to respond to the lead of the teacher, students must develop the organization and awareness of the thinking processes to guide themselves in order to think better. This awareness and level of metacognition is cited as good thinking (Swartz and Perkins, 1990).

The separation McCarthy refers to in the cycle of learning is necessary in order to be able to think objectively about the topic. The individual steps back and separates feelings from learning. Such a separation occurs in the process of metacognition, thus allowing the thinker to critically assess his knowledge. McCarthy advocates that this complete cycle is more important than any one particular segment. The cycle itself promotes the process of learning.

The McCarthy philosophy embodies creativity by acknowledging the four learning types of individuals and by calling on the learners to share their gifts with others. Here she applies the belief that each learner has undefinable creative potential and that through the opportunity the model provides for dialogue as well as other activities, the learner will come to make those known to all involved. She applies equal values to each difference. She calls upon each learner to refine and share his talent with others. By valuing every style, a learner is exposed to, and perhaps begins to develop, other skills that do not come to him naturally. In this way, each student develops his own natural gifts. He understands and develops an appreciation of the gifts of others and he is allowed the
opportunity to refine his best style while experiencing alternative styles.

Thus the McCarthy instructional design is comprised of the two dimensions of perception and processing, the four quadrants accommodating four types of learners which forms a four step learning cycle. It is also comprised of the eight right and left brain processing segments that teach to and respect hemispheric dominance. At this time the author wishes to acknowledge the presence of the concept of hemisphericity as it relates to information processing and disclaims the usage of it throughout this paper because of the controversial and still fluctuating conceptual nature of hemisphericity.

McCarthy’s graphic instructional model begins at the top of a circle and moves clockwise in a progression that includes the four learning styles and uses whole brain processing techniques. McCarthy cites this progression as an effective methodological common sense way to learn.

The cycle begins with:

<table>
<thead>
<tr>
<th>Quadrant One: Imaginative Learners</th>
<th>Integrating Experience with the Self</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1. Create a concrete experience</td>
</tr>
<tr>
<td></td>
<td>2. Reflect on the experience, analyze it</td>
</tr>
<tr>
<td>Quadrant Two: Analytic</td>
<td>Concept Formulation</td>
</tr>
<tr>
<td></td>
<td>3. Integrate experience and reflections into learners concepts.</td>
</tr>
<tr>
<td></td>
<td>4. Examine and formulate concepts.</td>
</tr>
<tr>
<td>Quadrant Three: Common Sense Learners</td>
<td>Practice and Personalization</td>
</tr>
<tr>
<td></td>
<td>5. Work on defined concepts and givens.</td>
</tr>
</tbody>
</table>
Quadrant Four: Dynamic Learners

Integrating Application and Experience

7. Analyze application, judge results of experimentation.
8. Apply learning personally and share with others, (McCarthy 1987, 123).

The following are two methods this author chooses to use to depict this model graphically. The first Figure 2, is the step-by-step procedure in which to deliver instruction according to the McCarthy model. This is the author's depiction of McCarthy's successive cycle of presenting instruction.

Next, as seen in figure 3, the four kinds of learners are matched with a key significant question, which, when answered by the teacher through her instruction, would help students to acquire perception, and would facilitate students processing of new knowledge through their particular style preference.
Figure 2. Author's Linear Representation of the McCarthy Learning Progression (McCarthy 1987, 122)
The Dynamic Learner

What if I added my ideas to this concept?

The Imaginative Learner

Why is this necessary for me to learn?

Student Needs to Know

The Common Sense Learner

How does this concept work? Let me try.

The Analytic Learner

What exactly is this? I need details.

Figure 3. Author's Representation of McCarthy's Quadrant Styles Model (McCarthy 1987, pp. 37-43)
CHAPTER III
EVALUATION OF THE MCCARTHY MODEL IN TERMS OF TEACHING CRITICAL AND CREATIVE THINKING SKILLS

While the primary goal of McCarthy is to provide, within the framework of experiential learning, a model which incorporates methods of maximizing learning for all four types of learners, an analysis of the model reveals that opportunities for the practice of some aspects of critical and creative thinking are inherent in the model.

Definition of Critical Thinking.

First, it is instructive to define and examine what is meant by critical thinking. Robert Ennis defines critical thinking as "rational reflective thinking concerned with what to do or believe" (Ennis 1987, 10).

According to Richard Paul, critical thinking is:

- the art of thinking about your thinking while you're thinking so as to make your thinking more clear, precise, accurate, relevant, consistent, and fair
- the art of constructive skepticism
- the art of identifying and removing bias, prejudice, and one-sidedness of thought
- the art of self-directed, in depth, rational learning
- thinking that rationally certifies what we know and makes clear wherein we are ignorant (Paul 1990, 32).
This author has adopted Richard Paul's definition as a framework for curriculum in this thesis. The author has chosen to cite the work of Anne Murray, a former student in the University of Massachusetts, Graduate Program of Critical and Creative Thinking. Anne Murray has a tabulation of skills that foster creative thinking and that appear to be inherent in Dr. McCarthy's instructional model. In her 1992 Doctoral dissertation on "Training Teachers To Foster Creativity Using The 4-Mat Model", she provides the source for the second list of skills when using the McCarthy instructional design as an initial source to juxtapose and plan curriculum (Murray 1992, 212). The author includes the Murray listing because it delineates specific attitudes and skills. Even though most of the skills and attitudes Anne Murray lists are in the realm of creativity, the author lists them for discussion.
Quadrant 1

Attending
Connecting
Focusing
Generating
Observing
Questioning
Visualizing
Imagining
Inferring
Diverging

Quadrant 1

right
- Observing through the senses
- Empathizing
- Developing open-mindedness
- Imagining
- Diverging
- Associating
- Recalling personal experience

left
- Formulating questions
- Setting objective
- Recognizing/defining problem
- Categorizing
- Noting similarities and differences
- Combining

Figure 4  Quadrant 1 Thinking Skills Labeled by Anne Murray and Bernice McCarthy when using the McCarthy Instructional Model.
<table>
<thead>
<tr>
<th>McCarthy</th>
<th>Murray</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Quadrant 2</strong></td>
<td><strong>Quadrant 2</strong></td>
</tr>
<tr>
<td>Conceptualizing</td>
<td>right</td>
</tr>
<tr>
<td>Imaging</td>
<td>Elaborating</td>
</tr>
<tr>
<td>Defining what the concept is</td>
<td>Using metaphor</td>
</tr>
<tr>
<td>Patterning</td>
<td>Making analogies</td>
</tr>
<tr>
<td>Organizing</td>
<td>Visualizing</td>
</tr>
<tr>
<td>Analyzing</td>
<td>Relating self and experience to concept</td>
</tr>
<tr>
<td>Seeing relationships/interrelationships</td>
<td>Seeking patterns</td>
</tr>
<tr>
<td>Identifying parts</td>
<td>left</td>
</tr>
<tr>
<td>Ordering</td>
<td>Encoding</td>
</tr>
<tr>
<td>Comparing</td>
<td>Representing symbolically</td>
</tr>
<tr>
<td>Classifying</td>
<td>Assimilating</td>
</tr>
<tr>
<td>Prioritizing</td>
<td>Examining</td>
</tr>
<tr>
<td>Analyzing language</td>
<td>Analyzing structure, cause and effect, parts to whole</td>
</tr>
<tr>
<td>Identifying attributes</td>
<td>Identifying attributes</td>
</tr>
<tr>
<td>Distinguishing reliable/unreliable sources</td>
<td>Distinguishing reliable/unreliable sources</td>
</tr>
<tr>
<td>Using reasoning/logic</td>
<td>Using reasoning/logic</td>
</tr>
<tr>
<td>Comprehending/explaining</td>
<td>Comprehending/explaining</td>
</tr>
<tr>
<td>Deriving</td>
<td>Deriving</td>
</tr>
<tr>
<td>Sequencing</td>
<td>Sequencing</td>
</tr>
</tbody>
</table>

Figure 5  Quadrant 2 Thinking Skills Labeled by Anne Murray and Bernice McCarthy when using the McCarthy Instructional Model.
McCarthy

Quadrant 3
Testing
Extending
Inquiring
Exploring
Problem Solving skills
Experimenting
Seeing with insight
Predicting
Tinkering
Recording
Making things work

Murray

Quadrant 3
left
Using abstract theory in concrete manner
Giving examples of abstract concept
Investigating/seeking evidence
Verifying/testing
Practicing with analogous examples
Dealing in an orderly manner
Seeking precision
Using measurements/samplings
Allocating resources
Over learning
Manipulating

right
Making original applications
Giving original examples
Illustrating in a new way
Inferring
Adapting
Revising
Developing flexibility
Varying context

Figure 6 Quadrant 3 Thinking Skills Labeled by Anne Murray and Bernice McCarthy when using the McCarthy Instructional Model.
<table>
<thead>
<tr>
<th><strong>McCarthy</strong></th>
<th><strong>Murray</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Quadrant 4</strong></td>
<td><strong>Quadrant 4</strong></td>
</tr>
<tr>
<td>Transferring</td>
<td><em>left</em></td>
</tr>
<tr>
<td>Evaluating</td>
<td>Integrating parts to whole</td>
</tr>
<tr>
<td>Integrating</td>
<td>Deciding</td>
</tr>
<tr>
<td>Verifying</td>
<td>Taking and supporting a position</td>
</tr>
<tr>
<td>Explaining</td>
<td>Establishing criteria</td>
</tr>
<tr>
<td>Synthesizing</td>
<td>Judging in terms of criteria</td>
</tr>
<tr>
<td>Re-presenting</td>
<td>Synthesizing present and past</td>
</tr>
<tr>
<td>Re-focusing</td>
<td>Identifying assumptions</td>
</tr>
<tr>
<td>Summarizing</td>
<td>Forming a plan</td>
</tr>
<tr>
<td></td>
<td>Developing strategies</td>
</tr>
<tr>
<td></td>
<td>Evaluating</td>
</tr>
<tr>
<td></td>
<td><em>right</em></td>
</tr>
<tr>
<td></td>
<td>Initiating</td>
</tr>
<tr>
<td></td>
<td>Inventing</td>
</tr>
<tr>
<td></td>
<td>Speculating/projecting into the future</td>
</tr>
<tr>
<td></td>
<td>Choosing more appropriate environment</td>
</tr>
<tr>
<td></td>
<td>Extending concepts to new settings</td>
</tr>
<tr>
<td></td>
<td>Synthesizing present and future</td>
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<tr>
<td></td>
<td>Deriving new theories</td>
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<tr>
<td></td>
<td>Taking risks</td>
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<tr>
<td></td>
<td>Collaborating</td>
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<tr>
<td></td>
<td>Intuiting</td>
</tr>
</tbody>
</table>

Figure 7  Quadrant 4 Thinking Skills Labeled by Anne Murray and Bernice McCarthy when using the McCarthy Instructional Model.
Discussion of Critical Thinking Skills and the McCarthy Model.

Questioning, listed in quadrant one, is a critical thinking component, that clarifies what we know and what we need to know. Formulating questions involves the clarifying of issues and their meaning through inquiry. Good questions focus attention on relevant information and are designed to generate new information. When a student formulates a question, he is actively involved in the learning. This skill, along with that of observation is also categorized as a core thinking skill under the heading of an information gathering skill (Marzano et al. 1988). Teaching students to formulate questions about material they have read prompts the educator to understand the question-answer relationship and its importance as a critical thinking skill. The ability to formulate a question requires an initial understanding of content. The student is able to construct a textually explicit question with a mere understanding that the answer lies in the text. Higher levels of thinking call for questions requiring the student to generate textually implicit questions. These are questions that ask about inferences from prior knowledge.

McCarthy does not provide for the teaching of questioning skills in the instructional model, but she does acknowledge, and recognize the importance of questioning as a process a learner needs to practice. Critical thinking questioning is identified by Marzano et al with asking such questions as:

- Why?
- What is your main point?
- What do you mean by...?
According to Robert Ennis, one basic critical thinking disposition is the search for a clear statement of the thesis or question. The Tiedt developmental model for thinking instruction labels questioning as a more advanced (not basic) data processing thinking activity. It is designated as more advanced because it requires the learner to process given information, and to move beyond the collection of facts to interpretation, imagination, and organization (Tiedt et al, 1989). The author agrees that certain kinds of questioning calls for higher levels of thinking.

Learners can ask questions that require different kinds of skills and abilities that go beyond the knowledge level in Bloom and Krathwohl's Taxonomy of Educational Objectives (Bloom and Krathwohl, c1984). Examples of such questions are those that require analytical thinking or synthesizing, and even problem solving approaches on the part of the learner. In this way, creativity in formulating questions is improved while increasing the student's enthusiasm and depth of understanding.
Another thinking activity, which is fostered in McCarthy's quadrant three section, is inferring. Tiedt's developmental levels of thinking abilities labels this skill not as a basic thinking skill but as a more advanced thinking activity that is preceded by such endeavors as discussing, comparing, analyzing, visualizing, questioning, creating, and showing (Tiedt et al, 1989).

In Dimensions of Thinking, Marzano et al, categorize inferring under the topic of generating skills, producing new information, meaning, or ideas. His definition describes it as going beyond available information to identify what may be reasonably true. Marzano distinguishes inferring as a core thinking skill, which is essential to the functioning of other dimensions. Generally, core thinking skills provide means of accomplishing particular tasks; they are mental activities one uses to reach a desired goal (Marzano et al, 1988). The author adopts this same philosophy about the skill of inferring.

Costa also categorizes inferring as an individual, discrete, mental skill that is a prerequisite to more complex thought:

The Discrete Skills of Thinking

1. Input of data
   - Gathering data through the senses (listening, observing, smelling, tasting, and feeling)
   - Being alert to problems, discrepancies, and dilemmas
   - Being fascinated by the environment

37
2. Elaborating (processing) the data
   Comparing/contrasting
   Analyzing/synthesizing
   Classifying/categorizing
   Inducing/deducing
   Perceiving relationships (temporal, analogous, seriational, spatial, hierarchical, syllogistic, transitive, symbolic)

3. Output of the products of elaboration
   Inferring
   Hypothesizing
   Predicting/forecasting/extrapolating
   Concluding/generalizing/summarizing
   Evaluating (Costa 1991, 68)

Integrating skills are another group of core thinking skills that involve connecting or combining information. These skills include summarizing, the combining of information efficiently into a cohesive statement and restructuring, the changing of existing knowledge structures to incorporate new information (Marzano et al, 1988). The skills of integrating are found in the fourth quadrant of McCarthy’s model where the student applies the learned information demonstrating the application of new concepts.

Tiedt et al acknowledge this skill of integrating and place it at the highest position in "The Spiral Thinking Process" (Tiedt et al 1989, pp. 9-11). These integrative learning experiences involve students in collecting data, processing it in various ways, and producing a publication or a performance. Any of the other thinking processes may be used and repeated. Students are involved in active purposeful learning that permits them to make choices. The welcome interaction with peers and the satisfaction of the finished product make this self-motivated learning a pleasure. The author’s
experience observing and interacting with children whose instructors utilize these processes with the McCarthy model confirm these advantages.

Discussion of Creative Thinking skills and the McCarthy Model.

First, it is important to define what is meant by creativity. In Sternberg's three-facet creativity model, creativity occurs at a peculiar intersection among three psychological attributes: intelligence, cognitive style, and personality/motivation (Sternberg, 1988).

Amabile's theory contains components of domain relevant skills as well as creativity-relevant skills. The creative thinker must have some knowledge about the material he is being asked to think about. This is what Amabile means by domain-relevant skill. She goes on to say that domain-relevant skills combine with creativity-relevant skills, the ability to generate ideas, to think divergently, to elaborate ideas for emphasis, to develop and demonstrate originality and flexibility, to attack tasks playfully, and to be willing to try out a variety of ideas before one settles on one strategy. Intrinsic motivation is another component in Amabile's construct of creativity. She argues that without a commitment to task, domain or creativity-relevant skills are not put to work (Amabile, 1983).

Diverging, another quadrant one skill, is often overlooked by educators. The author believes this may be because educators are often so focused upon students' arriving at one correct answer. The skill of diverging is a feature of being original, and imaginative. In order to be full of ideas, one must have an attitude that welcomes
divergence. Flexibility in ideas and thoughts develops as a process and becomes a skill the more it is practiced. Divergent thinking needs to be made acceptable by the instructor, and must be as free from evaluation as possible. Children who are afraid will think only the most obvious ideas if they do not feel it is safe to take a risk (Torrance and Myers, 1973). McCarthy creates that welcoming atmosphere in the first part of the model by presenting material in such a way that it has value to the learner.

In formulating questions that bring about divergent thinking one is calling for:

- **Fluency**: the production of as many ideas as possible, not bothering at first about quality.
- **Flexibility**: shifting to a variety of approaches or categories.
- **Originality**: unusual or uncommon ideas, away from the obvious.
- **Elaboration**: Working out the details of an idea or planning out the steps (Davis, 1992)

A permissive attitude toward error is more conducive to the kind of thinking that will generate diverging possibilities than is a severe or punitive attitude (Kagan, 1967). A learner's environment can support or suppress creativity because much of what is labeled creativity stems from a response to social needs. Society also places judgment on who and what can be called creative (Davis, 1992).

Since much of what is labeled creativity is rooted in a response to social needs, a learning environment can function to either support or repress creativity. With the use of the McCarthy instructional
model, group interactions create the formal setting that provide practice in diverging for all who participate. In his research, Davis compiled a list of divergent thinking characteristics extracted from over ten sources. The following is a partial listing of the characteristics Davis cites:

- Aware of creativeness
- Value originality and creativity
- Value own creativity
- Original
- Imaginative
- Full of Ideas
- Flexible in ideas and thought
- Is a "what if" person (Davis 1992, 70)

Thinking that is both effective and original implies creative thinking. Thinking that is solely original, without yielding some effectiveness, is simply fun, but a non-productive exercise. Thinking that yields effective results but without originality, may be useful, but does not constitute creative thinking. Student thinking tends to be dominated by old patterns and categories. It is the position of the educator to look at novel but effective approaches (Swartz and Perkins, 1990). Brainstorming is a common technique that requires diverging the learner's thoughts to conceive ideas. It calls for the subskill of creative thinking identified as flexible and fluent thinking (Swartz and Perkins, 1990). The brainstorming session is of value in a formal setting because it encourages the use of lateral thinking.
(De Bono, 1970). The author’s perception of lateral thinking can be described as reflective thought fashioned on an issue that takes a horizontal form, rather than a vertical one. Instead of moving one’s thoughts to the next logical step, the thinker reflects on ways to generate more possibilities of enhancing previous thoughts.

When creativity is applied, it encourages students to think critically and creatively about what they learn. It makes simple ideas useful and exciting. Seeing new relationships and possibilities, synthesizing unrelated elements, refining what is known and building from it are expectations that are required of students whose teachers are using the McCarthy instructional model. "Greater depth of learning occurs when students reproduce with imagination, elaborate, transform, and rearrange and extend their learning beyond the classroom walls" (Tiedt et al. 1989, 175). Reflecting on McCarthy’s process, Tiedt et al conclude that stretching students to make choices, to think, and to apply their thinking, depends upon the educator’s sense of respect for students and their ideas. Students should be allowed to create in a classroom setting, thus having this kind of experience provides the modeling that enables students to create without that setting.

Torrance and Myers believe that the most fundamental condition necessary for creative behavior is that of sufficient "warm up". One thing should flow toward and lead into another. This warm up occurs when the student produces something and then goes on to produce something else from what was already created. This happens when the mind is stretched, limbered, and extended with an openness to creative thinking attitudes and dispositions (Torrence
and Myers, 1973). This attitude is developed in the first quadrant of the McCarthy model which calls for making connections from prior knowledge to new learning and then examining that new learning. It is fostered again in the third quadrant when the learning content is extended and practiced. Ideas are played with through the use of multiple activities. The fourth quadrant provides the learner with time to refocus ideas through integration and evaluation. It provides opportunity for divergent ideas brought about in quadrant one to resurface and become part of a more developed project in quadrant four, where the learner is asked to elaborate an idea by re-teaching the concept to himself or to someone else. The warm up Torrance and Myers refer to begins in the first part of the McCarthy model with diverging, creative thinking skills and attitudes, and is built upon throughout the model by providing opportunities for elaboration, ending in the final product the student creates. This end product is certainly more detailed and elaborate than the earlier idea because the attitude for diverging was present earlier. Diverging, another quadrant one skill, is often overlooked by educators. Use of the McCarthy model is a way to redress this oversight.

Other skills categorized in the quadrants from McCarthy and Murray’s list that can be identified as sub skills and/or attitudes of creative thinking are: imagining, visualizing, formulating questions, combining, adapting, synthesizing present and past, initiating, inventing, choosing a more appropriate environment, synthesizing present and future, intuiting, taking risks, and exploring.

In the second quadrant of the model, the skill of imaging is valued because of its role in helping the learner make necessary
connections. A powerful form of imaging is the generation metaphor. Davis emphasizes the important role that metaphor plays in creative thinking:

Most creative ideas stem from analogical, metaphorical thinking. One cannot overstate the importance of analogical and metaphorical thinking in creativity. It is simply and absolutely true that many - perhaps a large majority - of our creative ideas and problem solutions are born in analogical and metaphorical thinking. When we think analogically or metaphorically, we take ideas from one context and apply them in a new context, producing the new idea combination, new transformation, new theoretical perspective, or more colorful literary passage. We make a connection between our current problem and a similar or related situation (Davis 1992, 120).

This form of thinking is commonly used as a creative tool when insight is the desired end product. The use of metaphors facilitate imagining by forming a picture of a known concept while comparing the new concept to it. Historian Jacob Bronowski acknowledges "the discoveries of science, the works of art, are explorations - are explosions - of (seeing) a hidden likeness" (Davis 1992, 120).

Metaphors provide similarities between things that are otherwise unlike. They stimulate the development of new relationships. Metaphors also provide the connection between previous learning and new concepts (Tiedt et al, 1989).

Analogical and metaphorical thinking is exceedingly common in creative innovation. It is a learn able creative thinking technique. Davis offers three perceptions on creativity: first, that ideas come from somewhere; second, that the analogical use of ideas is common
and effective, and third, that seeing analogical and metaphorical connections is very creative (Davis, 1992).

Most new creations are combinations of previously unrelated ideas. Davis views the process as combining idea #1 with idea #2 to produce novel idea #3. Creative techniques such as analogical and metaphorical thinking can be used by creative thinkers to produce a novel idea. There also is some similarity to metaphorical thinking in the steps or stages in which a person proceeds to solve a problem. This thinking is evident when the person stops to reflect on whether he has ever solved a problem somewhat similar to his new problem. Also, the comparative analysis of how this new problem is similar to another idea or problem is metaphorical thinking. Further examples of analogical and metaphorical thinking used in creative innovation recall a two-stage model. Davis maintains that this is not a theory but rather a statement of fact.

Stage 1: The big idea stage in which the main idea for the creation, invention, or problem solution is found.

Stage 2: The elaboration and development stage in which the big idea is implemented (Davis 1992, 124).

Analogical and metaphorical thinking takes place most clearly in the big idea stage. After the big idea this kind of thinking may be used again to further develop the idea. Von Oech, in his book A Whack In The Side Of The Head, suggests that the first stage includes creative activities such as fantasy, imagination, synthetic and analogical thinking. When the creative idea is found, the activities of logical thinking, analyzing, and sequential planning are necessary in order to develop and implement the idea (Davis, 1992). These steps
involve whole-brain processes, which are also fundamental to the McCarthy model. In relating analogical and metaphorical thinking to the creative process described above, the reader should note that this procedure is meant to be accomplished in the first half of the instructional cycle of McCarthy. It has the potential to go on for elaboration and further development as the learner becomes more involved in giving back the knowledge in his own distinct way, which are quadrant three and four activities. Davis asserts that "analogical and metaphorical thinking are extremely important in creativity" (Davis 1992, 120).

In Costa's *Developing Minds, A Resource Book For Teaching Thinking, Volume 1*, creative thinking behaviors are identified as those that contain novelty and insight. Costa's list of behaviors that come under the heading of creative thinking are: creativity, fluency, metaphorical thinking, complexity, intuition, model making, insight, and imagery (Costa, 1991). Current literature continues to support the importance of metaphorical and analytical thinking, and also concur that this kind of thinking is certainly a product of the realm of creative thinking.

In Figure 8, the author summarizes the variety of critical and creative thinking skills, and attitudes, fostered by using the McCarthy instructional model.
The McCarthy Model

Critical and Creative Thinking

Figure 8. Thinking Skills, Values, Attitudes, and Dispositions Fostered by the use of the McCarthy Model in Combination with Critical and Creative Thinking.
The influence of Modalities.

First, it is necessary to discuss what McCarthy means by modalities. Modality teaching is instruction designed with respect to the channels built into a learner's receptive system. It involves teaching through the use of the senses. It involves an integrative perspective by creating an environment for learning that combines experience, perception, cognition, and behavior (McCarthy, 1987). This kind of teaching is inclusive in this model. Modality activities are generally holistic and have a gestalt sensitivity that influences processing. Firsthand experience has a very high learning impact; it excels with cognitive, affective, and skill objectives, besides being auditory, kinesthetic, visual, olfactory, and gustatory. It also generates critical thinking more easily because it provides the teacher a starting point from which to teach critical and creative thinking. My perception is that educators need to match modality strengths with sensory involvement, and combine activities, while simultaneously designing plans to focus and to achieve a desired thinking result.

Thinking Skills Missing in the McCarthy Model When Thinking is an Objective.

This author feels teaching through modality strengths is very important when the objective is teaching for thinking. This is a missing component in the McCarthy model. Based on my learning experiences in the Critical and Creative Thinking program the author has found that the thinking skill or process that is to be learned has to be the educator's focus of intention along with the subject content.
The two realms of content and teaching thinking need to be meshed in such a way that the product is learning and/or practicing thinking through curriculum. The teacher navigates the path of the two kinds of learning. It is not enough to assume that just because material is presented and explored in many thinking methods that it will be modeled. It is not enough to hear children using and practicing some thinking skills, and assume they will learn the rest somewhere else. What is important is the teaching for thinking specifically allowed by the modeling of the teacher, and then the continued practice of these principles (Swartz and Perkins, 1990). Swartz and Perkins caution against using simplistic approaches such as separating thinking from content or teaching about thinking without engaging students in thinking. They advocate teaching through infusion, allowing children to explore through practical application. Metacognition is woven throughout, which also allows for practice.

This author thinks there is reason to believe that skills of thinking are enhanced not so much by practice alone, but by strategic organization as well. For instance, if you want to get better at generating creative ideas you are likely to find that mere practice does not help that much, while systematic strategies for conceiving ideas, with practice, help quite a lot. Swartz and Perkins states that good thinking involves more than skill in a narrow sense and that skills come from strategic organization, not just practice (Swartz and Perkins, 1990).

Good thinking begins with prompting the learner’s awareness of the uses of thinking skills, and with the teacher’s modeling of thinking terms such as predicting, creative problem solving, etc. The
presence of these activities provides an open atmosphere of acceptance. Important strategies such as announcing the thinking skill objective that day, and using the jargon of thinking words naturally during the instruction, provide an optimal environment. One of the practices that this author would add to the model on a regular basis is the process of metacognition. Swartz and Perkins describe this as strategic monitoring. They ask students to describe retrospectively what they did in thinking about the particular issue or problem. Another method of fostering metacognition is to have the students think out loud while other students record the thinking processes going on. This method prompts the reflective use of thinking skills and thus provides further strategies. Educators can help students monitor their thinking by describing it, reflecting on effective ways of doing this type of thinking, and then asking them to direct their thinking accordingly. Swartz and Perkins say prescribing should be part of the reflective analysis. They suggest asking students to develop rules for good thinking, to recommend to others different ways to think, to plan a thinking project, and to correct ineffective thinking (Swartz and Perkins, 1990).

Swartz and Perkins define metacognition as referring to one's knowledge about, and awareness of, thinking. An awareness of one's mental strengths and weaknesses constitutes metacognitive knowledge. Swartz and Perkins define four levels of metacognitive thought:

- Tacit use: The individual does a kind of thinking-say decision making-without thinking about it.
• Aware use The individual does that kind of thinking conscious "that" and "when" he or she is doing so.

• Strategic use The individual organizes his or her thinking by way of particular conscious strategies that enhance its efficacy.

• Reflective use The individual reflects upon his or her thinking before and after, or even in the middle of, the process, pondering how to proceed and how to improve (Swartz and Perkins 1990, 52).

There is much tacit use of metacognition in the application of their model. I believe this can be accomplished by cooperative learning activities, writing journal logs, participating in class or small group discussions, or even perhaps writing evaluations of the process. Richard Paul calls this "reflective self-criticism" (Paul 1990, 299). He states that the ability to detach oneself from one's own views and to reflect critically on one's own thinking is fundamental to learning to think for oneself. Awareness of one's own views mainly depend on one's understanding of how one's views relate to the views of others (Paul, 1990).

Teaching for and about Socratic questioning, as well as teaching how to formulate critical questioning strategies would be another dimension of thinking this author would add to this model. Socratic instruction takes many forms. Socratic questions can be generated by the teacher or by the students and can be used in most questioning situations for different purposes. The essential thing to remember is that probing and stimulating questioning is a key element in developing student thinking. Questioners must try on 51
other's beliefs, imagine what it would be like to accept them, and wonder what it would be like to believe otherwise. Socratic discussion is structured dialogue.

The discussion, the thinking, is structured to take student thought from the unclear to the clear, from the unreasoned to the reasoned, from the implicit to the explicit, from the unexamined to the examined, from the inconsistent to the consistent, from the unarticulated to the articulated. To learn how to participate in it, one has to learn how to listen carefully to what others say, look for reasons and evidence, recognize and reflect upon assumptions, discover implications and consequences, seek examples, analogies, and objections, discover, in short, what is really known and distinguish it from what is merely believed (Paul 1990, 270).

The process of Socratic questioning therefore:

- raises basic issues
- probes beneath the surface of things
- pursues problematic areas of thought
- helps students discover the structure of their own thought
- helps students discover sensitivity to clarity, accuracy, and relevance
- helps students arrive at judgment through their own reasoning
- helps students note claims, evidence, conclusions, questions at issue, assumptions, implications, consequences, concepts, interpretations, points of view - the elements of thought (Paul 1990, 270).

Dialogical discussion will occur naturally, according to Richard Paul, if teachers learn to stimulate student thinking through Socratic
questioning. Through Socratic discussion, students learn to appreciate the power of logic and logical thinking. They learn that all thoughts can be pursued in at least four directions: their origin, their support, their conflicts with other thoughts, and their implications and consequences (Paul, 1990).

Paul Torrance also believes in the importance of guiding learning-thinking questioning techniques (Torrance and Myers, 1973). The other major component this author thinks should be added to the McCarthy model is the teaching for specific processes. This additional objective guides the learning. When teaching thinking, its processes and skills should be labeled and students should be aware of the practices they are using at the time. Specific techniques should be taught, labeled, and modeled by the educator, within the context of the instructional model. This author thinks a hierarchical list of thinking skills and processes that follow a developmental pattern would be the best situation. The important idea is to label, plan and teach for thinking along with curriculum.

Lastly, another major area to incorporate into the McCarthy model is teaching for dialogical thinking. Richard Paul states that:

Education is not merely piling up more and more bits and pieces of information. It is a process of autonomously distinguishing true from false. It calls for self-motivated action on our mental nature and active participation in forming our own character. It requires us to learn to open our mind, correct, and refine it, and enable it to learn rationally, thereby empowering it to analyze, digest, master, and rule its own knowledge, gain command over its own facilities, and achieve flexibility, fair-mindedness, and critical exactness. This process cannot be accomplished when learning is viewed monologically. The process of gaining knowledge is at its roots
dialogical. Our minds are never empty of beliefs and
never without a point of view. Since our instinctive
intellectual drives are initially egocentric, we must learn
to bring our implicit ideas and reasonings into open
dialogical conflict with opposing ones to decide rationally,
as best we can, upon their merit as candidates for
mindful belief. Our implicit everyday theories of
ourselves, our friends, our neighbors, our nation, our
religion, our enemies and antagonists, and our hopes,
fears, and premonitions must become overtly known to
us that we might learn to continually re-assess them as
we enter empathic ally into more or less alien belief
systems (Paul 1990, 220).

Paul believes all rational dialogical thinking involves creativity
because dialogical thinking is a series of creative acts where one
moves between different imagined roles. Paul says if children only
hear what other people say, they do not experience the inner logic of
alternative points of view. Children have an inner ability to
empathize imagined situations naturally through role playing. Their
play suggests that they enjoy taking on the role of others and acting
as if they were someone else. This drive should be cultivated,
expanded, and reshaped, in younger children perhaps by beginning
with encouraging empathy for the thinking and feelings of storybook
characters. This empathy can lead into reflective philosophical
discussions. As they mature, students can be encouraged to develop
the same kind of empathy for other figures. Older students can also
be provided with challenging ethical questions and dilemmas to
think about. The issues should get increasingly complex. Paul
emphasizes the importance of leading children to the point that they
begin to get comfortable dealing with dialogical issues rationally.
Thus, the author feels that the missing components in the McCarthy model are the teaching for thinking, the labeling of thinking terms and the continuing practice of varying levels of metacognition. Two other major critical thinking skills that this author feels are important to teach using this model are Socratic questioning and dialogical thinking.
Analysis of A Sample Lesson.

In her book *The 4-Mat System*, Bernice McCarthy describes an exemplary science lesson written by Marlene Wieczorek Bowen. It is a unit on insects targeted for intermediate grade level students.

This author repeats the lesson as it is written in the text, and provides the analysis of thinking components. This is accomplished by referring to, for comparison of thinking skills the two lists generated by Anne Murray and Bernice McCarthy and introduced in the second chapter of this thesis. The author also finds it necessary to define the components once listed, to explain their connection to the lesson, and to follow each quadrant listing with an interpretive discussion and their relation to the learning taking place in the insect lesson.

It is important to note that some of the skills listed in individual quadrants are not used in this particular lesson. The lesson begins with Quadrant 1, right mode activities which is the most comfortable learning style for the Imaginative Learners. Right and Left mode labeling is referenced at this time, for the purpose of distinguishing between Anne Murray's and Bernice McCarthy's views of hemispheric characteristics.
Insects

Objective: To observe and experience a living insect. To enhance observational skills

Activity: Students are assigned partners. Each pair of students is given its own live grasshopper. Containers are a large glass jar covered with screen and/or cheesecloth. Add leaves grass, food, and water. Place on a shelf or counter that allows for sun and shade. Instruct students as to proper care. Give them the following observation worksheets.

1. Name the body parts (head, thorax, abdomen).
2. Sketch and label them.
3. Observe the antennae. Are they thick or thin?
4. Sketch the antennae. What do you think they are for?
5. How many legs? All the same length? Are there joints?
6. Sketch the legs.
7. Are there wings?
8. What does your grasshopper eat?
9. How does it eat? Suck, bite, or chew?
10. What environment does your grasshopper need?
11. What is its range of activity? Does light or darkness affect its activity?
12. Name your grasshopper.
13. Both of you must make a sketch of your grasshopper. Refer to your textbook if you need help.

Evaluation: Quality and accuracy of worksheets. (McCarthy 1987, 153)

Thinking skills practiced in this section according to Anne Murray:
Observation
Associating
Developing open-mindedness

Thinking skills practiced in this section according to Bernice McCarthy:
Attending
Connecting

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The lesson continues with activities for Quadrant 1 with Left Mode preferences:

Objective: To pool observations and begin systematizing data.
Activity: Discussion of worksheets and observations. (In the class in which we piloted this lesson, we collected the grasshoppers after two weeks and changed the containers, and to our amazement, the students were able to identify their own.)
Evaluation: Quality of the discussion (McCarthy 1987, 153)

Thinking skills practiced in this section according to Bernice McCarthy:
- Focusing
- Categorizing
- Recording
- Inferring

For the reader, the author will provide interpretation of the meaning of these skills, by connecting the actual lesson activity with the thinking label.

The children involved in this lesson are using the skill of observation before they are able to complete their worksheet. First, observation through their senses is taking place as they are seeing, smelling, touching, and feeling their own grasshopper in order to be able to answer the detailed questions asked by the teacher. Second, attention is focused on the situation and concentration is given to the topic. Third, connections are being made, where real observations are viewed, in order to create a drawing of the insect itself. Fourth, they are transferring information, taking the teacher provided names of body parts and assigning those parts to their drawings. Fifth, students are enabling themselves to construct theory from what they
see and predict what would be by estimating what the insect eats, whether or not it has the ability to chew or bite, and by determining if light or darkness affects its activity. Sixth, associations are being formed when considering the grasshoppers' necessary conditions for survival. This is accomplished as children perform the tasks of adding leaves and water to the grasshoppers environment and discuss this step with their partner. Students have been focusing, observing, recording, and making inferences in order to achieve their desired worksheet results.

The discussion of worksheets and organizing activities generate categorizing and combining of ideas to form assumptions based on observations. These further the development of hypotheses which lead to theory development. Developing open-mindedness is fostered through the students' empowerment to work with a partner, and to make decisions on their own accord or as a team action. The author thinks this dialogical approach fosters an atmosphere of open-mindedness because students are hearing the views expressed by all who participate in the dialogue. Exchange between different points of view or frames of reference is necessary for a dialogical discussion to take place and thus encourage reasoning abilities. The discussion of observations allows students who have not observed a particular trait to alter their opinion about the value of that trait in the grasshopper and to back up their reasoning with the support dialogue they heard in a very non-threatening way.
The lesson continues with activities for Quadrant 2 with Right Mode preferences:

Objective: To provide an activity that will broaden their grasshopper experience to insects in general in preparation for lecture and reading materials.

Activity: Instruct students to begin their own insect collections. Any good science text will explain this process.

Evaluation: Insect collecting process. (McCarthy 1987, 154)

Thinking skills practiced in this section according to Anne Murray:
- Elaborating
- Making analogies
- Visualizing
- Relating self and experience to the concept
- Seeking patterns

Thinking skills practiced in this section according to Bernice McCarthy:
- Conceptualizing
- Imagining

The lesson continues with activities for Quadrant 2 with Left Mode preferences:

Objective: To teach stages of insect growth.

Activity: Lecture with accompanying text; eggs, larvae, pupae, adults, eggs, nymphs, adults. Read the assigned chapters in the text.

Evaluation: Objective test. (McCarthy 1987, 154)

Thinking skills practiced in this section according to Anne Murray:
- Representing symbolically
- Examining
- Analyzing language
- Identifying attributes
- Comprehension/explaining

Thinking skills practiced in this section according to Bernice McCarthy:
- Further defining the concept
- Identifying parts
- Ordering
In order for students to begin their own insect collections they must first seek patterns in the knowledge base they are using. In this case they are working with the "grasshopper". Their thinking becomes visualizing in their own depiction of what their personal collection could then become. This is also conceptualizing, states McCarthy, forming ideas, especially general ideas of a thing or a class of a thing. Students then use some creative thinking strategies such as elaborating to develop that personal collection. They involve themselves in the decision making process as they decide the type of collection to make, therefore relating self and experience to concept and using the skill of imagining. The skill of making analogies, using a sample to create a likeness or new sample is also used in this process of making a personal collection.

Listening to the lecture portion of this lesson involves other, different thinking processes. Murray defines this step as analyzing language, looking for more than meaning in the spoken word. At this point, they need to comprehend the language used in the lecture and accompanying text in order to later explain their understanding.

In essence, they are further defining the concept by identifying parts, ordering the knowledge, and identifying attributes. The lesson continues with activities for Quadrant 3 with Left Mode preferences:

Objective: To practice the concepts and reinforce the learning.
Activity: Workbooks, worksheets, activities in text. Students begin identifying their insect collections.

Evaluation: Quality and accuracy of the above. (McCarthy 1987, 154)
Thinking skills practiced in this section according to Anne Murray:

- Using abstract theory in a concrete manner
- Investigating / seeking evidence
- Practicing with analogous examples
- Seeking precision
- Using measurements and samplings
- Allocating resources
- Over learning

Thinking skills practiced in this section according to Bernice McCarthy:

- Testing

The lesson quoted from McCarthy's model lesson continues with activities for Quadrant 3 with Right Mode preferences:

Objective: To personalize students' learning by allowing them to choose an activity that explores some facet of insect life.

Activity: Do a sketchbook of various insects. Do sculptures of various insects. (Teachers should use some of the excellent experiments listed in various science texts.)

Invent and build an insect, using what you now know about insects. (Have various materials: pieces of Styrofoam, toothpicks, remnants cloth, colored paper, pipe cleaners, etc. Consider an all school display.)

At this step the students turn in a project plan for teacher and where necessary parent approval. They write a contract specifying: the project, the materials needed, the resources, the concepts to be examined worked through or tested, and the date of completion.

Evaluation: How well the students go about the task of planning their projects and the scope of their activity (McCarthy 1987, 154).
Thinking skills practiced in this section according to Anne Murray:

- Making original applications
- Giving original examples
- Illustrating in a new way
- Inferring
- Revising
- Developing flexibility
- Varying content

Thinking skills practiced in this section according to Bernice McCarthy:

- Extending
- Inquiring
- Exploring
- Experimenting
- Seeing with insight
- Predicting
- Tinkering
- Recording

These activities for quadrant three allow for free expression of creativity and application of the knowledge students have gained from other quadrant activities. This incorporates an investigatory approach as students are asked to find evidence for support. Researching and making use of abstract principles and checking for precision before applying these principals to the students' worksheet ensure that students are using material in a self-directed way for their own purpose.

In some instances, information on certain insects may be unavailable so the learner must be able to adapt and perhaps devise a method for measurements and samplings.

Students need to apply newly acquired skills in order to create a drawing, a sketchbook, a sculpture, and in order to invent or build their own insects. At first their thinking takes the form of making original applications and giving original examples in order to create their own personalized insect. Then more creative thinking abilities are called for; these include illustrating their new insects, inferring its characteristics based on previous study but examining the "what ifs" of this new challenge. This kind of activity develops flexibility of
thinking to promote elaboration, revision, and varying the content with which it is presented. They include thinking behaviors such as extending and exploring the topic for other possibilities, followed by experimenting, tinkering, and recording responses. Predicting outcomes becomes a natural by-product of the above processes. Lastly, seeing with insight comes to the learner after he has experienced all these steps in this learning process. This insight provides the course of the student's original insect creation.

The lesson continues with activities for Quadrant 4 with Left Mode preferences:

Objective: To enhance student ability to plan and work systematically.
Activity: Students begin their projects.
Evaluation: The manner in which they "get to work" (McCarthy 1987, 155).

Thinking skills practiced in this section according to Anne Murray:
Deciding
Taking and supporting a position
Establishing criteria
Forming a plan
Developing strategies

Thinking skills practiced in this section according to Bernice McCarthy:
Transferring

The lesson continues with activities for Quadrant 4 with Right Mode preferences:

Objective: To increase student ability to complete what they begin. To give them the opportunity to explain what they have learned.
Activity: Students complete their contracted projects and present them to their classmates, either by display, explanation, or both.

Evaluation: Quality of completed projects, faithfulness to project contract and quality of sharing. (McCarthy 1987, 155)

Thinking skills practiced in this section according to Anne Murray:
Inventing
Taking risks
Collaborating

Thinking skills practiced in this section according to Bernice McCarthy:
Integrating
Explaining
Synthesizing
Re-presenting
Re-focusing
Summarizing

As students complete their own paired decision making process in order to complete their final insect project they are called upon to use several thinking skills. Taking and supporting a position (labeled transferring by McCarthy) represents the culmination of all the previous steps including: deciding on the topic for the project, establishing criteria, forming a plan, and developing a strategy to follow. The author thinks students are also acquiring organizational skills as they take new information and do something with it. Accomplishing this task represents a synthesizing of the cognitive and practical domains. It allows learners to integrate the entire insect experience and to be able to tell themselves first, whether they know the material about the insect, and second, if they are able to invent something that would demonstrate that fact to someone else. Thus, the question becomes how can they explain this new knowledge to someone else in this re-focusing and re-presenting the insect content, learners at this point are called upon to do some
creative thinking as they decide their course of action. They must be able to summarize the information for themselves and for others to view and listen. These attitudes incorporate risk taking and foster an atmosphere of creativity. Before the final presentation of their project, students may be called upon to collaborate with partners in order to facilitate the delivery of the final presentation.
Anne Murray’s Thinking Terminology

Observation
Associating
Developing open-mindedness
Observing
Combining of ideas
Categorizing
Elaborating
Making analogies
Visualizing
Relating self and experience to the concept
Seeking patterns
Representing symbolically
Examining
Analyzing language
Identifying attributes
Comprehension/explaining
Representing symbolically
Analyzing language
Identifying attributes
Comprehension/explaining
Using abstract theory in a concrete manner
Investigating
Making original applications
Giving original examples
Illustrating in a new way
Inferring
Revising
Developing flexibility
Varying content
Deciding
Taking and supporting a position
Establishing criteria
Forming a plan
Developing strategies
Inventing
Taking risks
Collaborating

Bernice McCarthy’s Thinking Terminology

Attending
Connecting
Focusing
Observing
Recording
Inferring
Conceptualizing
Imagining
Further defining the concept
Identifying parts
Ordering
Testing
Extending
Inquiring
Exploring
Experimenting
Seeing with insight
Predicting
Tinkering
Recording
Transferring
Integrating
Explaining
Synthesizing
Re-presenting
Re-focusing
Summarizing

Figure 9. Compiled Lists of Thinking Skills from the "Insect" Lesson
Conclusions.

Based on the analysis of this sample lesson, the author makes the following conclusions:

1) Differing levels of simple and complex thinking are practiced throughout the lesson.

2) Numerous thinking skills and processes which the author has cited, are practiced.

3) Thinking processes are not taught, nor is the appropriate jargon used.

4) Children are not aware of the fact that they are practicing good thinking habits. This fact is not made known to them.

5) Some critical and creative thinking opportunities are provided by allowing time for this to take place within the structure of the lesson. Thus emphasizing the teacher's value of this process. This example illustrates that thinking can be happening concurrently while teaching for content.

6) The lesson shows how learning can be engineered to adapt to the varying styles of learners, and to satisfy some criteria for the teaching of thinking skills.

The McCarthy model does indeed provide practical applications of different kinds of thinking. It does not, however, embody the philosophy of teaching the skills of thinking, prior to, during, or after a topic of learning. Practice is emphasized at this point because the
teaching of thinking skills and processes must be another objective and must be planned into the curriculum accordingly. A child could be practicing creative thinking, but unless the instructor has labeled it so, and unless the instructor goes on to provide a model for teaching strategies to increase creative thinking, that child’s ability to become a better creative thinker will not improve. The language of thinking skills and processes needs to be used on a daily basis for all to refer to and dialogue about. This labeling provides for a metacognitive point of view, and gives students common terms to use in their thinking discussions.

Some metacognition is built into the McCarthy instructional model. It is found in the first quadrant when the initial experience is reflected and analyzed. It appears again in the second quadrant when the teacher’s objective is to begin to integrate that reflective analysis into the concepts he wishes to teach. Again in the fourth quadrant, there is reference to metacognitive awareness through the student’s analysis of relevance and usefulness. These levels of metacognition go beyond the tacit use of the skill to the awareness level and to the strategic use level where organization and planning guide development further. This author suggests the use of this thinking practice as frequently as possible for the benefits it will provide the learner. This rehearsal will aid in the transfer of thinking skills as well.

Evaluation of Sample Lesson.

Some evaluation of individual quadrant thinking skills has been discussed after each quadrant section above. This discussion,
however, is solely based on the lesson the way it has been cited from the McCarthy text. The author would like to acknowledge a critical and creative thinking teaching strategy design devised by Dr. John Murray, of the Critical and Creative Thinking Program at the University of Massachusetts at Boston and the author. The following design focuses on the teaching for and practice of, multiple thinking skills using the identical content area of insects. The following is a restructuring of the "Insect" lesson, organizing the teaching for thinking in a manner which provides for more advanced levels of thinking throughout the lesson, while providing for individual learning style preferences.

John Murray's and the Author's List of Critical and Creative Thinking Skills:

- Organize
- Plan

Lesson Procedure:

1) Rather than providing an insect, it would be far better to have the children collect their own insect sample for study. If possible, go outdoors, do some observing of grasshoppers, crickets, and other insects in their natural habitat. This will allow for far richer observations. Students can decide where and how to make their observations. However, if this is not possible, provide each pair of students with a grasshopper for observation.
Observe

Infer

Question

What If ...

Decide

Dialogue

Classify

Examine assumptions

Design experiments

Analyze data

2) Have students record their observations. After this have them organize and categorize their observations. Next, in groups discuss all areas of observations. After the discussion have each group make a composite history of their observations.

3) Ask the learners about what questions they may have or can think about, in light of observing this information on grasshoppers.

4) Discuss in groups of four, students findings and questions.

5) Next, each of the groups reports its findings and questions. Students put this information on the board in order to make a class list of observations and questions.

6) Teacher and students together develop ways of answering, or researching their questions.
7) Students carry out the plan that they have just devised as a class. They actually do the research, that is possible. Other activities may include watching a film, inviting a speaker in to discuss the subject, or whatever was decided. They are asked to record where and how they found their answers.

8) Once again, if possible get several different types of insects for comparing and contrasting with grasshoppers. This would be a motivator to focus students on the insect’s parts and the theoretical concept, "Form Follows Function".

9) Going back to their original list of questions, or assumptions, have students design and conduct insect experiments.

10) Have each pair of students decide what they would like to do with this new knowledge. The technique of brainstorming could be encouraged with the objective being to present their findings, in whatever form they choose, to a younger classroom of children.
<table>
<thead>
<tr>
<th>Extend</th>
<th>11) After projects are chosen students could write their project plans. The teacher should allow time to plan and execute the completion of the projects.</th>
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<tbody>
<tr>
<td>Transfer</td>
<td></td>
</tr>
<tr>
<td>Synthesis</td>
<td>12) Students present the projects to their classmates and guests, using the method they have chosen to demonstrate.</td>
</tr>
<tr>
<td>Evaluate</td>
<td></td>
</tr>
<tr>
<td>Metacognition</td>
<td>13) Have students review the process and thinking they have been doing. Analyze it from the beginning, naming each step.</td>
</tr>
<tr>
<td>The Teaching of Critical and Creative Thinking</td>
<td>14) Following this, name the thinking skills that were used at each step.</td>
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Reshaping the lesson in this manner provides, through an emphasis on the art of thinking, for greater self-directed student learning. The learning process is less teacher directed and much more student directed. The original objective was teaching for thinking, so learning was structured in a way to accommodate this purpose. Metacognition and labeling of the names of each skill are naturally built into this design. These are important to note, as these are the same elements of critical and creative thinking not found in the McCarthy model.

This author believes that it is also possible to add other significant thinking skill processes to the McCarthy model, such as Socratic questioning, and techniques to incorporate dialogical and dialectical thinking, in order to achieve more desirable thinking skill results. There is much, in light of the teaching for thinking, that can be added to the McCarthy model.

Other Thinking Skill Components That Can Be Added To The McCarthy Model.

One example of a method of teaching a thinking skill would be the integration of a lesson using Socratic questioning. Teaching Socratic questioning techniques promoting dialogical and dialectical discussions, and using and teaching for metaphorical thinking are other important means of enhancing the use of the McCarthy model to maximize the teaching of thinking skills built into curriculum.
Dialogical discussion will naturally occur if teachers learn to stimulate student thinking through Socratic questioning. This consists in teachers wondering aloud about the meaning and truth of students’ responses to questions. The Socratic teacher models a reflective, analytic listener. One that actively peruses clarity of expression. One that actively looks for evidence and reasons. One that actively considers alternative points of view. One that actively tries to reconcile differences of viewpoint. One that actively tries to find out not just what people think but whether what they think is actually so.

Socratic discussion allows students to develop and evaluate their thinking in comparison to that of other students. Since inevitably students respond to Socratic questions within their own points of view, the discussion inevitably becomes multi-dimensional (Paul 1990, 251).

In the restructured "Insect" lesson, not only are pairs of students discussing together their points of view to complete the teacher directed project, but also opinions, of the entire class are generated and aired as the lesson proceeds through the planned activities.

The author would like to point out at this time, the importance of an instructor's own ability to be a reflective, thoughtful, and even creative thinker. She must be able to change her plan for teaching a given lesson or lessons, at any particular time, if the students' needs call for something other than that specific day's lesson. The author assumes that the McCarthy model advocates this fluidity in the instructor's techniques because of the emphasis of respect placed on reaching individual learners through their strengths. The teacher's ability to change and adapt her plans when necessary provides an example for students to model, as they are faced with different
challenges each day. Perhaps, when it is necessary to deviate from a given plan, reflection on the teacher's purpose in doing this is one of the significant lessons given.
CHAPTER V
GENERAL GUIDELINES INTEGRATING THINKING SKILLS AND THE FOUR STYLES OF LEARNING FOR CURRICULUM PLANNING

At this point the author shares a model she constructed from a synthesis of methods of teaching thinking skills and McCarthy's four styles of learning. This instructional design is based on the premise that teaching for thinking is an objective that is best learned through the vehicle of content. Curriculum provides the pragmatic application, while thinking procedures form the structure for thought. In planning for the teaching of thinking along with curriculum, I feel it is necessary to have a sequence chart of thinking skills and processes to readily draw on. The optimal situation is when other teachers in the same school or district value the same skills and processes, and as a result the exchange of teachers' ideas is encouraged through the elementary and secondary grades. The student in turn benefits from a system of processes taught and practiced with hierarchical complexity.

The author is aware that there are several other instructional models whose principle goal is to teach thinking developmentally. However, she chose to structure her instructional format around McCarthy's model. This was done because of the author's value and respect for McCarthy in accommodating learning styles in each individual. Suggestions for the practice and teaching of thinking, with respect to the students' styles of learning, are discussed below by the author. The name given to each style of learner is the same as Bernice McCarthy's.
Suggestions for the planning of curriculum for Imaginative Learners:

1) Use as close to a concrete example as possible, and create an experience that would cause one to reflect, observe, and then formulate questions for further thinking and knowledge acquisition of the topic.

2) Provide an opportunity for potential learners to talk about experiences in relation to themselves. Encourage discussion of any prior experiences and knowledge.

3) Discuss what that experience means to the learners.

4) Encourage a listening environment. Sit at round tables, or move desks to promote dialogue and socialization. If possible team learners in pairs, or in groups of fours.

5) Provide an environment for sharing thoughts and time to reflect on these.

6) Question for opportunities in which the learner shares through dialogue, his own experience with the new concept.

7) Brainstorm prior, as well as newer, perspectives which they can now view from this new opportunity for discovery. Are there any added insights? Share the results.
8) Be alert to you, the possibility that the educator, can change the topic to be of greater interest to the learner. Question to discover whether there are segments of information on the topics that could increase the value and meaning of this subject to an individual or individuals. Question what would make individual learners commit to this topic for further study. What do they like about this topic? Do they know enough about this topic already to pick something that interests them or do they need more information?

9) If more connections are needed to facilitate learning, delve into aspects of the learners' own cultures to spark more interest and to help relate subject matter to those individuals. Provide ample reflective time with this idea.

10) It is important to study this topic by having the topic relate in some way to the individuals past experiences (answering the students "why"), therefore bringing personal meaning about the topic to each individual.

11) Since the imaginative learner uses innovation and imagination, focus dialogue on the learner's opinion of the topic. This provides feedback as to the degree to which the new knowledge has been internalized, also this provides insights into existing structures, biases, scaffolds, and opinions that are already in place prior to the new learning.
For Analytic Learners:

1) Since they learn by thinking through ideas, form a list, as detailed and factual as possible, about the subject you, the educator, want to teach. Note the textbook, or source material pages for reference by learners, and suggest that they utilize these lists themselves.

2) Provide learners copies of this list either by overhead presentation, didactic teaching, or pointing out the information in a text they may have.

3) Allow learners to critique the new information in some way. Provide time to reflect on this through dialogue.

4) Provide opportunities for students to write down ideas pertinent to the subject being learned, for example note taking, comparing and contrasting these lists with other students. Encourage students to justify the value of these ideas.

5) Look for an area within the curriculum where additional information is needed in order to achieve a more complete learning experience of the subject.
6) Allow learners time to devise a theory based on the factual information already presented that will carry over to aid the construction of facts for the new learning. The goal here is to prompt learners to formulate theories and then seek verification. Encourage this process by asking if there are any questions arising from the new knowledge that learners would like to know more about.

7) Assemble different experts on the subject you want to teach and provide textbooks, or three dimensional sources, allowing time and the means to investigate these sources. Advance their knowledge, by allowing time to discern differences among sources and the information they provide. This learner will thrive on the skills of recognizing bias, reliability of source, and distinguishing fact from opinion. Use Socratic questioning strategies to further enhance the knowledge.

8) Structure an exercise that would allow the learner to define the main concept. Encourage looking for interrelationships, identifying, ordering, comparing, and prioritizing parts.

9) Since the Analytic learner performs best by thinking through ideas allow for idea generating sessions. Foster further creations from these ideas; thus, advocating creative problem solving.

10) Provide these learners recognition for their synthesized ideas.
11) Because these students prefer to work alone rather than in a group setting, it is important that educators are aware of and respond to this preference.

12) When teaching thinking processes, show step-by-step procedure of the method. Encourage the detailing of alternative steps to produce the desired goal.

For Common Sense Learners:

1) These learners possess strength in integrating theory into practice. They excel in looking for ways to apply ideas. Integrating goes on naturally for them within their cognitive processes. Since they are instinctively trying to solve problems and apply common sense, ask them to share their opinions in order to shed insights for others.

2) These learners value strategic thinking approaches. Pointing out a systematic step-by-step process of how knowledge is derived for that particular content would be important for they may want to model it.

3) Provide opportunity for some tactile experiences that could originate from questioning on the part of the learner. Give this learner an opportunity to try and test things out.
4) Provide an explanation as to how things work, either didactically or inductively. To rehearse better thinking, this author feels inductive methods work best. In using an inductive method, the student reaches analysis and conclusions on his own with the teacher solely directing the process of learning.

5) Refer often to diagrams or flow charts that display thinking models. Point out how the particular model that you the educator happen to be using at the time works, or elicit that information from the student. Refer to the thinking the children are doing at the time, by its correct terminology. Encourage the use of thinking terminology by the students.

6) Ask the students to look through their list of facts about the new subject and formulate questions that might lead to an experiment or something they could test.

7) Provide time for reflection of thinking accomplished.

8) As a guide, try to supply learning experiences that will cause learners to know, understand, and be able to reiterate how it works. Let them enjoy the process of telling about the learning in their own way.

9) Since these students excel in gathering factual data in a hands-on atmosphere, allow opportunity for them to practically apply new knowledge as much as possible. Or, present this as an idea generating platform for learners to go on with.
For McCarthy's Dynamic Learner:

1) Structure learning experiences to allow every opportunity learners could possibly have for discovery of their own. These persons are characteristically enthusiastic about acting on new ideas. They feel compelled to do something with what they learn.

2) Ask these learners how they would change the situation for extended learning. For example, should the environment for this kind of learning be changed, the manner in which it was set up? Should more students be involved? Inviting them to think creatively and show them that you value their thoughts.

3) Since these learners excel at integrating experience and application, question to encourage further applications. Encourage brainstorming techniques to develop more skill in generating ideas, especially from these learners.

4) When these learners offer a conclusion, encourage metacognitive reflection on the process of arriving at that conclusion.

5) These learners display creative attitudes and dispositions because they are generally risk takers. Foster dialogue about attitudes of risk taking and sociability in dealing with people. These people are generally at ease with others. Provide opportunities for them to share that intuitive ability with their classmates.
6) These learners have a unique ability to look at new knowledge and then construct something from it. Adding something that makes that knowledge purposeful to them is their specialty. When these new experiences are created by this learner, encourage reflection on the procedure used to benefit the entire group. These are creative thinking and creative problem solving techniques in which the Dynamic learner is especially talented.

How does the teacher apply all of the above when focused on a variety of curricula and learner types? These general suggestions are provided to aid in the design of curriculum planning as a kind of guide or checklist upon which to structure learning activities in order to reach thinking and learning style based objectives. The author feels that as many of these suggestions as possible should enter into curriculum planning efforts on the part of the educator. These methods are structured to aid in the practice of thinking while acknowledging students' strengths in learning styles. Obviously each and every suggestion may not be pragmatic to initiate under certain time constraints or for specific curriculum. It is solely the judgment of the educator planning the learning environment to use as many or as few as necessary or advisable.

It should be clear to the reader that once a thinking skill is taught, what should follow is the practical application of that skill. Re-teaching may be necessary to some degree, but for most, practical application is the next ingredient in teaching thinking skills successfully. Practical application takes the form of rehearsal, and
repeated rehearsal. For example, the teacher may decide to introduce the skill of problem solving at an appropriate time when the situation calls for knowledge of that skill. In one instance, when a problem on the playground arises, she may take that opportunity to teach the step-by-step procedure one uses in general problem solving. The children are then exposed to the method and are guided in its practical application to the playground scenario. After this instance, any other problem needing to be solved, could, under teacher direction, be tackled using the techniques of problem solving previously introduced. Once the skill is taught, practice through application is the necessary element to aid in the final goal of the student inductively transferring the process on his own, to use with other disciplines and in other real-life situations.

When the pedagogical objectives are both content and thinking based, the primary consideration should be teaching for thinking specifically within the structure of content. This provides a proven testing ground for the skill introduced. Since cognition into one’s long term memory is enhanced through rehearsal, it is also equally significant to practice those skills and processes learned. The McCarthy model does provide pragmatical applications, but it falls short of teaching for critical and creative thinking. In this chapter, the author’s suggestions go beyond the McCarthy model to provide a structure which could incorporate the teaching for thinking at any appropriate interval in the existing curriculum. Metacognition, and dialogue, are provided for. It is the teacher who must plan for the teaching of thinking, and the labeling of skills, by these differing kinds of learners. This implementation of any or all of these...
suggestions remains at the discretion of the individual teacher who must critically evaluate, in light of the different learning styles of her current students, the times and lessons most conducive to the effective integration of these thinking skills.
"Good" observation skills are essential for critical and creative thinking to take place. Furthermore, in the author's way of thinking, observation includes thorough processing of the data collected from whatever is being observed. To be more specific and less abstract, the author will describe "how" to construct a McCarthy style lesson for critical and creative thinking. The following is one complete four quadrant model lesson, composed by the author, designed to teach a number of critical and creative thinking skills and subject content simultaneously. These plans are created for the elementary and middle school students.

**Objectives:** The primary goals of this lesson are to provide opportunity for students to use most of the thinking skills listed below. Some of these opportunities are provided through the activities listed below. Furthermore, some of the listed activities allow for cooperative learning and the development of socialization and communication skills. The lesson and activities are further designed to take into consideration the four McCarthy learning styles.
The lesson begins with the teacher providing one or more live chickens for observation. The chickens may have to be tethered in order to make them cooperate if an enclosed area is not available. This will enable students to be close enough for good observation opportunities. Usually such domestic animals settle-down once they are no longer fearful of harm and are fed a small amount of food.

Students are assigned to groups of four composed of one of each McCarthy-style learner: imaginative, analytical, common sense and dynamic. This unique design provides the occasion for different learning style perceptions and observations to be shared.

Students are instructed to observe their chicken, learn as much as possible about it, and record all observations. Not determining how the observations are to be made frees the students to learn in
any style they prefer. Keen observation skills (using all senses) are critical to good thinking. After each has recorded his observations, the members of each group discuss their observations with one another. Members compare and contrast their observations and construct a group composite list. When there is disagreement about some feature, further observation may be necessary. This collaborative work improves communication and socialization skills, provides a chance to improve listening skills, and builds tolerance for the ideas and views of others. Many times students will record inferences made from previous knowledge as observations. These mistakes provide an opportunity to differentiate inferences from observations.

Following the collaborative work, each group reports its findings to the class. Once again, any conflicts with data provides an opportunity to teach tolerance and respect while providing an occasion for additional observations in order to resolve any conflict. A list of student observations may be something like the following hypothetical list:

**PHYSICAL TRAITS**

- **head**: beak, eyes, nose, mouth, ears, tongue
- **feathers**: large, small, other types, different colors, shapes, position
- **neck**: length in relation to rest of body, angle
- **wings**: position, length, width, number of large feathers per wing
- **body**: shape size, center of gravity, location of appendages
- **legs**: size, shape, location, scales, proportionality
- **feet**: toes, claws, number of, length of, color, shape
BEHAVIOR descriptions of:

- center of balance
- scratching
- motions
- walking
- looking
- awareness
- pecking
- reactions to noise etc...

Of course students may not initially put their lists into categories such as physical and behavioral observations, and when they are requested to organize and categorize their observations, they may choose different organizational strategies. What organizational strategy they select is less important than having the opportunity to decide and to evaluate different schemes of classification. This improves evaluation and decision making skills of students as well as their group negotiating skills and strategies. It may be of interest to the teacher and the students to note whether or not students with different learning styles prefer specific organizational schemes. The organization process has the advantage of being student owned and generated and not a teacher imposed order.

Feathers in the above list has been selected by the author to serve as the subject content for demonstrating a possible scenario that could be conducted with each of the observations on the list. Students in their groups of four may make some observations of feathers similar to the following:

1. Feathers are not always the same
2. There are larger/longer feathers on the wings and tail
3. Some feathers are different colors

4. Feathers on the underside are different from those on the topside

5. Most feathers are aligned in the same direction

6. A few of the feathers on the sides of the head are arranged more randomly and not in the same direction as the others

If this is the first time that the students are being exposed to thinking skills and strategies, it would be especially important for them to reflect upon their thinking and the skills they use at each step of the process. A critical thinking strategy is to rephrase a keen observation into a question. For example, 1. "Why are the feathers not always the same?" and 2. "Why are the larger/longer feathers only on the wings and tail?". This illustrates a type of observation-processing strategy for students. This questioning becomes automatic if practiced, and also extends further into questions such as, "is this unique to this chicken or do other chickens also have this?", and "Can this be personalized to all other chicken-like animals with feathers or just the ones we are observing?". Additional thinking about the observations occurs when students are taught and practice "what if?" questions that reflect on the topic from a fresh point of view. For example: "What if all of the feathers on a chicken were the same?". This strategy aids students' analyses of the observations that they made by focusing on the consequences of chickens having or not having different feather types at specific locations. Some students will likely hypothesize that
the larger feathers found on the wings and tail are essential for flying even though domesticated chickens may not fly far because they have become too heavy for sustained flight. During metacognitive reflections students become aware of how much is not observed by each student and also by each group of four. Furthermore, they become aware of the unlike assumptions engendered in each of their hypotheses.

It is important for students to state testable hypotheses so that they can design experiments that test their hypotheses. However there may be times when testing a hypothesis may be possible but not desirable. For example even though altering the wing feathers of a chicken and/or some bird is possible, it may not be desirable from an ethics point of view. However, the teacher may use this dilemma to discuss inductive logic and its use in science. For example if all flying birds have proportionally larger/longer feathers on their wings and tail than on the rest of their body, this is strong evidence that they are essential for flight and navigation. This thinking may lead students to brainstorm in groups about all of the possible uses that feathers serve for chickens and a closer examination of each feather type and how its parts mesh with one another. Magnifying glasses are desirable if they are available. A number of student generated activities may stimulate students to think more about feathers. For example some students may want to draw different feather types, whereas, others may desire to build a chart with actual feathers on it and an accompanying discussion of the proposed function of each type. Some students may want to write stories about feathers or even compose poems. Thus students are
encouraged by such activities to express any newly learned factual information in the mode that they prefer. Students may also want to explore the uses that man has made of feathers in the past times and in the present. These types of activities could lead to individual or group student projects. The availability of multiple reference texts of various reading levels is almost essential for such projects if students are to learn self-sufficient investigative skills.

The feather activities illustrate the pedagogical approach to learning that would be utilized for each of the previously listed subject content areas. Sufficient time must be spent with one or more content area in order for students to acquire good critical thinking skills; less time will be required for each topic as students become more proficient with critical and creative thinking and investigative strategies. Groups well experienced in critical and creative thinking skills and strategies may eventually divide the content areas for research and report their finding to those who researched other content areas. Students would then jointly explore how content areas interact or interface with one another. For example, investigating the functional relationship between the circulatory and excretory systems, etc.

A common criticism of the above lesson style is that it is too time consuming to cover large amounts of material. However, maybe the real question to be asked is, "How do students learn the most, and what do students not learn when lectures are used to accelerate the amount of material covered?". Does the teacher covering (going over) the material foster meaningful long-term learning. What about
the ownership of the information or understanding, awareness and ownership of the learning process itself?

It is the opinion of this author that the above self-directed learning, thinking skill development and metacognitive examination of the learning process are essential for the development of a positive attitude toward life-long learning for any learning style. The McCarthy model does well in addressing the need to teach students with different learning styles, but it should be adapted for the intentional inclusion of teaching for thinking.

In this abbreviated exemplary lesson, the author has modeled how to actively involve students in critical and creative thinking while simultaneously allowing for the learning of subject matter content from any learning style. Once students used similar processes in learning about the other content material on the list, they would be in a strong position to compare it with the systems of other animals. Such lessons may foster a true interest in learning how the parts of any organism function and contribute to its survival.
CHAPTER VII

FINAL CONCLUSIONS

The McCarthy model, which improves learning by addressing the various learning styles of students through an experiential approach, also provides for the practice and reinforcement of many thinking skills. Utilizing McCarthy's research based cyclical method, in which the instruction must follow the sequential progression of the four quadrants, the educator can provide for the learner, several major advantages. The McCarthy model permits the learner to explore existing ideas, and to develop new ideas that are created as a result of the learning process. It provides for the application of, rehearsal with, and dialogue about new and prior learning experiences thus aiding in the true integration of the new learning by the student. It fosters an ambiance of creativity, while providing for experiences that encourage critical thought, inquiry and reasoning.

The pragmatic application of critical and creative thinking skills and processes can clearly be planned for within this model. However, when the philosophy of teaching thinking is as important to the educator as teaching content, then it is necessary to plan for the teaching of thinking per se. This can be done by weaving instructional thinking proficiency with the material to be taught. Using the McCarthy model as a prototype, the author provides a sample lesson which teaches thinking, labels skills and processes, and calls for more metacognition, three elements missing from the McCarthy model.
The model of teaching critical and creative thinking provided by Dr. John Murray and the author certainly accomplishes the task of teaching for thinking. It does this by allowing learners to experience their own empowerment of self-directed study, under the teacher's guidance. Furthermore, it improves students' learning of organizational and planning skills. My perception is that it promotes continued reflection, and self-analysis of the learner's behavior and how it relates to his desired goal. It encourages a final reflective analysis on the totality of procedures performed for the purpose of becoming a better learner/thinker in preparation for the next learning experience. It assumes that learners come into the classroom with thinking capabilities that can be enhanced. It also values and respects individual types of learners by addressing learning style preferences, honoring their capabilities to think, and valuing the importance of their dialogue.

Thus, the author takes the well-founded McCarthy model, and analyzes it from the perspective of practicing and also teaching critical and creative thinking. In the analysis of the teaching for thinking, the author chooses to embody the example set forth by Dr. John Murray. The perspective of the McCarthy model, along with the enhancements by the author, fashions the author's own model lesson. This lesson incorporates considerations of learning styles, with significant improvements in the area of teaching thinking skills namely, the teaching for thinking, labeling the thinking, and allowing for increased metacognition.

The McCarthy model then, which identifies and respects various learner styles while also providing an accommodating
instructional format, proves to be an excellent plan upon which to "scaffold" the building of knowledge with thinking skills. The educator is encouraged to accomplish thinking objectives by following the models provided in this paper by the author.

The fundamental requirements of our democratic society provide an effective rationale for focusing on thinking. Democracy, even as it was envisioned in our nation's beginning, rests on informed, thoughtful, creative citizens. The teaching for thinking is essential. The end result can be envisioned in skilled students, and later adults, who are able to cope better with personal and societal problems, to achieve vocational fulfillment, to function as informed citizens capable of clear thinking, and as innovative lifelong learners, who remain open to new experiences and ideas throughout life.
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