CHAPTER II

THEORETICAL OVERVIEW

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This chapter presents a conceptual review of literature which is expected to be of help in enriching the theoretical framework of the study.

2.1 4MAT System of Instructional Design: An Introduction

Differentiating instruction, constructivism, progressive education, language experience, whole language, child-centred education, mastery learning, phonics or sight based learning; all have been touted as "the" method for teaching at one time or another. Furthermore, the impact of individuals such as Howard Gardner and his theory of multiple intelligences (1983), Maria Montessori's method for young children (1964), and A. S. Neill's Summerhill School experience for adolescents (1960), varied though they maybe, all have one element in common - all methods and individuals seek to provide an effective education for the learner. Horace Mann said of education, "Education, beyond all other devices of human origin, is the great equalizer of the conditions of men - the balance-wheel of the social machinery.... It does better than to disarm the poor of their hostility towards the rich; it prevents being poor" (Zenkel, 1994).

Dr. Bernice McCarthy's 4MAT System is one educational tool, which attempts to reach this educational goal by applying the behaviourist concepts of Learning Styles to the classroom. This teaching model translates concepts from Learning Style theory into instructional strategies. The model is based on Kolb’s (1984) theory of experiential learning and on the findings of Brain Hemisphericity research.

McCarthy's 4MAT System provides a systematic approach to organizing and delivering instruction that addresses the Learning Styles and Hemispheric Preferences of students. This instructional design consist four quadrants each of which represents one of the four major Learning Styles. By superimposing right and left hemispheric preferences on each of the four quadrants, eight-step cycle is formed. Right Mode and Left Mode instructional strategies are assigned to each of the eight steps. According to 4MAT System, if the teacher follows the cycle, the Learning Style and Hemispheric Preference of each individual would be addressed at least one-fourth of the instructional time. During other parts of the cycle, the learner would be “stretched”, learning other ways to solve problems. (McCarthy, 1980)

The 4MAT System is a constructivist model of pedagogy which is centered on four essential phases of learning: learner motivation, conceptual mastery, application
of ideas, and creative synthesis (McCarthy, 1981). The basic premise is that while students favor different places on the 4MAT cycle according to their styles, they all need to go through the four major steps as offered by the following questions. What are the possibilities? Why is this important? How can I use this? What is the concept? In addition, teachers need to use both left- and right-mode teaching strategies. Left-mode thinking is sequential, segmental, and essentially verbal. The right-mode is credited with needing strategies that synthesize, find and create spatial relationships, use images, perceive whole from a part, hands-on exploration, and many dimensions of non-verbal reasoning (McCarthy, 1981).

The instructional design developed by McCarthy moves students through activities appropriate for the four types of the learners as well as through activities that encourage left or right brain development. McCarthy called the eight steps 4MAT as “the natural learning cycle” – the progression from experience to abstraction and experimentation to assimilation. As teachers move through the cycle, they employ a variety of instructional strategies thereby providing the opportunity for each learner’s style to be both matched and stretched (McCarthy, 1987). 4MAT’s cyclical design encourages teachers to adopt a number of roles; beginning with the role of the motivator or witness, they successively switch to information giver, facilitator or coach and evaluator or remediator. In addition, as the cycle is completed, traditional and non-traditional materials are integrated in a systematic fashion. McCarthy felt that the best use of 4MAT was “to enlarge the teacher’s skills, equipping the teacher with multiple methods of instruction in order to reach students of each Learning Style” (Leflar, 1983).

The 4MAT System aids teachers in designing learning activities that address the Learning Styles as well as Hemispheric Preferences of students and emphasizes a role for the learners to construct their own knowledge (Wilkerson & White, 1988). This instructional design helps teachers create activities which will allow students to develop the skills and potentials inherent in each hemisphere of the brain as well as the skills and concepts necessary for becoming productive members of the society.

By drawing on the theories of John Dewey, David Kolb, and Carl Jung, Bernice McCarthy developed the system. It helps teachers to plan meaningful learning experiences for all “styles” of learners. Her eight step model assumes (1) that individuals learn in different yet identifiable ways and (2) engagement with a variety
Bernice McCarthy’s 4MAT System is a teaching model which combines the fundamental principles of several long-standing theories of personal development with researches on human brain function and learning. The fundamental assumption of the model is that humans learn and develop through continuous, personal adaptations as they construct meaning in their lives. The investigator summarizes the theories and describes the nature of their contribution to McCarthy’s model for teaching.

2.2 Historical Perspective: Major Theories Modelled in the 4MAT System of Instructional Design for Teaching, Learning and Leadership

The fundamental assumption of the 4MAT Model, that humans learn and develop through continuous, personal adaptations as they construct meaning in their lives, is derived from the work of John Dewey, Carl Jung and David Kolb. The basic assumptions modelled for Dewey and brief descriptions of Kolb’s Experiential Learning Theory and Jung’s theory of Individuation are described in this section.

2.2.1 The Centrality of Experience and Individuality in Learning the Pedagogy of Instrumentalism: John Dewey

According to Dewey, all learning required the transactional interaction between the individual and the environment (Experience and Education, 1916). Dewey’s biology based theory made a case for learning by doing instead of learning by abstraction or rote. Thus he preferred the word “Instrumentalism” as a description of his philosophy of education which emphasized the testing of practical consequences of ideas. For Dewey, experience, the interaction of the individual with the environment as a testing ground for ideas, is paramount.

In his book How We Think (1993), Dewey described his Five step method for thinking which involved (1) reflecting upon a problem, (2) establishing the limits or characteristics of the problem in precise terms, (3) testing possible solutions and postulating a wide range of hypotheses, (4) considering possible outcomes and acting on these considerations, and (5) acceptance or rejection of the solutions. Dewey’s
stages of thinking were designed to systematize a “method” for working through each human experience as it arose.

Philosophy of education by John Dewey emphasized the importance of human experience as a gateway to human understanding. Dewey wrote extensively about the interconnectedness of scientific, social, aesthetic and moral aspects of education. His writings clearly reflect his belief in the “consummatory educational experience,” as one in which both the individual and the environment are in harmony. John Dewey is credited for the introduction of a pedagogy which unites the mind and the body of the learner through a method of thinking and doing, an experience he called the supreme art form…the art of education.

John Dewey is a significant contributor to the 4MAT System. His dictum that developmental education required the provision of experiences which inform the learner of the limits and contradictions of his/her way of constructing the world is modelled throughout the eight steps of the 4MAT System. The role of the teacher as one who fosters over a shorter period of time and development which would be natural over the course of an individual’s lifetime is also modelled as a guiding principle of 4MAT.

Today, researchers are confirming the significance of personal experience in the deployment of brain function and cognitive abilities. It is also possible to document human brain, although “hard-wired” to function in specific ways, is also incredibly flexible in the deployment of these functions. As a result of these studies, there is a growing evidence that each human being perfects a specific set of cognitive operations (and not others) as a result of personal adaptations to his/her life experiences. These cognitive operations, often referred to in the literature as intellectual potentials, result in high levels of competence in diverse areas of human endeavor. Additionally, there is also support that the human brain continues to adapt and expand for the lifetime of the individual. From this broader perspective, *that cognitive potential is not hidden in the mind awaiting perfection, rather, it evolves and diversifies through use*; it is clearly supportable that John Dewey’s insights about the importance of experience in learning were accurate.
2.2.2 Experiential Learning Theory: A Lifelong Cycle of Learning and Development: David Kolb

Another experience-based theory of human learning and personal development is David Kolb’s Experiential Learning Theory. Based on an expanded view of human intellectual capacity which involves testing ideas in actual experience, Experiential Learning Theory focuses on those adaptive modes of thinking from which productive lines of thought and action can be fashioned. According to Kolb, human learning and personal development are synonymous processes which involve the continuous integration of a distinct set of independent systems that give meaning to life’s circumstances. Kolb specifically names these systems (or modes) as follows: Concrete Experiential (CE), Reflective Observation (RO), Abstract Conceptualisation (AC), and Active Experimentation (AE).

**Concrete Experience**

<table>
<thead>
<tr>
<th>Active Experimentation</th>
<th>Intuitive (Marketing)</th>
<th>Imaginative (Counselling)</th>
<th>Reflective Observation</th>
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<td></td>
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<td>Theoretical</td>
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**Abstract Conceptualization**

*Figure 2.1 Kolb’s Experiential Learning Cycle*

At the heart of Kolb’s theory is the conviction that learning is a continually recurring process through which individual refines and integrates basic adaptive modes for perceiving, thinking, acting and feeling. The major assumptions of the Kolb Model are: (1) learning is a continual process, not an outcome; (2) learning is grounded in personal experience, (3) learning requires the resolution of conflicts between dialectically opposed modes of adaptation to the world, and (4) learning involves transactions between the individual and the environment whereby experiences are transformed into knowledge and actions. According to Kolb, learning is the constant, all-encompassing central life task, and how one learns becomes a major determinant of personal development. Kolb’s theory is grounded in the idea that individuals attain higher levels of cognitive complexity through the integration of preferred and less preferred modes of adapting their personal circumstances.
Cycle of Learning

The theoretical basis for the 4MAT Model is David Kolb’s Cycle of Learning. According to Kolb, adaptations to the environment proceed through a naturally recurring dialectic which begins with a valuation of the learner’s prior experience. This valuation, (usually an affective judgment), creates the context for engaging perception through observation and reflection. These observations enable the learner to move to a second stage in the process which is oppositional to affect and personal experience, a stage which requires a shift away from affect toward conceptual abstraction and the construction of a validated theory. From the construction and assimilation of this theory, the learner proceeds to the testing or third stage of the cycle. Implications for behaviour are determined in this stage. The testing phase is oppositional to perception and reflective observation. The cycle completes itself with the integration of these implications into a newly constructed synthesis which forms a composite for action. Kolb’s theory is, therefore grounded in the idea that individuals attain higher levels of cognitive complexity through the integration of preferred and less preferred modes of adapting their personal circumstances.

In this way, Kolb’s Experiential Learning Model describes a process through which the four modes of human experience are engaged at various levels of complexity to create more complete levels of understanding. According to Kolb, prerequisite to learning and personal development is the adaptive engagement between and among the modes of Concrete Experience (CE), Reflective Observation (RO), Abstract Conceptualization (AC) and Active Experimentation (AE). As an example, one might view a problem exclusively from the perspective of personal experiences with this problem or those problems considered to be similar, or one might view a problem from what has been verified by experts about the nature of the problem. The decision to trust one adaptive strategy over the other is personal. One might also attempt to resolve the problem by reflecting upon it and designing a plan, or by manipulating and testing applications until a solution can be found. Balance and experience with all four of these adaptive learning modes is the basis of Kolb’s theory. According to Kolb, “individuals expand their learning and adaptive processes through exercising them.”
Again, according to Kolb, when contrasting world views are consistently resolved through the suppression of one mode and the reliance upon its opposite, learning tends to become automatized around the trusted mode and limited in those areas which are suppressed. The result is a preferred “style” for learning.

Kolb has made a classification system popularize which identifies four basic learning “styles” which are described as follows:

- Diverges (CE+RO) rely upon their concrete experiences and process these experiences reflectively;
- Assimilators (AC+RO) rely upon theories and abstract conceptualizations which they process reflectively;
- Converges (AC+AE) rely upon abstract conceptualizations of the world, and process them actively;
- Accommodators (CE+AE) rely upon their concrete experiences and process them actively.
Using these four learning styles Kolb articulated his concept of *environmental learning press*, the idea that differentiated complexity inherent in each environment facilitates a particular type of adaptation. According to Kolb, a situation that demands experimenting with behavioural alternatives enhances and reinforces active experimentation. Hence, for Kolb, a particular task or environment may be particularly fertile for enhancing one or another generic adaptive competence. Kolb reports that his examination of these four styles of learners in careers reveals that Diverges are over-represented in social professions, Assimilators in science-based professions, Converges in natural science/mathematics careers and Accommodators in humanities and social science. Again, one expands his/her learning and adaptive processes through exercising them.

**Principles of 4MAT Modelled in Kolb**

Experiential Learning Theory, specifically Kolb’s cycle of interaction between Concrete Experiential (CE), Reflective Observation (RO), Abstract Conceptualization (AC) and Active Experimentation (AE) modes of personal adaptation, *is the theoretical basis for the 4MAT System for Teaching, Learning, and Leadership*. McCarthy credits Kolb for the structure upon which she built her model. And while McCarthy has slightly changed the articulation of Kolb’s theory to incorporate other theories and to reflect more recent research, each change was an extension of rather than departure from, Kolb’s original dictum that individuals expand their adaptive processes through exercising them.

By applying Kolb’s experiential theory, McCarthy demonstrates that her model effectively orchestrates a repertoire of specific teaching/learning sets which balance tensions between concrete experiential and abstract conceptual orientations. The comprehensive quality and depth of these learning sets, especially their articulation in practical language, are McCarthy’s contribution to the expansion of Kolb’s theory. McCarthy’s model also provides for balance between reflective observation and active experimentation through specified variations in teacher/learner interactions. Learning by validating preferred modes of adaptation while stretching to less preferred modes are clearly unifying principles in both Kolb’s and McCarthy’s models.
Kolb classified individuals into one of four learning styles based on a mathematical computation which derives from the individual’s score on a self-report instrument which measures preferences for perception and processing. This style is then described in terms of individual behaviours. McCarthy emphasizes the independent yet related nature of all four of Kolb’s aspect of style. She describes a leading adaptive mode, two supporting modes and a least preferred mode. Using the 4MAT Model, McCarthy draws attention to the commonalities in learning that individuals share, while also indicating the extent to which the behaviours of others must be accommodated.

In this way McCarthy applied Kolb’s constructs to help individuals compare their composite profile to the specific task requisites in any endeavour (Kolb’s Environmental Press) and then make decisions about employing their preferred modes while managing or stretching less preferred modes. Therefore, McCarthy resists the temptation to classify learners in terms of a single style. The key issues in McCarthy’s Model are the level of differentiation (or preference) and juxtaposition of each of Kolb’s four contrasting ways of understanding and acting on life’s circumstances.

Also, according to McCarthy, each of the four preferences is considered separately in light of its degree of reliance upon reflective or active processing. Individual learning style is the degree to which individuals differentiate and use each of Kolb’s four ways of knowing. Style for McCarthy, is the relationship between and among these modes as much as it is the most preferred.

When Kolb popularized his Experiential Learning Theory, little was known about the influences of hemispheric specificity upon teaching, learning and human development. The inclusion of hemispheric specificity as a further determinant of individual differences in learning is a further extension of Kolb’s model by McCarthy. McCarthy has overlaid a right and left hemispheric variation within each of Kolb’s four styles.
Figure 2.3  McCarthy’s 4MAT System

It is reasonable to examine the measurable commonalities, in light of the adaptations of Kolb’s model by Bernice McCarthy, which continue to exist between the two models. In recent years, statistical relationships between Kolb’ constructs of CE, RO, AC and AE [as measured by his Learning Style Inventory] and the four adapting modes which McCarthy has named quadrant one through four respectively [as measured by McCarthy’s Learning Type Measure] have been established and are reported as follows:

Concrete Experiential (CE) is significantly related to Quadrants 1 and 4 as measured by McCarthy’s Learning Type Measure (LTM). Abstract Conceptual (AC) has the highest mean score in Quadrants 2 and 3; however the means were not statistically different from each other. There is a statistically significant difference between LTM quadrant scores on Reflective Observation (RO) comparisons with
Quadrant 2 having the highest RO mean score and Quadrant 1 having the next highest mean.

There is a statistically significant difference between LTM quadrant scores of Active Experimentation (AE), with Quadrant 4 having the highest AE mean score and with Quadrant 3 having the next highest mean.

The following conclusions are supported by both Kolb’s Experiential Learning Theory and McCarthy’s 4MAT System:

- Individuals learn in different yet identifiable ways;
- Differences in learning styles, although clearly not related to aptitude, are significantly related to personal motivation and performance;
- Learning is a continuous, cyclical, life long process of differentiating and integrating personal modes of adaptation; and
- Learners expand and refine adaptive modes by exercising them.

2.2.3 Individuation: A Theory for Growth and Personal Development

Carl Gustav Jung

Jung’s Theory of Personality Types, is a holistic theory of human development which assumes the presence of measurable and consistent individual preferences for making sense of the world. Jung postulates that . . . much apparent random variation in human behaviour is actually orderly and consistent; being due to certain basic differences in the ways people prefer to use modes of perception and judgment.

For classification of the limitless variations in individual behaviour, Jung relies upon what he calls the four basic functions: sensing, thinking, feeling and intuition. These functions are opposing modes for making sense of the world. According to Carl Jung, sensing refers to taking in the observable by way of the senses, which tells you something exists; thinking, a term used to define logical decision-making processes, tells you what something is; feeling, a term for the process of appreciation in terms of subjective/personal value, tells whether something is of value or not; and intuition, a term used for apprehension of meanings, relationships and possibilities by way of insight, tells when something connects, where it came from and where it is going.
Jung emphasized that individuals continued to differentiate their personal type (a term Jung used for preferred functions) throughout their lives. According to Jung, a mature individual is one who has developed command of all four functions, elevating two of the four functions to a dominant and auxiliary status and differentiating the use of and respect for the remaining less preferred functions. This process, called *Individuation*, is a cornerstone of his work. Jung defines individuation “as a process of differentiation, having for its goal the development of the individual personality.”

Jung used the terms extroversion and introversion to describe two basic attitudes toward the environment. Extroverts are individuals who focus attention on objects and people in the environment, while introverts focus on the consolidation of energy within themselves. Kolb named these attitudes Active Experimentation and Reflective Observation.

The judgment-perception preference, added later to Jung’s theory by Isabel Myers, discriminates an individual’s predisposition for imposing order upon the environment. According to Myers, judging types impose convergent, orderly systems upon their environments. Perceptive types, by contrast, impose personally ordered, divergent systems upon their environment.

Jung’s contribution to 4MAT (and subsequently to teaching/learning environments) was his precise descriptions and research on Psychological Types and their preferences in personal development.

![Figure 2.4: Jung’s Personality Types](image-url)
Principles of 4MAT Modelled from Jung

Jung’s Theory of Psychological Type, specifically his concepts of *individuation* and *differentiated functions* are modelled throughout the 4MAT System for Teaching, Learning, and Leadership. In 4MAT, learning type is described as the order and juxtaposition of our possible type preferences. These preferences are then reported relationally from most preferred to least preferred. In this way individuals report their preferences for dominant (most preferred), support or auxiliary (second most preferred), third and least preferred. The message here, modelled from Jung is that continued personal development requires the differentiation of less preferred functions and the balance of the individual’s type. If Kolb’s cycle represents the outer structure of the 4MAT Model, Jung’s theory adds text and additional form inside the cycle.

It was also found that, statistically significant relationships exist between 4MAT learning types as measured by the Learning Type Measure (LTM) and the functions and attitudes of Jungian typology such as Feeling, Sensing, Thinking, Intuition, Extroversion and Introversion. For example, McCarthy’s Type One Learner has been statistically correlated with Jungian “Feeling types”, Type Two with “Thinking types”, Type Three with “Sensing types”, and Type Four with “Intuitive types”. There is also a significant correlation found to exist between the Watching score on the LTM and Introversion and between the Doing score and Extroversion. Types One and Four also report highest means on Perception and Types Two and Three highest means on Judgment as measured by the Myers-Briggs Type Indicator (MBTI).

It should also be noted that while correlation between the individual functions of Jungian typology and 4MAT learning types are supportable, one to one correspondence between the four aspects of Jungian Type (as measured by the MBTI) would oversimplify these constructs and therefore are not to be expected. Jung’s theory deals with the wholeness of personality, a constellation of human behaviours, while 4MAT focuses primarily on those behaviours related to the learning process. However, because the requirement to resolve the tension of polar opposites (central to Jung’s process of *Individuation* as well as Kolb’s Experiential Learning Model) forms the basis of the rationale for the 4MAT Model, it is reasonable to expect that
those constructs drawn from Jungian theory would be related to similar constructs in the 4MAT Model.

2.3 Development of Cerebral Asymmetry: Hemispheric Preferences

There is still little understanding of the reason the human brain developed hemispheric specialization in the first place. Some researchers have proposed that hemispheric specialization, especially left hemisphere dominance for language, emerged more as a result of the evolution of certain motor skills “that lend themselves to communication” than as a consequence of the asymmetric evolution of symbolic functions.

Therefore, the left-hemisphere evolved language, not because it was more analytic per se, but because it became well adapted for specific categories of motor activity. Additionally, the specified spatial skills of the right hemisphere are due to the evolution of different kinds of motor skills, those that involve the ability to manipulate spatial relationships. Much of the evidence reviewed by Springer and Deutsch (1998) suggests that hemispheric asymmetries in some form are present at birth.

The cognitive processes used for language and those used for spatial-perceptual functions are incompatible and therefore the brain had to develop separate processing systems. In clinical cases, where one hemisphere is damaged at birth, sensitive tests reveal hemispheric deficits which persist through development, leading to the conclusion that the basic blueprinting for asymmetry is present at a very early age. It is reasonable therefore, to conclude that genetic factors clearly influence hemispheric organization. Therefore, hemispheric specialization is probably present from birth, but is shaped further by the demands and input to the brain.

2.3.1 Differences in hemispheric function

According to Springer and Deutsch (1998), the most widely researched and cited characteristics used to describe the processes of the left and right hemisphere are as follows:

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<thead>
<tr>
<th>Left</th>
<th>Right</th>
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<tbody>
<tr>
<td>Verbal</td>
<td>Nonverbal</td>
</tr>
<tr>
<td>Digital</td>
<td>Visuo-Spatial</td>
</tr>
<tr>
<td>Sequential</td>
<td>Simultaneous</td>
</tr>
<tr>
<td>Rational</td>
<td>Analogueal</td>
</tr>
<tr>
<td>Logical</td>
<td>Intuitive</td>
</tr>
</tbody>
</table>
The verbal-nonverbal distinction was the first to emerge from studies of split-brain patients. The sequential-simultaneous distinction has its basis in the fact that the left hemisphere tends to deal with rapid changes in time and to analyse stimuli in terms of detail. The right, on the other hand, deals with stimuli simultaneously through patterns. These differences are widely researched and generally accepted.

Certainly the importance our culture places on words and verbal knowledge has influenced the idea that because the left hemisphere controls (in large measure) our language capability, it is the important one to develop. However, the right hemisphere houses important activities of its own, activities without which we would be unable to function normally. The right hemisphere appears to play a major role in our ability to perceive relationships and see things as integrated wholes rather than as a collection of isolated parts.

If any hemispheric damage happens in children, when the left is damaged, the right hemisphere is capable of developing language skills, but when the right is damaged, the left hemisphere is not capable of developing nonverbal spatial skills. This also suggests that the right hemisphere is better able to subserve the functions of both hemispheres. Also implied from these studies are speculations that routine tasks are the domain of the left hemisphere while the right hemisphere is assigned tasks for which there is no readily apparent code. Thus the right hemisphere is more flexible and able to handle greater informational complexity.

2.3.2 Hemisphericity and Human Learning

Clinical studies with “split-brain” patients (patients whose two hemispheres have been disconnected for medical reasons), and brain research on normal adults and children using specially developed technologies like Magnetic Resonance Imaging (MRI), Electroencephalogram Scans(EEG), Dichotic Listening Tests and Blood Flow Maps confirm the following facts that:

1. The hemispheres of the human brain process information and experience in identifiably different ways;
2. The neural organization in each hemisphere is complementary yet different;
3. The corpus callosum, the bundle of nerve fibers connecting the two hemispheres of the brain, serves to integrate the actions of the hemispheres;
4. Hemispheric specificity and hemispheric disposition (use preference) are quantifiable; and

5. Individual preferences for hemispheric integration have clear relationships to cognitive style, especially with regard to learning.

2.4 McCarthy and Brain Research

The hemisphericity research that was revolutionizing neuropsychology in the 1970’s also influenced McCarthy’s learning style model. At that time, research investigated the behavior of "split-brain" individuals, epileptic patients who had undergone surgical division of the corpus callosum, the neural fibers connecting the left and right brain of the neo cortex. The refinement of this surgical procedure coincided with the development of advanced electrical imaging techniques that allowed researchers to see the actual pattern of energy exchange as neurons fired in the brain. Because these scanning procedures were non-invasive, research on human subjects was expanded to include normal, healthy individuals. An explosion of new information on brain function resulted.

McCarthy determined that two findings from this research were particularly relevant to education. Split-brain research suggested that the hemispheres of the brain served different functions, responded to different stimuli, and, though always working together, appeared to have distinct domains of expertise. A corollary to these findings was that different kinds of experience encourage the growth of dendrite structures in different hemispheres. So that, for example, while listening and playing music by ear produce activity in the right hemisphere, learning to read music and attend to rhythm generate development in the left hemisphere in most individuals. Secondly, more and more evidence pointed to measurable individual differences in the development of neural systems and the employment of those systems. At this same time, Gregorc’s (1984) research on style confirmed what Kolb and McCarthy had found.

In her own research, McCarthy compared the achievement of three groups of students: one group was matched for style (as determined by Kolb’s learning style inventory) for half a day and then purposely mismatched for the other half of the day, a second group was given matched instruction for the entire day, and a third group received no special instruction. McCarthy fully expected the matched group to achieve the greatest gain. Instead, the group receiving instruction that was both
intentionally matched and mismatched performed the best. Continuing research along this line of inquiry, she finally concluded that although it was essential for a student’s style to be matched part of the time, complete matching was unnecessary and possibly counterproductive. She hypothesized that a synergistic relationship might occur when content is experienced in a variety of ways. McCarthy postulated, as well, that confidence in learning translates into a willingness and need to "stretch" into other styles. Bernice McCarthy, drawing heavily upon these brain studies and grounded in the work of John Dewey, David Kolb and Carl Jung, has created a pedagogical model which assumes (1) that individuals learn in different yet identifiable ways, and that (2) engagement with a variety of diverse learning sets results in higher levels of motivation and performance.

2.5 Bernice McCarthy’s 4MAT System

The 4MAT System, designed by Dr. Bernice McCarthy is defined as, "... an eight step cycle of instruction that capitalizes on individual learning styles and brain dominance processing preferences" (McCarthy, 1994). This instructional system moves students through activities appropriate for the four types of learners as well as through activities that encourage left or right brain development.

The 4MAT teaching model is based on a learning cycle that covers the four student types suggested by McCarthy and all the characteristics of the right and left hemispheres of the brain and also makes learning a continual process. In this cycle, while teachers revolve around the reel, they also teach according to personal differences by using educational strategies suitable for each student’s learning style (McCarthy and McCarthy, 2003). This model is a student centered model based on learning styles occurring based on the relation between the brain and learning and also centering the learning cycle.

2.5.1 The 4MAT System: The Three Elements

Dr. McCarthy has based her system on research from the fields of education, psychology, and neurology, incorporating the theories of David Kolb, Carl Jung and John Dewey. The 4MAT System consists of three elements therefore, those being 1) learning styles 2) brain mode and 3) modalities all structured within cyclic framework.
The First Element: Learning Styles

According to McCarthy (1990), some perceive reality mainly by sensing/feeling or intuition, while others rely on thinking through a situation or rationale. No one way, be it sensing/feeling or thinking, is totally exclusive of the other, nor is one superior to the other. On the contrary, one should complement the other, working in tandem. The second component in learning is processing which involves the functions of watching and doing. Some individuals are watchers first, others doers who dive right in. However, both are equal and complementary in that doers need to reflect on their actions and watchers need to act on their reflections. The theoretical foundation of the 4MAT System is built on how individuals perceive and process reality.

Perceiving

Human perception means the ways people take in new information. This occurs in an infinite variety of ways, all of which range between experience and conceptualization.

Experience

Conceptualization

Figure 2.5 Human Perception

Experience: Perception by personal engagement—sensations, emotions, physical memories; the immediate; the self; being in it.

Conceptualization: The translation of experience into conceptual forms—ideas, language, hierarchies and naming systems. It is an abstract approach to learning, being apart from it. The interplay between the “feeling” of experience and the “thinking” of conceptualization is crucial to the learning process. It connects the personal values and perceptions of students to those of expert learners.
Processing

Human processing means what people do with new information—occurs in an infinite variety of ways, all of which range between reflection and action.

Figure 2.6 Processing of Information

**Action:** Applying ideas to the external world; testing, doing, manipulating. The interplay between the “watching” of reflection and the “doing” of action is crucial as it provides the impetus for acting on internal ideas. It encourages the learner to test ideas in the real world and adapt what they learn to multiple and ambiguous situations.

**Reflection:** Transforming knowledge by structuring, ordering, intellectualizing.

"Kolb found that it is the combination of how we perceive and process that forms the uniqueness of our own Learning Style, our most comfortable way to learn" (McCarthy, 1994). When the elements that make up perception and processing are viewed on a continuum, one's place on the continuum determines their Learning Style. While all learners engage in all types of learning, most seem to favour one particular type. Dr. McCarthy's 4MAT model is formed when the continuums of perceiving and processing are juxtaposed, thus creating four quadrants or four major Learning Styles. Furthermore, when Dr. McCarthy overlaid her four strands with those of other researchers, similar conceptualizations of perceiving and processing were apparent. It must be acknowledged that other factors such as age, environment, and life experiences, to name a few, also affect Learning Style. The Four Major Learning Types by McCarthy are:
Type One Learners: Why? (Imaginative/Innovative Learners)

Type one learners perceive information directly and process it reflectively.

McCarthy describes their characteristics. They learn by feeling their experiences, being present to them, trusting in their perceptions, and being open to sensory input. They take time to reflect and ponder their experience. They seek meaning and clarity. They integrate experience with the self. They learn primarily in dialogue, by listening and sharing ideas. They excel in viewing these ideas from many perspectives. They have highly developed imaginations. They are insightful, absorbing reality, taking in the climate. They thrive on lots of reflecting time, especially when pondering new ideas. They seek commitment. They work for harmony and clue into the needs of others with ease. They are great mentors. They nurture others to help them accomplish their goals. They tackle problems by reflecting alone and then brainstorming with others. They exercise authority through group participation. If they are forced into a conflict situation (which is usually difficult for them), they deal with it through dialogue and a great deal of listening. They build trust through personal interactions.

Their favourite question is “Why?” They seek to know the underlying values.

Strengths: People skills, reflection

Goals: To be involved in important issues and to bring harmony

Need to improve: Working under pressure and taking risks.

Type Two Learners: What? (Analytic Learners)

Type two learners perceive information abstractly and process it reflectively.

Characteristics of these learners are: They learn by thinking through experiences, judging the accuracy of what they encounter, examining details and specifics. They take the time to reflect and ponder on what they experience. They seek to achieve goals and to be personally effective. They integrate their observations into what they already know, forming theories and concepts. They excel in traditional learning environments and are thorough and industrious. They judge new learning by how theoretically sound it is. They are intrigued by how systems function. They look for structure. They thrive on stimulating lectures and readings. They seek continuity
and certainty and are wary of subjective judgments. They have clearly defined goals and monitor cutting-edge research in their fields. They want to be as knowledgeable and accurate as possible. They are systematic. They tackle problems with logic and analysis. They exercise authority with principles and procedures. If they are forced into a conflict situation, they deal with it systematically, dissecting the problem before coming to a conclusion. They build trust by knowing the facts and presenting them systematically.

Their favourite question is “What?” They seek to know what the experts know.

Strengths: Concepts and theory, reflection
Goals: Intellectual recognition
Need to improve: Creativity

**Type Three Learners: How Does This Work? (Common Sense Learners)**

Type three learners perceive information abstractly and process it actively.

These types of learners have the following characteristics. They learn by thinking through their experiences, judging the usefulness of what they encounter. They take the time to figure out what can be done with what they learn. They seek utility and results. They integrate new learning by testing theories. They excel at down-to-earth problem solving, often tinkering to make things work.

Type three learners learn best with hands-on techniques. And once they have it, they move quickly to mastery. They are pragmatists: they need closure; they like to get things done. They thrive in the company of competent people and excel at problem solving. They seek to get to the heart of things. They work for deadlines and “keep to the plan.” They like to be considered competent. They tackle problems quickly, often without consulting others. They exercise authority with reward and punishment. If they are forced into a conflict situation, they deal with by creating solutions. They build trust with straightforward forcefulness.

Their favourite question is “How does this work?” They seek to know the usability of theory.
Strengths: Action, getting things done

Goals: Productivity, competence

Need to improve: People skills

**Type Four Learners: What If? (Dynamic Learners)**

Type four learners perceive information directly and process it actively.

The characteristics possessed by type four learners are: They learn from their perceptions and the results of their experiences. They are open to all manner of sensory input. They take the time to consider the possibilities of what they learn. They seek challenge and are risk takers. They integrate their present experiences with future opportunities. They learn primarily through self-discovery. They excel at synthesizing. They are flexible and flourish in challenging situations. They seek to influence others. They push their potential. They are at ease with all types of people. They actively seek growth and pressure others to do so. They tackle problems with their intuition. They exercise authority by influence and expect their people to be accountable. If they are forced into a conflict situation, they react emotionally and then move to cool rationally. They build trust with high communication skills and openness.

Their favourite question is “What If?” They seek to know the possibilities.

Strengths: Innovation and action for change

Goals: To be on the cutting edge of social progress

Need to improve: Digging into the details
Figure 2.7 The Learning Styles by McCarthy
The Second Element: Right-mode and Left-mode Brain Functioning

Anatomically, the brain is divided into left and right hemispheres with each side performing different functions. The left hemisphere is the realm of the analytical, systematic and rational, while the right hemisphere is intuitive, random, and creative. The left is viewed as the mind or the head, the right, the heart. Joseph Bogen’s Concept of Hemisphericity, (cited McCarthy, 1981, 1987) suggests that individuals have a preferred brain modality. However, to say that one hemisphere is superior does a disservice to the other. Unfortunately, education has done just that by revering the 'head' while downplaying the importance of the 'heart'; whereas, the purpose of education should be moving towards wholeness.

"The dichotomy between the two modes of knowing has gone on long enough. It is a false dichotomy. It is time to teach both analysis and synthesis. It is time to teach to the whole brain, intellectual and intuitive, mind and heart, content centered and student centered." (McCarthy, 1994)

Learning Style and Hemispheric Dominance

When hemispheric dominance was tested in each of the four Learning Styles, Quadrants Two and Three revealed a tendency to left mode bias, whereas Quadrants One and Four were right-mode biased. It is to the bottom of the 4MAT cycle in Quadrants two and three that schools primarily function thereby reinforcing the notion of students as passive receptacles. The back and forth movement between Two and Three are what McCarthy refers to as the pendulum style of teaching. By its very nature, it engages only two-eighths or twenty-five percent of the learners.

Because findings from the McCarthy Hemispheric Mode Indicator revealed that right, left and whole brained learners are present in each of the four quadrants, the 4MAT model added alternating right-mode and left-mode brain function to each quadrant in effect creating a wheel with eight equal wedges.

Wholeness and Balance

Kolb's research shows a correspondence between learning style and type of career chosen. He also noted a correlation between a student's own learning style and that of the teacher who had the most impact on the student. This raises the question, is it the teacher's charismatic nature which in effect overpowers the student's preferred
learning style thereby sublimating student's own learning style? That being the case, Dr. McCarthy argues for the necessity of teaching all four modes of learning.

Although the 4MAT System seeks to determine learning style and brain mode preference, it should not be used as an instrument for labelling or pigeon-holing students. Quite the reverse, its sole purpose is for wholeness and balance in learning and by doing so, educators are creating individuals who are better equipped to deal with personal and global issues.

**The Third Element: Modalities**

The third and final element in the 4MAT System is modalities, that being the sensory channels by which we receive information. The three modalities are visual, auditory, and kinaesthetic. Individuals not only exhibit preferences for Learning Style, brain mode, but modality also. Visual learners need to see and imagine; auditory learners need to hear and verbalize; kinaesthetic learners need to do and manipulate. By addressing the three elements, learning style, brain mode, and modality, teachers will go a long way to meet the individual needs of students.

"Learning is reflective and active, verbal and nonverbal, concrete and abstract, head and heart. The teacher must use many instructional methods that are personally meaningful to each student. The more students can travel the cycle, the better they can move to higher-order thinking." (McCarthy, 1997)

**A Cycle of Instruction**

4MAT offers specific guidance for any teacher to teach anything in a way that will appeal to all types of learners.
2.5.1 Steps in the 4MAT Model

According to McCarthy, 4MAT deepens the experience of learning by engaging learners in diverse learning sets which require the learner to form and test the limits of his/her understanding. McCarthy’s 4MAT System, an eight step model for teaching, is summarized as follows:

**Step One — Quadrant 1 Right**

The first step of the 4MAT System is designed in such a way to engage the learner in a concrete experience which leads to a search of prior knowledge and prior experience. This search is designed to create an interactive group dialogue which connects what the learner already knows and believes to what the teacher intends to teach. There are no correct answers in this dialogue. Learners experience and compare their perceptions of their existing state of knowledge and work cooperatively to create an overall learning set from which to proceed. In this step the teacher encourages...
diversified ideas, dialogue and participation. Here McCarthy applied Kolb’s concrete experience and reflective modes for making sense of the learning environment, as well as the engagement and encouragement of subjective valuation, i.e. Jung’s feeling function. This step encourages relational and symbolic thinking which is a right hemispheric function.

Suggestions for teachers

- Connect students directly to the concept in a personal way.
- Capture students’ attention by initiating a group problem-solving activity before delivery of instruction.
- Begin with a situation that is familiar to students and builds on what they already know.
- Construct a learning experience that allows diverse and personal student responses.
- Facilitate the work of cooperative teams of students.
- Elicit non-trivial dialogue from students.

Evaluation: Engagement, participation in collaborative dialogue and generation of ideas.

Step Two— Quadrant 1 Left

Quadrant one left, the second step of McCarthy’s 4MAT System, is designed to add process judgment to the perceptions and dialogue generated in step one. In this step, the teacher engages student reflection upon their existing level of knowledge and experience to determine if their opinions and beliefs are supportable.

In quadrant one (right and left) the goal is engagement. However, in quadrant one left, the teacher’s role is to assist student as they demystify and pattern their thinking. In quadrant one left, beliefs and opinions begin to evolve into organizers and structures for future thinking and theory building. This phase of the 4MAT cycle emphasizes left hemispheric thinking and therefore has as its goal the imposition of structure.
**Objective:** To examine the experience.

**Suggestions for teachers**

- Guide students to reflection and analysis of the experience.
- Encourage students to share their perceptions and beliefs.
- Summarize and review similarities and differences.
- Establish a positive attitude toward the diversity of different people’s experience.
- Clarify the reason for the learning.

**Evaluation:** The quality of students’ analyses of their collective subjective world of experience. It is also of students ‘ability to explore stated feelings by listening, listing, patterning, prioritizing and stating their own reflections.

**Step Three— Quadrant 2 Right**

This step of the 4MAT System is designed to create a context for the learner to represent the subjective nature of his/her existing knowledge as a preparation for the validation and analysis of ideas. In this step, learners are encouraged to symbolize, in as many modalities as feasible, their present state of understanding of the subject matter. Image making, central to this step, is a right mode activity. The emphasis here is the expansion of representations of meaning. This step requires the learner to begin to shift from reflective experience to reflective thinking. The teacher’s role here is to draw attention to aspects of structure and objectivity implicit in the students’ representations of what they know.

**Objective:** To integrate personal experiences into conceptual understanding.

**Suggestions for teachers**

- Provide a metaview, lifting students into a wider view of the concept.
- Use another medium (not reading or writing) to connect students’ personal knowing to the concept (i.e. visual arts, music, movement, etc.).
- Involve learners in reflective production that blends the emotional and the cognitive.
• Transform the concept yet to be taught into an image or experience, a “sneak preview” for the students.
• Deepen the connection between the concept and its relationship to the students’ lives.
• Relate what the students already know to what the experts have found.

_Evaluation:_

Quality of student production and reflection

**Step Four— Quadrant Two Left**

Step four of the 4MAT System engages students in objective thinking. Here, the emphasis is given for the analysis of verifiable concepts, facts, generalizations and theories. The role of the teacher is to present information and experience in complete and systematic ways. The good “two-left” lecture builds upon the personal connections established in quadrant one to foster conceptual thinking.

**Objective:** To define theories and concepts.

_Suggestions for teachers_

• Provide “acknowledged body of knowledge” related to the concept.
• Emphasize the most significant aspects of the concept in an organized, organic manner.
• Present information sequentially so students see continuity.
• Draw attention to important, discrete details; don’t swamp students with myriad facts.
• Use a variety of delivery systems: interactive lecture, text, guest speakers, films, visuals, CAI, demonstrations, etc. when available.

_Evaluation:_ Teacher verbal and/or written checking for student understanding

**Step Five— Quadrant Three Left**

In this step of the 4MAT System, the emphasis shifts from acquisition and assimilation to testing and adaptation. Students now take the lead to apply what has been taught. In quadrant three left, the goal is reinforcement and diagnostic evidence of the student’s ability to apply the concepts taught. The teacher’s role here is
coaching and assisting, as the students refine their ability to find applications of their own ideas. This teaching set engages Kolb’s abstract concepts in action and Jung’s extroverted sensing functions. It also models Dewey’s idea that knowledge must be tested in the environment. Because the emphasis of this teaching/learning set is left mode, correct answers and student products which demonstrate their ability to apply the concepts are considered important here.

**Objective:**

Working on Defined Concepts (Reinforcement and Manipulation)

*Suggestions for teachers*

- Provide hands-on activities for practice and mastery.
- Check for understanding of concepts and skills by using relevant standard materials, i.e. worksheets, text problems, workbooks, teacher prepared exercises, etc.
- Provide opportunities for students to practice new learning, perhaps in multi-modal ways (learning centers, games fostering skills development, etc.)
- Set high expectations for skills mastery.
- Use concept of mastery learning to determine if re-teaching is necessary and how it will be carried out.
- Have students create additional multi-modal practice for each other.

*Evaluation:*

Quality of student work, perhaps an objective quiz

**Step Six— Quadrant Three Right**

This step of the 4MAT System exemplifies John Dewey’s idea of ‘the student as a scientist’. In this learning set, the student tests the limits and contradictions of what he understood. The teacher’s role is to encourage students to take the application of learned ideas to more sophisticated, personal levels. Students are encouraged to develop their own applications which demonstrate that they understand and can apply what has been learned. Project work is the essence of this phase. The right mode emphasis in this learning set is designed to encourage students to create personal applications of their experiences with the ideas learned.
**Objective:**

“Messing Around” (Adding Something of Themselves)

**Suggestions for teachers**

- Encourage tinkering with ideas /relationships /connections.
- Set up situations where students have to find information not readily available in school texts.
- Provide opportunity for students to design their own open-ended explorations of the concept.
- Provide multiple options so students can plan a unique “proof” of learning.
- Require students to organize and synthesize their learning in some personal, meaningful way.
- Require students to begin the process of planning how their project will be evaluated, identifying their own criteria for excellence.

**Evaluation:**

Students’ on-task behaviour and engagement in their chosen options

**Step Seven—Quadrant Four Left**

Step seven of the 4MAT System requires the learner to critically examine the place of the newly acquired knowledge and experience in his or her existing world view. The central issue here is that student should think what new questions do I have and what must be done to integrate this learning into a meaningful conceptual subset. Working alone or preferably in pairs and triads, learners in this learning set edit and refine what they have worked. They also face and resolve contradictions implicit in the tension between new and earlier schema. The teacher’s role here is to guide the refinement of the old schema and encourage the formation of a more complete perspective. A requisite of this step is to objectify intuition.
**Objective:**

Evaluating for Usefulness and Application

**Suggestions for teachers**

- Give guidance and feedback to students’ plans, encouraging, refining, and helping them to be responsible for their own learning.
- Help students analyze their use of the learning for meaning, relevance, and originality.
- Maintain high expectations for completion of chosen options.
- Help mistakes to become learning opportunities.
- Summarize by reviewing the whole, bringing students “full circle” to the experience with which the learning began.

**Evaluation:**

Students’ willingness and ability to edit, refine, rework, analyze, and complete their own work

**Step Eight— Quadrant Four Right**

The essence of step eight in the 4MAT System is integration, celebration and closure. This is the last of McCarthy’s learning sets, the learner returns to the place where he/she began, the self, and integrates the learning experience into a slightly different, personally held world view. This is the step where presentations are given, where poems are recited, where letters are mailed and research reports submitted. The teacher’s role is to join in the celebration and facilitate entry into the next unit of study.

**Objective:**

Doing it themselves and sharing what they do with others

**Suggestions for teachers**

- Support students in learning, teaching, and sharing with others.
- Establish a classroom atmosphere that celebrates the sharing of learning.
- Have opportunity for students to practice new learnings.
• Make student learning available to the larger community, i.e. books students write are shared with other classes; students report in school paper; student work is displayed throughout the school; etc.

• Leave students wondering (creatively) about further possible applications of the concept, extending the “what ifs” into the future.

*Evaluation:* It is to find student’s ability to report and demonstrate what they have learned, expressions of student enjoyment in the sharing of their learning, to find quality of student final products.

### 2.6 Features of 4MAT lessons

4MAT lessons have the following Features.

- They create fascination

They begin by captivating and inspiring learners by showing how learning connects to them and relates to their own lives (We call this the CONNECT step). One key feature of a good CONNECT activity is that it does not include any content or even a problem involving the use of the content. Connections must first come from the students, either through an activity that relates or an EXPERIENCE that draws them into the learning process, to want to know more, to understand why?

- They generate active dialogue

4MAT Lessons encourage student sharing and discussion and include methods for drawing students into discussions about how information relates (The ATTEND step). Social dialogue and sharing are crucial in the 4MAT process, and are built-in to the design process. 4MAT System is based on the belief that people often learn as much from each other, as they do from the teacher.

- They uncover the essence or clarify the purpose of learning

They uncover the essence, by helping learners see the big picture or how learning connects to the underlying content that teachers are asking learners to master (The CONCEPT). It is not possible to teach a 4MAT wheel without first knowing the over-arching idea that the teacher is teaching or how it relates.

- They encourage student adaptation of knowledge
4MAT lessons let students take over, to be responsible for their own learning and to create something new in the world by using learning in some new and original way. Learning by doing has much more impact than just listening to information. 4MAT requires people to do something new with learning—to adapt information in a new and original way. This is the PERFORM step of 4MAT and the one that students often enjoy the most.

- They address both sides of the brain

4MAT Lesson Plans incorporate right and left mode processing techniques into each major phase of learning. McCarthy’s research with students has shown that both types of strategies are important but students seem most engaged in the Right Mode steps of 4MAT, so these are crucial steps in creating more dynamic learning for students.

In a 4MAT learning environment, one can see more of this…

- Motivational activities, that connect learning to the lives of students
- Displays of student work
- Lively discussions of diverse viewpoints
- Visual displays of key information and ideas
- Learning by doing
- Active projects, not seat work
- Key conceptual ideas, that tap into the interests of students
- Student initiated learning

In a 4MAT learning environment, one can see less of this…

- Fragmented presentations that do not connect
- Skills and Drills
- Rote memorization
- Long lectures
- Knowledge for knowledge sake
- Teacher-directed learning
• Students asking, “Why do I need to know this?”

It is just not enough to know what students should learn. Teachers must also consider how people learn. That is what 4MAT helps provide—a process for helping people improve the quality and impact of learning.

4MAT and Assessment

4MAT offers teachers and trainers a guide for assessing learner growth through the course of a lesson.

Figure 2.9 4MAT and Assessment

4MAT and Curriculum

4MAT offers a concept-based framework for curriculum and instruction that focuses on (1) Concepts, (2) Essential Questions, (3) Content and Standards and (4) Outcomes, and (5) gives specific guidance on how to connect all of this to Learners.
Conclusion

The investigator traced the origin and historical perspective of 4MAT System of Instructional Design. The investigator also examined the learning cycle and the 4MAT System of Instructional Design which is based on learning styles and hemispheric preference developed by Bernice McCarthy. This helped the investigator to frame the topic of the study and to adopt a suitable procedure to carry out the study.