AN INVESTIGATION OF INTUITIVE THINKING AS IT RELATES TO THE VISUAL DECISION-MAKING PROCESS

by

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This thesis advances the proposition that intuitive thinking, although difficult to observe, explain or measure, can be the subject of investigation and is amenable to analysis. The nature of intuitive thinking is reviewed, and its characteristics applied to an observable situation during a summer school course in which the subjects and the instructor/researcher recorded their awareness of intuitive thinking in journal form while involved in solving a variety of visual and creative problems. It is shown through the analysis of these evidences that four basic types of intuitive thinking are used during the creative problem-solving process. Further analysis shows that thinkers are sensitive to a variety of external influences, which either inhibit or facilitate intuitive behaviour. The study concludes that it is useful for educators involved in visual problem-solving activities to be cognizant of the physical and psychological factors that influence intuitive thinking and that it is possible to cultivate those heuristic behaviours which facilitate this form of non-deliberate thinking.
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When someone initiates a search, many others are involved; when something is learned, many other things are affected.

This has been proven true during the research and writing of my thesis. I am grateful to have had the opportunity to look anew not only at myself personally, but at the ideas that have been accumulating in my head, asking to be tempered.

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KU MANO NUPYA KUTEMWA

To know and to love
CHAPTER I

INTRODUCTION AND STATEMENT OF PROBLEM

Introduction

In education, we focus on two basic types of behaviour; the deliberate, and the intuitive. Both are accepted as existent, but because of their differing natures, the deliberate has been well documented, while the intuitive has not.

This discrepancy in documentation reflects the unique nature of each behavioural strategy. The deliberate, because it is based on deductive reasoning, can be described and discussed by observers and by the individual involved in the process itself. The goal is often predictable and the steps toward it intentional, even premeditated. Deliberate behaviour follows a linear mode of thinking which takes place in an orderly sequence.

Intuitive behaviour, on the other hand, escapes observation because the process through which the formulation or solution has been arrived at is seldom evident to the one experiencing it or to the vigilant observer. Hunches, leaps of understanding, answers from a "mysterious source" are difficult to observe, explain, describe or measure. Thus, documentation of intuitive thinking or behaviour defies the statistician or empirical researcher's need to record, measure and evaluate.

Both of these behavioural strategies are evident in the
classroom during problem-solving activities. However, while both are accepted as natural and necessary, the deliberate is always more in evidence. Also, emphasis on the non-intuitive aspects of mathematics and science in education encourages a focus on deliberate, analytical, rational modes of thinking. Intuitive thinking, by contrast, is obscure, unperceived, and usually unverbalized even by the person involved and therefore not in evidence. Yet intuitive thinking is crucial to the creative process and is therefore an essential focus for those involved in the arts and specifically art education.

Recently, educators have been concerned to acknowledge the interdependence of the two behavioural modes, allowing that to develop one without the other is to deny the person as a total entity and to limit the holistic operation of the mind. Although opinions differ on right and left brain theory, the controversy has helped to point out the educational necessity of developing both modes of behaviour to their maximum, without designating one as a more appropriate strategy than the other. Indeed, intuitive behaviour, although it is not easily accessible to the observer, seems to use many, if not all the intellectual operands characteristic of deliberate behaviour except that the implicit nature of the intuitive makes it less easily communicated.

More attention in the past has been given to the creative product than to the intuitive process which helps to give it birth. Little is known about the intuitive thinking which takes place during the conception, stages, phases, transitions, failures and revisions of the creative act. In fact, the relationship between intuitive thinking and visual problem solving is basically unexplored. For these
reasons, an investigation was undertaken of the nature and development of intuitive behaviour during the visual decision-making process and results of that investigation were recorded and interpreted so that the nature and development of intuitive behaviour might be more clearly understood.

**Purpose of the Study**

**Statement of the Problem**

This study was designed to investigate the nature of intuitive thinking as it related to visual problem solving by addressing the following questions:

- what are the characteristics of intuitive thinking?
- how are these characteristics manifested in behaviour?
- in which ways is intuitive thinking influenced (or affected) externally?
- does intuitive behaviour become institutionalized?
- to what extent does it defy institutionalization?
- can intuitive thinking be described in terms that make it amenable to refining or sharpening through education?

These questions were given specific focus by being addressed to teachers taking an interdisciplinary summer school course. The research questions were as follows:

1. What are the characteristics of intuitive thinking as described by the conduct of members of a summer school class for elementary teachers?
2. In which ways is intuitive thinking perceived by these teachers to be manifested in their behaviour during and outside of class, in the course of work undertaken during the summer school?

3. In which ways is intuitive thinking perceived by the instructor/researcher to be manifested by the teachers, in the course of visual work undertaken by the teachers during summer school?

4. What kinds of evidence in records kept by the teachers and the instructor/researcher suggest that some methods of intuitive thought are more efficacious than others in promoting further thinking or achieving outcomes satisfactory to the teachers, or to the instructor?

5. To what extent is there congruence between the researcher's perceptions of intuitive thinking and those enunciated by the teachers?

Definition of Terms

**Intuition**, although defined in various ways, is for the purpose of this paper, an unpremeditated intellectual process through which one has the ability to extrapolate, organize and synthesize information available to the subconscious because of past experience, thereby arriving at a possible, but tentative formulation without rational or deductive reasoning. Intuition is characterized as the ability to make a mental leap in a very short span of time, which is seldom evident to the one experiencing it or to the vigilant observer.

**Intuitive Thinking** is generally understood to comprise a method of arriving at formulations or conclusions without being aware of going through analytical and cognitive processes to reach them.

In this study, it is a description of mental activities by which
students say they arrive at a visual decision.

Behaviour means the observable and describable actions or activities of an individual. In this study, behaviour is the actions or manifestations of intuitive and intellectual thinking during the visual decision-making process.

External Elements are variables that have a presence independent of the influence of the actor. Specifically, in this thesis, three external elements affecting intuitive thinking are identified: the conduct of the teacher; peer group response; environmental factors.

Productive Thinking is an intellectual activity using the most sensitive creative components available to an individual. It uses both cognitive and intuitive strategies of thinking in a way that produces a unique high level solution, rather than merely solving a problem.

Problem-Solving -- the task of working out some action that will enable the existing situation to be replaced by a more desirable situation.

Analytical Thinking is cognition that proceeds deliberately and explicitly, a step at a time. Thinking progresses with a rational basic awareness of all the information and operations needed. It is deductive and linear.

Subconscious -- existing and operating beneath or beyond consciousness; the totality of mental processes of which the individual is not aware.
Preconscious—antecedent to consciousness or to conscious action of some specified kind.

Design of the Study

Population

Persons involved in the study were fourteen teachers who had shown high performance levels both in their classroom teaching and as summer school students at the University College of Cape Breton. Each was enrolled in a new programme in elementary education organized to provide a base for an "integrated creative arts programme" in language, writing, literature, art, drama, and movement (University College of Cape Breton Calendar, 1982).

Time, Place, Conditions

The study took place at the University College of Cape Breton, Sydney, Nova Scotia, in July 1983, for the duration of one month, with daily sessions from 8.30 a.m. to 12.30 p.m.

Method of Data Gathering

Data development and collection was effected by the compilation of written records wherein the focus was on introspection and reflection. Each participant and the instructor, who was also the researcher, recorded in a visual/literary diary their thoughts on intellectual and intuitive thinking processes while planning and completing projects in visual problem solving. Their discussions with peers and with the instructor about the resulting activity were recorded through daily journal notation.
The instructor also used the journal/diary notation method to conduct a personal investigation into intuitive thinking, by recording daily any evidence of intuitive behaviour observed during lesson planning and teacher/activity lessons.

The instructor analyzed the class's visual art products to find evidence of intuitive thinking. These products were photographed and descriptions written about them. Also, participants examined their own products through introspection and reflection to try to discover which parts seemed to have been created intuitively.

**Interpretation of Data**

(a) Notations on intuitive thinking recorded in instructor and participant journals were compared at the end of each unit of study to discover variations in opinion about discovered or experienced intuitive behaviour.

These recorded notations were discussed critically. Similarities and divergencies were examined to see if any patterns of intuitive behaviour might be discovered.

(b) The instructor's and participants' data on the visual analysis of the art product were compared to see to what extent their respective points of view about intuitive behaviour converged or diverged.

These products were examined to see whether characteristics might exist that could be called endemic to intuitive behaviour. These were tabulated along with other significant data which might bring clarification to the phenomenon of intuitive behaviour.
Diary notations were scanned to see how closely the participants' intuitive behaviour followed the instructor's expectations rather than their own intuitive responses, and how and if peer group pressure affected this response.

Results were analyzed to discover whether the intuitive behaviour of members in the class revealed commonalities, whether these commonalities persisted, or whether they became more divergent. In other words, the question could be asked, did the intuitive behaviour become institutionalized or did it defy institutionalization?
CHAPTER II

REVIEW OF THE LITERATURE

Introduction

This chapter will review some of the ways scholars have defined intuition or intuitive thinking. Secondly, it will describe the characteristics of intuition. Thirdly, it will look at intuition and imagery; intuition in children; the need to order intuition and bring it to actualization. This chapter will also examine intuition and the educational environment; creativity; problem-solving. Lastly, it will look at imaging and intuition, the facilitators of intuitive thinking, and the possible training of intuitive thinking.

Intuition or Intuitive Thinking

By its very nature, intuition defies succinct definition. There is, however, some commonality found in most statements which attempt to clarify this non-specific form of thinking.

As early as 350 B.C., Aristotle wrestled with the concept of intuition, basing much of his logic upon it. He believed that cognitive links were "put together by intuition in the proper order of connection and held together by memory." (Seidel, 1966, p.22).

Descartes (1596-1650) called intuition a mysterious power and was convinced that if man used this power of intuition he could not go wrong. He believed intuition to be conceived without a
"shadow of a doubt" and that intuition was "pure and attentive seeing" which the mind performed freely (Seidel, 1966, p. 22).

Descartes' view did not take into account that intuition can be misguided, or misinformed. One modern view, espoused by Fischbein (1979) states that "wrong intuitions may endanger the adequate use of correct knowledge" and "render difficult the acquisition of correct interpretations in a given field" (p. 33).

Kant, in the 17th century, foreshadowed the stance of modern philosophers by declaring intuition to be one of two facets of human learning. He said that "human knowledge arises through the joint functioning of sensibility and intellect, or understanding; it consists of a union of intuition (the product of sensibility) and concept (the product of understanding)....neither by itself can give us knowledge: 'Thoughts without content are empty',...'intuitions without concepts are blind'" (Kemp, 1968, p. 16).

In many ways, modern definitions of intuition harken back to the early statements made by Aristotle, Descartes and Kant. For instance, Fischbein (1979) describes intuition as a "derived form of knowledge capable of transcending direct, empirically obtained information." He says it is "immediate knowledge" represented by a "mental leap which cannot be completely justified by logical or factual arguments." According to Fischbein, intuition is "global", a "compacted", "synthetic", "condensed" view which is highly resistant to teaching influence (p. 34). It can "organize information, synthesize previously acquired experiences, select efficient attitudes, generalize veri-
fied reactions and guesses, by extrapolation, beyond the facts at hand." (Fischbein 1979). Blank (1982) extended Fischbein's definition to say that this subconscious process yields a product which "appears self-evident and which as a consequence is available to, and if allowed will take action" (p.137).

Bruner (1971) on the other hand, characterizes intuition (as opposed to analytical thinking) as a field of intellectual endeavour which is "less rigorous with respect to proof, more visual or iconic, more oriented to the whole problem than to particular parts, less verbalized with respect to justification and based upon a confidence in one's ability to operate with insufficient data" (p.82).

Fischbein (1979) supports Bruner's (1971) statement that intuition is iconic or a visualizing process. He contends that intuition shares essential features with the iconic forms of knowledge, enabling it to translate information directly in terms of practical decisions and action. For example, each day people have to make decisions for survival—whether they have time to cross the road before the arrival of an approaching car; whether they can get through the automatic door before it closes on them; whether they can catch the bottle of red dye before it hits the counter; and, more dramatically, whether the trapeze artist's moment of departure from one swing will allow connection with another.

The analytical thinking process by nature is not rapid enough to meet these survival needs; however, through the process of intuitive thinking, one can view the whole problem globally, assess the situation, and take immediate action.
In a global situation, Fischbein (1979) says that "perception, evaluation, decision-making, and effective behaviour are deeply connected," and that the "anticipation of the efforts and reactions" of the perceiver enable the perceiver to "cope correctly with the situation." The behavioural estimation is based on previous experience. Fischbein calls intuition a "mechanistic translation between the symbolic and the enactive" (p.36).

He clarifies further, stating that intuition represents the basic mechanisms for connecting knowledge with action. Strictly speaking, knowledge is image; i.e. an internal subjective replication of objective realities (p.36).

Fischbein (1979) contends that the difference between intuitive and logical, analytical thinking is that in the intuitive, the transition between sensory perception and action is direct and is immediately implicated, whereas the analytical thinking process is a "lasting process"..."explicit," and "time consuming" which cannot be "effective if a direct, prompt, rapid form of adaptation is required" (p.36).

Intuition, according to Hinsic and Campbell (1975) is a "special method of perceiving and evaluating objective reality," which relies heavily on "unconscious memory traces of past and forgotten experiences and judgements. In this way, a storehouse of unconscious wisdom which has been accumulated (in unconscious memory) in the past is used in the present" (p.412).

English (1958) defines intuition as a judgement, meaning or idea that occurs to a person without any known process of cognition
or reflective thinking! (p.276-77). English says that this judgement is often reached "as a result of many minimal clues and of awareness of the similarity of the present instance to other experiences, though without awareness of the comparing or explicit recall of the other experiences" (p.277).

Classification of Intuition

Fischbein (1979) classifies three basic kinds of intuition and their function. They are: affirmatory; anticipatory; conclusive.

Affirmatory intuitions, according to Fischbein (1979) are divided into the categories of primary, secondary, operational-and content-orientated. Primary intuitions are interpretations or explanations of belief which develop from everyday experiences. They emerge independent of form instruction but are culturally influenced--thereby changing with the belief structures of society.

Secondary intuitions are those developed by formal schooling or systematic intellectual training. Intuitions which are forthcoming therefore emerge from a different intellectual premise: primary intuitions will be largely experiential, whereas secondary intuitions will be more factually based.

Operational intuitions are intuitions which accompany the process of logical cognition and are related to formal programs of logical inference. These have to be accepted as valid in themselves.

Content-oriented intuitions are explanations, interpretations and representations which relate our mental attitude to special spatial experiences and chance phenomena. For example, these intuitions deal with spatial problems which have to be solved with immediacy, i.e. a
batter has to decide in a flash whether he can hit the ball that is coming toward him; or the person skipping has to know the moment to jump into the skipping rope.

Anticipatory intuitions according to Fischbein (1979) are those preliminary global views which precede the analytically developed solution to a problem. Through a global view one can see the problem in its totality and move rapidly to take an educated guess.

Conclusive intuition, on the other hand, is characterized by the ability to "summarize in a globally structured vision, the basic ideas of the solution to a problem previously elaborated" (p.34).

Characteristics of Intuition and Intuitive Thinking.

Some characteristics of intuition or intuitive thinking according to Fischbein (1979) are:

Self-evidence - Intuition is immediate knowledge; an intuitively accepted truth is self-evident and does not need explicit proof.

Coercive - As a consequence of their intrinsic obviousness, intuitions exert restraint on the processes of conjecture (guessing), explaining, and interpreting facts.

Extrapolative capacity - Intuition transcends obtained information by rapidly estimating the outcome. The mental leap that occurs cannot be completely justified by logical or factual explanations.

Globality - Intuition is a synthetic view as opposed to an analytical one. It can be expressed by visual
symbolization because it is a consensed view.

Intuition allows for a unique representation of the whole situation.

**High stability** - Intuitions often exhibit a high resistance to teaching influences and to formal experimentation. It is not uncommon for the original or primitive interpretations or intuitions to be held even after new information has been acquired.

Wald (1975) adds two elements to Fischbein's list of characteristics. They are: infralogical and ineffable.

**Infralogical** - Intuitive thinking operates below the logical level, which is subconscious or subliminal and the opposite of analytical thinking.

Being infralogical, intuitive thinking does not follow explicit steps which have been premeditated. According to Bruner (1963) intuition proceeds with

manoeuvres based seemingly on an implicit perception of the total problem. The thinker arrives at an answer, which may be right or wrong, with little if any awareness of the process by which he reached it. He rarely can provide an adequate account of how he obtained the answer, and he may be unaware of just what aspects of the problem situation he was responding to. (p.58)

Research about the imagery resulting from the subliminal infralogical and transliminal states is scarce. However, there are some studies which illuminate this part of the study of intuition.

The recent upsurge of interest is, according to Khatena (1979) due to
work by Bugelski (1970) who contends that images are indirect reactivations of earlier sensory or perceptual activity rather than mental mechanisms (p.318).

These sensory perceptions are made available through the subconscious or as Rugg (1963, cited by Samuels and Samuels, 1975) calls it, the transliminal mind. He says that the transliminal mind is a "dynamic antichamber" between the conscious and unconscious mind. He feels that the threshold between the conscious and unconscious is the only part of the mind that is free from censorship. Rugg believes that the transliminal, the operating ground of creativity, is the area identified with Eastern meditation states, with light autohypnotic trances, with intuition and with hypnogogic states. The transliminal mind is characterized by a state of relaxed readiness or relaxed concentration. (p.245)

Ineffable - this is the instantaneous and incomprehensible nature of intuition which makes it difficult for one to characterize the process and describe it to another.

As Bruner stated, the intuition is reached "instantaneously and subconsciously with little awareness of the process or the information drawn on, making it difficult to identify and characterize." It would seem that in the intuitive mode, the mind operates at a much higher speed than that of analytical thinking. This occurs, according to Fischbein (1969) "by short-circuiting the premise" of the problem. (p.233). This short-circuiting or condensation of the intellectual process makes observation and articulation difficult.

Bruner (1968) adds that intuitive thinking
rests on familiarity with the domain of knowledge involved and with its structure, which makes it possible for the thinker to leap about, skipping steps and employing short cuts in a manner that requires a later rechecking of conclusions by mono-analytical means, whether deductive or inductive.

(p.58)

It is important, it appears, to recheck conclusions arrived at by intuitive thinking as they may have been based on insufficient and incorrect information. This may be done by the analytical mode of thinking as a confirmation of the infralogical and intuitive mode.

Sometimes, it would seem, there is an awareness of several small insights, prior to the economic mental leap to intuition. We are not cognizant of what takes place or the point at which the leap happens, but there is a decided mental gap between that moment and the arrival of the answer. This gap in the process remains a mystery to us, perhaps because it is buried in the subconscious or pre-conscious beyond conscious awareness.

Musicians, poets, artists, mathematicians, and scientists are usually able to record the result of this mental or intuitive leap rather than the process by which it was reached. Many of their intuitions take the form of visual images. The appearance of visual imagery in intuitive thinking is one of its distinguishing elements.

Ferguson (1977) states that it is through this ability to visualize and present ideas non-verbally that humans have

fixed the outlines and filled in the details of our material surroundings...pyramids, cathedrals, and rockets exist not because of geometry, the theory of structures or thermodynamics but because they were first a picture - literally a vision - in the minds of those who built them (p.287).
This phenomenon of visualization has been reported by artists, scientists, composers, engineers and mathematicians. Michael Faraday's mathematical visualizations are a good example of an intuitive scholar who, after having arrived at his many formulae by a kind of intuition, was unable to describe his thinking process verbally. He could, however, describe what Bruner (1971) calls the iconic or visual element of the intuition. Faraday stated that "he saw narrow tubes curving through space that rose up before him like things" (Koestler 1964).

Intuition and Imagery

The imagery which comes during these transliminal and subliminal states often leads intuitively to significant new forms and solutions.

Although some of the studies deal with after-imagery, eidetic imagery, and memory imagery (Pavio, 1971; Richardson, 1969, cited by Khatena, 1979, p.318), others deal with the relationship between the right hemisphere of the brain and the non-ordinary reality of the creative person as manifested in "hypnosis, visual imaging processes, psychedelic drugs, dreams, extra-sensory perception and self-actualization" (Khatena, 1979). Leonard and Lindauer (1973, cited by Khatena, p.319) researched aesthetic decisions, imagery arousal, and creativity correlates.

One finding was common to all studies. It was that imagery came with

the reduction of external stimuli operating
on an individual to a level that frees him
or her to attend to an inner world of stimulus events and allows the subject to experience imagination imagery (Richardson, 1969 cited by Khatena, 1979, p.319).

It would seem that further study of imagery is crucial to understanding what happens during the imagining aspect of the intuitive thinking process.

Khatena (1979, pp.318-319) categorizes several kinds of images which have been researched, some of which relate to imagery experienced during the intuitive thinking process.

1. **Hypnogogic imagery** which comes in the semi-dream state between sleep and wakefulness.

2. **Perceptual isolation imagery.** Imagery which occurs when external stimuli are radically reduced under controlled conditions.

3. **Hallucinogenic drug imagery.** Chemically induced images from such drugs as LSD, peyote, and mescaline.

4. **Photic stimulation.** Any relatively slow rhythmic visual stimulation that induces a trancelike state or drowsiness that may, in turn, facilitate image formation.

5. **Pulse current imagery.** Imagery induced by electrical impulses externally applied to the temples to stimulate the appearance of imagery.

6. **Non-drug induced hallucinations.** Imagery such as that experienced by schizophrenics, mystics and shamans.
Intuition in Children

According to Piaget (1960) children use intuitive thinking as their main source of thinking from about age 4 to 7, before the process of operational thought is evident. This intuitive thought is to use Wald's word, infralogical. It is derived from the direct impressions that are half-articulated global experiences of the child. These features of intuition are not only common to children, evidently, but characteristic of all forms of intuition encountered by all age levels. Fischbein (1969) states that "intelligence does not abandon its intuitive form when operations appear," "it continues to survive as a complementary form of thinking" (p.38).

In fact, he adds,

intuition functions as an effective form of cognition, is better adapted to action than analytical, discursive, time-consuming logical knowledge (p.38).

The Need to Order Intuition and Bring it to Actualization

Intuitive thinking is a necessary and essential part of all problem solving, but intuition, for the sake of intuition, is not necessarily an effective mental process. Conversely it is necessary to use intuition to deepen and enrich the analytical process. In fact, it is recognized that there is a complementary relationship between intuitive and analytical thinking.

Arnheim (1983) states that

The human species copes with the challenges of life by means of two cognitive procedures - the intuitive and the intellectual. Intuition is the principal domain of art but it is
not art's monopoly, nor is it alone sufficient for the needs of the artist. Art requires the collaboration of all the faculties of the mind, of which the intellect is one of the most important. By no means is art all intuition. But it is equally true that conversely, the sciences and other mainly intellectual pursuits rely heavily on intuition. The shaping of their theories, of models and systems, applies aesthetic criteria and provides an emotional involvement not different from that of the artist. (p.10)

In fact, Arnheim says "working in art and science differs mainly in the ratio in which intuition and intellect contribute to creative effort" (p.10).

Intuition needs to be manifested or actualized in a musical score, an object of art, a scientific theory or a mathematical formulation or it is wasted.

Bruner (1971) states that

unexploited intuition that goes nowhere and does not deepen itself by further digging into the materials—be they human, literary, scientific, mathematical, political—is somehow not sufficient to bring the person to the full use of his capacities. Intuition is an invitation to go further—whether intuitively or analytically, (p.188)

According to Fischbein (1979), "correct intuitive interpretations are able to stimulate productive mathematical thinking" (p.33). He does not feel in the mathematical field that formal representations are "efficient" tools for dealing with non-standard problems.

It seems, therefore, that Fischbein (1979) considers that intuitive thinking constitutes an essential catalyst to the other modes of thinking, in dealing with problems ranging from the most
elementary everyday situations to the most complex scientific problems.

Intuition is useful as an entry point to any problem solving situation no matter what discipline or subject area. Also, as soon as the problem has been isolated and examined, there is an initial set of intuitive responses to it. These responses may relate to the amount of time it may take to solve the problem; an assessment of the range of difficulty the problem presents; the feeling of relevance and correctness about the information that exists; a hunch about the final solution.

Bruner (1963) states that intuition by itself yields a tentative ordering of a body of knowledge that, while it may generate a feeling that the ordering of facts is self-evident, aids principally by giving us a basis for moving ahead in our testing of reality. (p.60).

It is not known what constitutes a "good" intuiter and what the intuitive transformation from the explicit to the implicit happens to be. Some scholars agree that a rich, developed background in experience and knowledge of the subject is an important factor for good intuition.

Instruments and experiments need to be developed for measuring the relationship between knowledge and correct intuition. Since these do not exist, we have to rely on an individual's willingness to communicate about his/her thinking process during problem solving. Accordingly we can have a tentative look into their mind as it moves towards the solution.
The factors that seem to have an effect on intuitive thinking are still open to conjecture. Some of these, however, have been isolated by Bruner (1971, pp.84-85) and can be discussed.

To paraphrase Bruner, they are:

**intuiting an entry point:** being able to sense a possible way to get started on some aspect of the problem is essential to getting involved with the problem.

**self-confidence:** having the personal confidence to follow through on the task. This relates to two aspects of self-confidence: (a) the knowledge that one has the ability to manage the problem-solving process, and (b) the confidence related to the individual's information and experience in the subject area.

**risk-ability:** being prepared to risk the exploration of concepts that go beyond the bounds of the information and experience base.

**ability to visualize:** having the ability to visualize the means towards and the direction to a potential solution. The ability to sense small clues and insights visually and interpret the global view.

**non-verbal factor:** the ability to work out a solution or discriminate throughout the process,
non-verbally—by visualizing.

**perception of structure:** the ability to perceive
the informal and often inexpressible structuring of
the subject matter or the task at hand.

**ability to select:** the ability to separate out
the relevant information in relation to the problem
and the solution.

### Intuition and the Education Environment

Intuitive thinking is affected by the educational environment
in which it is used. Academic settings where only the analytical
mode of thinking is acceptable, deny this undisciplined kind of
cognition. Many schools according to Bruner (1971)

discourage fantasy, imagination, clever guessing,
visualization, in the interest of teaching, reading
and drawing, writing and arithmetic. Great emphasis
is placed upon being able to say what one has on one's
mind clearly and precisely the first time. The
atmosphere emphasizes "intraverbal skills"—using
words to talk about words that refer to still other
words. (p.89)

This emphasis on the highly verbal and the intraverbal
skills as well as the deemphasis of creative thinking and visualization appears to hamper intuitive thinking.

The ability to visualize a problem form or concept
requires the student to apply both creative and intuitive thought
processes. If these processes have been inhibited in the educational environment, then the student's confidence, competence and mental development will also be inhibited.
Bruner reminds us that children arrive at school with this visualization skill very much in evidence. He states, "The child's graphic representational skills are highly diagrammatic in nature"....and that it is very important to deepen and reinforce the early children's drawing as viable permissible modes of representation. He says that children must be helped to view their childish form of drawing as an early state of knowing, that is neither "indecent nor irrelevant", just representative of their stage of visual development (p.91).

Bruner (1963) cautions that although intuition or intuitive thinking is considered "a valuable commodity" in various disciplines and one "which we should endeavour to foster in students," it requires a sensitive, extremely confident, intelligent, informed teacher to pedagogically allow its development in the classroom.

Bruner (1963) states that

along with any program for developing methods of cultivating and measuring the occurrence of intuitive thinking, there must go some practical consideration of the classroom problems and the limitations on our capacity for encouraging such skills. This, too, is research that should be given all possible support. (p.68)

Bruner, although raising questions about how we approach the encouragement of intuitive thinking is convinced that it is not only fruitful, but essential.

It is helpful to remember that the original "proofs of Euler" did not define analytical thinking as totally rigorous, but as having a number of steps which were, according to Bruner (1971)
"left quite intuitive and, in a rigorous sense, untested and untestable" (p.87).

Intuition and Creativity

Intuition, like creativity, explores concepts and ideas through the subconscious before giving them conscious form. The process is non-verbal and is not easily articulated even in retrospect although certain analytical steps which accompany the intuitive in any problem-solving activity are evident. Once there is a final product, however, description is possible.

Taylor (1963) states that

much of the creative process is intuitive in nature, and that it entails a work of the mind prior to its arising to the conscious level and certainly also prior to its being in expressible form. It is most likely preconscious, non-verbal or pre-verbal, and it may involve a large, sweeping, scanning, deep, diffused, free, and powerful action of almost the whole mind. (p.171)

Both intuitive thinking and creativity are fostered in an environment which allows flexibility of thought and action; ideational and associational fluency; openness to experience; ability to play with elements; is not frightened by the unknown or the ambiguous; is able to accept tentativeness and uncertainty; is able to integrate opposites. Maslow (1962) says that people who have the above characteristics are "self-actualizing" (p.17). The difference between creativity and intuition is that creativity may move to conclusion with intense concentration and manipulation of materials or ideas whereas intuition often leaps to conclusiveness without obviously moving through these stages of manipulation. This does
not mean that the stages have not been moved through, but that they are experienced with such rapidity that they appear as a gap or a mental leap.

Like intuition, creativity often experiences a sudden illumination which, as Rapp (1960) states, can "come alone--in the middle of the night, in a subway, in an airplane, any place" (p.165). How it comes is not the point, but rather that both the creative act and the phenomenon of intuition can be experienced as a flash of knowledge or a mental leap.

Other similarities exist between the intuition and creativity. For instance, the information available to both creativity and intuition is often only the tip of the iceberg; the remainder is not known. Intuitive thinking moves forward by using small clues from past experiences and incomplete segments of information, whereas creativity makes use of a variety of sources as listed by Rapp (1960). The creative process can progress from information gleaned from casual chance remarks of friends at lunch, informal situations in bull sessions, in buzz sessions or in a brainstorming session. (p.165)

Rapp adds that these informal sessions where ideas and concepts are tossed around, release the conscious sources of creativity allowing them to emerge and be eventually actualized. Whatever the informational source, creativity and intuition advance to conclusion from an unknown and nearly concealed body of information.
Neither can advance sequentially because not all the givens are available.

Intuitive thinking is an essential part of the creative act in that it provides the flexible kind of thinking needed to bring new forms and ideas together.

Thoughts, ideas, creativity or intuitive thinking cannot flow from an individual unless, as Guilford (1977) states:

all blocks and barriers, all inhibitions, emotional and intellectual, have been removed. If one is discouraged from playing with ideas, restricted from thinking in a specific way, and expected to learn in a serious non-stimulating atmosphere, neither creativity nor intuition will emerge. (p.170)

Training of Intuitive Thinking

The training of intuitive thinking as an aid to everyday and formal problem solving and creativity has been a common concern to educators for some time.

In 1963, Bruner stated that

intuitive thinking, the training of hunches, is a much-neglected and essential feature of productive thinking not only in formal academic disciplines but in everyday life. The shrewd guess, the fertile hypothesis, the courageous leap to a tentative conclusion--these are the most valuable coins in the thinker at work, whatever his line of work. (pp.13-14)

If this neglected form of thinking is as valuable as Bruner says, it should be developed through the educational process.

However, very little is known about the source of intuition or how it might be trained in the classroom.
Various points of view are held by scholars about teaching-thinking or intuitive thinking per se in the classroom. The positions examined here are by Kubie (1958) and another by Olton and Crutchfield (cited by McKim, 1972, p.28).

Kubie (1967) states that thinking need not be taught because it is a natural process in all people.

Thinking processes actually are automatic, swift, and spontaneous when allowed to proceed undisturbed by other influences. Therefore, what we need is to be educated in how not to interfere with the inherent capacity of the human mind to think. (p.104)

Kubie, in fact, does not say that thinking cannot be facilitated or sharpened; he merely proposes that we should not get in the way of the natural processes of thought that are available to us. He advocates an educational system which is free of neurotic practices; repetition; parroting back; regurgitation. He suggests the need for educators to deal professionally with the thinking blocks that students have so that they may use their natural ability to think spontaneously, swiftly and automatically.

Olton and Crutchfield (1969), on the other hand, show from their study that thinking skills can be sharpened by the direct training of thinking. They argue that programmes which systematically teach students how to think, are essential "at all levels and for all types of students" (cited by McKim, p.28).

They state further that
an education without such instruction will produce adults who are destined eventually to become crippled by their own obsolete patterns of thought and by knowledge that is no longer relevant, to become confused and then overwhelmed by a vastly changed society in which they will no longer know how to participate. (p.149)

At first glance, Kubie, Olton and Crutchfield seem to state opposite points of view. However, Olton and Crutchfield's position advocating the direct training of thinking does not in any way negate what Kubie says. Thinking depends on an educational climate which is healthy, neuroses-free and one which allows and encourages the natural thinking processes which Kubie so ardently wants to protect.

Unfortunately, children are not born into a neuroses-free society. Their thinking processes are well established by the time they enter the formal classroom. Their thinking patterns are influenced by their families' socio-economic backgrounds, their cultural heritage, their sexual role, their siblings and peer group, as well as their own natural abilities and temperament. What Kubie advocates is admirable, but perhaps utopic. It is well-founded, but idealistic, and depends on such colossal social change that it would be difficult to achieve. It is, however, a stance which educators must uphold as a desirable goal and in every way strive toward the most psychologically healthy educational climate possible. It would seem likely that intuitive thinking would flourish in such a climate.

Bruner (1971) states that methods of teaching intuitive thinking are urgently required. He suggests that young students be
taught to approach an unfamiliar problem by the less rigorous techniques of intuition; that students need to learn to "attend to and use the cues that are available" to them, make educated guesses and act on their hunches (p.96).

Bruner (1971) advocates the use and teaching of economic heuristics which allow an individual to solve complex problems by the most efficient procedures. Since these heuristics share many of the same characteristics of intuitive thinking, and they are trainable, Bruner suggests that they may be the door through which intuitive thinking can be encouraged.

Bruner (1963) cautions us, however, that the actual teaching or training of these heuristic procedures used by intuitive thinking could scuttle the very process we want to encourage, reducing it to no more than one that is logical and analytical. Bruner analogyzes that the heuristic nature of intuitive thinking is like a many-footed caterpillar which, although it can walk, cannot describe how it does it.

Bruner (1963), in spite of this difficulty, outlines the following characteristics of heuristic procedures which are supportive to intuitive thinking. They are: the use of analogy, the appeal of symmetry, the examination of limiting conditions, the visualization of the solution (p.64).

The first characteristic, analogy, as defined by Webster (1979) implies that "certain resemblances imply further similarity" (p.21). Analogy, then, is characterized by the ability to find
connections, relationships and similarities between facts, elements, and situations, which point to other similar relationships.

This characteristic is used as a tool by the intuition process for connecting similar facts, situations, experiences and segments of information together, which will possibly facilitate an intuitive leap.

It is possible to train the mind to think analogously first by becoming aware of simple related situations and finally by developing an ability to make analogies in much more complex circumstances. The training of analogous thinking in the long run frees the mind to think intuitively.

Analogous thinking used by the intuitive process may be manifested in the schools by unique artistic, scientific and expressive forms as well as insightful mathematic and historical formulations. The result of this kind of teaching may, in addition, facilitate decision making directly related to problem solving in everyday life.

Bruner's second heuristic characteristic is the appeal to symmetry. This means that there is a need to bring things together; to complete or balance them. The appeal to symmetry is manifested in intuitive thinking when the mind searches freely for connections and other segments of the whole in order to bring about a synthesis, an intuition.

Bruner (1971), however, states that whereas intuitive thinking does attempt to move toward symmetry or gestalt, it must
to be fruitful, carry a "sense of incompleteness; the feeling that there is something more to be done" (p.86); and that there is something that has yet to come together.

The "appeal to symmetry" in intuitive thinking can be encouraged educationally by timetabling for experimentation, exploration and divergent thinking. As well, a teaching philosophy which fosters questioning, doubting the given, using hunches and educated risk-taking in an attempt to bring something together or bring symmetry to a number of concepts or ideas, may possibly advance intuitive and creative thinking. This advance may manifest itself in classroom behavior by a more integrated approach to teaching and learning because wider issues, as well as individual problems, will be dealt with within a larger whole or as mentioned earlier, a global view.

An integrated approach to teaching can be defined, discussed, planned for and learned about. Its method can be charted - and its manifestations are observable. This being so, it would also seem feasible that by training teachers to use an integrated approach, we could ultimately encourage students and teachers to view all ideas, concepts and information as part of an integrated whole or at least bring this information as close to symmetry as possible through intuitive thinking.

The examination of limiting conditions is Bruner's third characteristic of heuristic procedure available to intuitive thinking.
Intuitive thinking, as quoted earlier from Fischbein (1979) is capable of transcending "direct empirically obtained information" (p.34) by moving beyond the facts at hand. Intuitive thinking, then, mentally explores, examines and pushes against the existing limiting conditions so that it can move beyond or transcend the information at hand in order to generate other possible solutions.

This moving beyond the facts at hand and examining limiting conditions relates to de Bono's (1970) concept of lateral thinking—a thinking process which can be used as an insight tool. De Bono suggests that new ideas come only through conflict between old and new information. The lateral thinking process, like intuitive thinking and the heuristic characteristic of examining limiting conditions, depends on a mental search and the agitation of available material in order to turn up new ideas, concepts, and formulations.

De Bono (1977) states that lateral thinking is a "deliberate process" and is "as definite a way of using the mind as logical thinking—but in a very different way" (p.9). Fortunately, processes can be taught, and learned. This could mean that by training teachers and students to think laterally, in other words, move sideways rather than advance in a linear fashion during the thinking process, limiting conditions could be explored and challenged, resulting in more intuitions and creative illumination and thus generating new thought patterns and formations.

Again, by training the mind to break free of, as de Bono states, the "prisons of old ideas" (p.11) and by training it to risk
the use of the heuristic characteristic—that of exploring limiting conditions—we would also be training the mind to think intuitively.

De Bono (1977) reminds us that any skill is difficult to learn without practice, and that the skills needed for lateral and intuitive thinking are no different—they need fostering, nurturing, application and practice.

Lastly, the heuristic characteristic of the visualization of the solution is important to intuition. Visualization or mental imagery is essentially non-verbal and "non-symbolic", Guilford (1977), which according to Gowan (1979) occurs "in consciousness not immediately preceded by perceptual intake" (p.39).

Although controversial, the functions of the right hemisphere, according to Guilford (1977) involve the use of imagery which is essential to creativity, intuitive thinking, and problem solving. This imagery is not, as stated before, necessarily restricted to spatial relationships among physical objects. It can take the form of diagrams, theories, and concepts which are visual manifestations of a mental thought.

McKim (1980) notes that "when abstract and concrete ideas are expressed in graphic form or imagery, the abstract-to-concrete thinking strategy becomes visible" (p.115). He adds that the first attempts to bring this about seem to have similar qualities to the intuitive thinking process. The cognition is "fast, crude, wholistic and parallel, while the second part of the cognition is deliberate, attentive, detailed and sequential" (p.133). Once
again, we have the complementary relationship reinforced between the analytic and intuitive modes of thinking.

The visualization process helps to reduce to a code, the ideas and formations which the mind is exploring. Imaging moves along with the cognitive process and occasionally jumps intuitively to a solution before the mind is aware that the segments of thought have made a connection. It is not uncommon for individuals to exclaim that they "see" or they understand something so vividly that it is or seems to be manifested in a visual image. Many cases can be cited which indicate that very elaborate images have been intuited by individuals who have been working on highly complex problems.

Relaxation as a Facilitator of Imagery and Intuition

Gowan (1974) lists the testimonies of men such as Archimedes, Newton, Faraday, Agassiz, Hilpecht, Poincare, Mendeleev, Kekule, Loewi, as people who have courted "the Muse", by relaxing the hold of the conscious mind on the problems, through various techniques such as sleep, reverie, travel, nature, bodily activity, or meditation, so that other parts of the psyche can take over. (p.416)

Wallas (1926) calls the second stage of preparation for creativity, incubation. It would seem that during the incubation stage, a necessary condition of relaxation is needed in order to facilitate productive or intuitive thinking.

Gowan (1979) describes this state of preparation or incubation period analogously:
If preparation sets up the mind as a radio receiver, and incubation clears away the static and turns on the power, development may be likened to the fine tuning of the instrument so that what was a howl now becomes a clear and intelligent signal. (p.416)

Kekule (cited by Koestler, 1964) describes the vivid images which he experienced while searching for the synthesis of the benzene atom. It is important to note that Kekule was searching for the answer. Kekule said:

I turned my chair to the fire and dozed. Again the atoms were gambolling before my eyes. The smaller groups kept modestly in the background. My mental eye, rendered more acute by visions of this kind, could now distinguish larger structures, of manifold conformation, long rows sometimes more closely fitted together, all twining and twisting in snake-like motion. But look! What was that! One of the snakes had seized hold of its own tail and the form whirled mockingly before my eyes. As if by a flash of lightning, I awoke. (p.118)

Gowan (1979) states that Kekule's non-verbal state of thinking happened because he was in the presence of a non-categorical numinous archetype in a non-ordinary state of reality...The numinous archetype presented in hypnagogic dreams and creative reveries is a non-categorical image, and is hence capable of as many interpretations as there are percipients...Each participant will interpret the numinous archetype idiosyncratically, in accordance with his level of development (like the seven blind Indians who went to see the elephant). The archetype hence acts as a generating entity, which may produce a number of art forms or alphanumeric scientific statements. Since the non-ordinary experience may occur in many persons, the key concept of creativity is to possess the previously prepared matrix of verbal or mathematical analogy which will catch the ephemeral vision and preserve it in concrete form. (pp.477-8)
It would seem then that the image is generated through the presence of archetypal forms which come into a new juxtaposition during a relaxed state of consciousness.

Similar to Kekule's statement, biographers Hunt and Draper (1964) recorded a non-verbal thinking experience or intuition which Nicola Tesla had while quoting poetry to a friend during a relaxing walk. The clarity of the imaging enabled Tesla to describe it in detail.

An idea came to him like a flash of lightning and the solution to the problem of alternating current motors appeared before him as revelation. He stood as a man in a trance, trying to explain his vision to his friend...The images which appeared before Tesla seemed as sharp and clear and as solid as metal or stone. The principle of the rotating magnetic field was clear to him. In that moment, a world revolution in electrical science was born. (p.33)

If what Gowan (1979) says is true, Tesla could not have arrived at the theory of the rotating magnetic field without having first had a substantial knowledge base about the electro-scientific field. The new intuition or revelation did come to him when he was in a "non-ordinary state of reality" but it also came to him because he was in the "presence of a non-categorical numinous archetype" or an enormous body of original knowledge.

Fischbein (1979) clarifies this further, saying that an image [or vision] is not an intuition by itself. In order to be an intuitive way of understanding, the image has to be included in an active process. The role of the image-intuition is therefore a double one: (1) to unify information and (2) to prepare, guide, and anticipate action (on the basis of that information). (p.40)
A vision or visual representation, to Fischbein, is able to contribute efficiently to an intuitive understanding of something. However, it does not stand on its own; it must move on to action. As well, concrete experience such as Tesla's indepth research into the electro-scientific field must support the image and the development of intuition.

**Training for Visualization**

McKim (1981) presents a programme for training visualization and visual thinking which includes preparation through relaxation and incubation, reducing sensory input, eliminating visual stereotyping; thinking ambidexterously; graphic ideation; idea sketching. These are only a few of the techniques and skills which he proposes. He develops the imaging process through the practice of graphic ideation as a tool for thinking intuitively, productively and creatively.

In other words, he is training the heuristic characteristic which is important to both intuitive thinking and problem solving—that of visualization.

McKim (1980) states that individuals have lost self-confidence and the ability to image-in because of a society that encourages individuals to see how they appear to others, a secondhand precept, rather than enabling and encouraging individuals to see things anew for themselves. This secondhand kind of seeing or thinking is perhaps one of the greatest deterrents to intuitive thinking because it does not encourage people to risk, guess, leap, twist, turn, or as McKim says, think ambidexterously.
Gowan (1979) states that as well as learning to think flexibly, it is important to lessen the sensory input and to gentle the preconscious so that imagination and visualization can emerge. He notes that:

Imagery appears to be bound in the unconscious mind, ready to rush into consciousness whenever the perceptual flow is stilled. (p. 419).

Through these modes of functioning, imaging and visualizing, people are able to develop their ability to intuit, imagine and see things anew as individuals.

This heuristic character of intuition—visualization or imaging, therefore, allows people to economically state, and synthesize thoughts and experiences of the mind. During the visualization process, only the essential elements are selected; others are eliminated.

Bruner (1971) states that this kind of selectivity is necessary for all problem solving, creativity and intuitive behaviour. Bruner writes:

whether the person uses a heuristic involving visualization or some other shorthand way of summarizing the connections inside a set of givens, he drastically reduces the range of things to which he attends. This narrowing of focus involves a kind of risk taking that requires not only a certain amount of confidence, but also a kind of implicit rule for ignoring certain information, again a risky prescience about the nature of a solution or the kind of goal one is looking for. (p. 85)

The latter part of Bruner’s statement harkens back to Gowan’s (1979) statement about people searching for a solution or a kind of
goal (e.g. Kekule, Tesla) and then going through a variety of mental gymnastics to find it. Gowan (1979, p.477) says, "Kekule went in (to the cave of Aladdin) looking for a dollar and came out with a dollar. In other words, he knew what he was looking for and found it." He agrees with George Kelly's statement that one is "constrained to experience events in the way one anticipates them" (p.477).

In other words, the solution or intuition is dependent on a number of factors: the depth of understanding of subject matter, the level of mental consciousness, and the intensity of the search for a solution or goal as well as the level of an individual's mental development and anticipation.

The heuristic characteristic of visualization or imaging, according to McKim (1980) can be developed and taught in the same way that we can teach thinking skills.

Summary.

This chapter has reviewed the definitions and characteristics of intuition or intuitive thinking and its relationship to creativity, visualization, imagery, and problem solving.

It has looked at intuition in young children, intuition in the education environment, and has reviewed some of the facilitators of intuitive thinking.

Finally the chapter has looked at ways of training for visualization that could be applied to the classroom situation.
CHAPTER III

PROCEDURES AND DEVELOPMENT OF PROGRAMME

Introduction

The study took place at the University College of Cape Breton, Sydney, Nova Scotia, in July 1983, for the duration of one month, with daily sessions from 8.30 a.m. to 12.30 p.m.

The Setting

The setting for this study was a very large, double-sized classroom that had once been the library in the Continuing Education wing of the University College of Cape Breton. One end of the room had large bright windows covered with drapery, and two blackboards covered most of the longest wall. There was only one small display board, which was near the blackboards. There were two doors in the wall opposite the windows. The walls were light cream plaster, as were the tiles on the floor, making the overall effect of the room rather neutral. There was no sink in the room so students had to go across the hall when they needed water for their projects.

Fifteen large, dark brown tables were available to the students, as were about thirty chairs. The university had borrowed about two dozen folding, free-standing and lockable display boards at the request of the instructor. These were about 5' x 6' each and could be manoeuvered into half circles, octagons, etc., to create different spaces for work, group discussion, relaxation, and display, etc.
The Clients

Most of the subjects of the study were Cape Breton classroom teachers with several years of experience. There were two exceptions: one teacher taught in Labrador and another in New Brunswick. No one had had specialist training in visual arts, and although three indicated their aptitude for being visually creative, most had a very low opinion of their creativity. Three teachers were former students of the instructor from previous summer schools.

All 14 subjects had just completed a year of teaching, and some had taken continuing education courses throughout the winter and spring semesters. They were therefore tired and rather fearful of not managing to meet the expectations of a summer session course. Several registrants cancelled their registrations, following the spring course, because they were over-extended and discouraged by a number of circumstances. The enrollment for the course was, therefore, lower than anticipated. During the first few days of the course, several teachers remained uncertain about whether they would continue to study throughout the summer. They did so, and their participation level during the course was exceptionally high.

Procedures

The summer school programme on intuitive thinking as related to visual problem solving was both theoretical and task oriented. The tasks can be categorized into general levels: 1) major visual projects, of which there were five; 2) short, time limited, three-dimensional tasks; 3) two-dimensional tasks, with a
time limit; 4) explorations without a time limit; 5) exercises that contributed to all of the above tasks; 6) theory that supported all the tasks; 7) discussion and description of the thinking involved in visual problem solving; and 8) journal writing to record the thinking that accompanied most tasks.

Pre-tasks

The first week was basically for orientation. The participants, being teachers, had just finished a school year and were weary. Some had come a long way; others had taken a spring session course that had left them angry and discouraged. Some came with anxiety about the words "intuition" and "visual problem solving". Many felt they were artistically inadequate, so feared what they would have to do in class.

The classroom was large and barren but was full of possible personalized work spaces. The participants explored these possibilities and tailored the room to their spatial needs, during the first few days.

Before attending the first day's class, the students had been given a package of pre-tasks and preparatory work to do. These tasks were designed to acquaint the registrants with some of the terms they had to know for the course, to encourage an awareness of their thinking processes, and to begin collecting some of the materials and equipment needed for the visual projects.

Task One: Preparation of Equipment Kit

The participants collected from home or purchased a number of
items that were listed in the prepackage. These included (see Appendix A for list) practical articles such as scissors, markers, brushes and staplers. It was hoped that by collecting items before class entry, the course could be launched earlier in the first week. Also, the exercise of thinking out what was needed for the project was a way of assisting the participants to get themselves organized for a new experience.

**Task Two: Search for Materials**

The participants were asked to search for a variety of usable materials that could be used for the visual projects to be undertaken in the course. Some were gleaned from home, while other material was scavenged from department store trash boxes. The material listed (see Appendix A for complete listing) included cardboard tubes, dowelling, scrap paper, photos, wire, grasses and plastic. One of the purposes of this task was to help the participant become aware of the material possibilities that exist in unlikely places. The task also encouraged the participants to contribute to a stock of unusual materials that would be shared by themselves and others.

**Task Three: Search for Literature Related to Intuitive Thinking**

The participants were directed to a number of books that dealt with creativity, productive thinking, divergent thinking, lateral thinking and intuitive thinking, so that they would be acquainted with some of the available literature.

They were asked to write definitions for several terms that were pertinent to the study. They were encouraged to xerox articles
that could be added to a resource file for everyone to use.

Task Four: Pre- and Post-Task

These two tasks were to be carried out before the participants had attended class and after the course was finished, so that the results would be free from peer or instructor influence. The task was to build a toy that could be moved or had a moving part. It was to fit into a shoe box and be completed within a four-hour time constraint.

The teachers were asked to record the awareness of their thinking during the toy construction. The aesthetic nature of the project was not to be considered as important as the thinking that accompanied the problem solving process. Both the pre-task toy and the post-task toy were to be presented to the class and talked about, using graphic ideation to explain the mode of thinking used during their creation.

Task Five: Becoming Aware of One's Own Thinking Process.

The first part of this task asked the participants to think about the way they made simple decisions and solve everyday problems. It was essentially an awareness exercise. They were also asked to recall certain problem-solving situations to see if they could remember their thinking sequence. They were also to become aware of their usual thinking patterns - how they approached most problems that they thought about. The participants selected two of the four stated problems which they were to solve, then wrote out the thinking process they used. These were to be shared in class and the solu-
tions discussed, so that everyone had an opportunity to verbalize
their thinking processes.

Task Six: Preliminary Statements Recording the Participants’ Thinking
Process.

This form, labelled Form #1, was designed to help the participants
make clear statements about their thinking process. Each sentence
is only partially formed so that the participant is free to complete
the rest of the statement. The form was to be attached as a summary
to the journal entries for each major visual project and several
smaller ones.

Visual projects.

Visual Project #1: The Pouch

Using the basic materials, paper, plastic, wire, grass, twine, reeds, the participants were to construct a unique pouch form
by weaving, braiding, looping, etc. the material, then prepare and
package five natural objects for depositing inside the pouch.

Before attempting the pouch form, the participants were
encouraged to explore the limitations and possibilities of the
material; generate ideas; search for those that were compatible
with the material; state the idea, both visually and in writing;
prepare the material and test the idea with the material; re-order
ideas; think ambidexterously; synthesize; bring the form to con-
clusion; evaluate the visual product aesthetically.

While planning this and the other major projects, the
participants were asked to record their thinking graphically and in
written form. They were encouraged to be aware of the logical
sequences of thought, changes in idea direction, idea selection, small insights, intuitive thinking (skilled leaps of knowledge, guesses, hunches) and gestalts. They were to write out their thinking experiences as spontaneously as possible in journal form.

**Visual Project #2: Natural Aesthetic Environment**

Using clay, wood, rock, moss, dried grasses, reeds, etc. plus a reflective surface such as a mirror, the participants were asked to make an aesthetic environment that concentrated on using texture and contrast similar to that found in nature and in the Japanese garden. They were asked to use mirrors as a reflective piece, so that part of their own environment and others would show the repetition of shape and textured form. The mirrors were to be placed in such a way as to be part of, rather than in opposition to the natural form. The project was to be completed in three phases: 1) the participants were to create their own individual environment as an aesthetic piece; 2) they were to join their environment to the other environments so that there would be one combined full flowing, aesthetic form; 3) they were to draw contour lines in the sand plane around the large environment.

**Visual Project #3: Wood Sculpture**

The participants were to alter three or more blocks of wood so that they would relate spatially and aesthetically to each other. They were to consider problems of interlocking form, interesting juxtaposition; structural or visual dependency. The finished product was to show a high degree of craftsmanship, both in the exe-
cution of the form and the surface finish. The surface was to be sanded, buffed, oiled or some portion painted, carved or embellished through drawing. At least one section of the wood sculpture was to have colour, line, pattern or texture as a visual focus.

The participants were to examine and use a variety of tools that they would need to complete the sculpture so that their skill and competence level would be better developed. Before attempting to solve the problem, the participants explored their ideas in clay, paper and wood, other than their blocks. They also completed several small two- and three-dimensional exercises that helped them to understand visual relatedness. The participants were encouraged to illustrate their thinking graphically and their changes in ideation before choosing one design to execute.

Visual Project #4: Fetish

The participants were given the choice of making a fetish or creating a fabric sculpture. Those who chose the fetish problem were to use a free range of material (twine, yarn, beads, fabric, toothpicks, shells, feathers, wire, cardboard, wood, etc.) to make their personal fetish. This was to be a conglomerate form of something to which they were "irrationally devoted". The form was to have meaning to its creator. It was to show skill and craftsmanship in its execution, and also be visually aesthetic. The participants were to consider shape, colour, texture, and spatial aspects of the form. Size was not to be a factor, but they were to be able to carry it with them on a hike, so that in itself was a limitation.

This project enabled the participants to examine their personal preferences and the things in life that were most meaningful to
them. It also gave the participants the opportunity to select the materials they wanted to work with and create a form that was very much their own. Apart from the initial discussions about the definition of "fetish", they had to intuit every decision on their own. Peer group influence was minimal, and instructor input was given when required or initiated by the student.

Visual Project #5: Fabric Sculpture

Those who chose the fabric sculpture project were to use stitchery and textured materials to make a soft sculptured fabric form of some Canadian commodity (e.g. snow, clouds, gophers, glaciers, banks, puffs), which we usually do not think to package for export. The container had to be able to be carried in two hands and had to relate visually to the contents.

Formal Instruction

During week one, the philosophy of the course was presented along with preliminary exercises that prepared the students for the visual problem-solving projects. The students arranged the room according to their preferred work space. Three special areas were also designated: one for rest and relaxation; one for group-sharing, graphic ideation as well as show-and-tell experiences; and one for lectures or theoretical presentations. Each of the last two designated areas had folding display space that was covered with white paper. While the participants or the instructor talked, they expressed their ideas graphically at the same time. This pattern of presentation was initiated on the first day that the students brought their pre-toys. Difficult as it was, the students came to appreciate the reasons for graphically supporting what they said. Many who
were reluctant early in the course used the area naturally toward the end of the course.

The first Friday was used for a field trip. The class drove to Port Morien, a fishing village of some beauty. The village served as a focus for some awareness training and experiences in ambidextrous thinking. Both written and drawn responses were expected by the instructor in answer to the problems given (see Appendix C). The field trip helped the class feel more comfortable with each other and enabled everyone to relate to a common experience. Many of the solutions intuited by the students became helpful discussion points for the study of intuitive thinking later in the course.

The instructor presented definitions and an introduction to thinking. Divergent, convergent, analytical, intuitive, reproductive, productive. Discussion on creativity, and problem solving also took place.

During week one, journal writing was explored and some practice given in writing up small thinking processes in journal form. More theory was added daily as the course progressed, but an introduction to the concepts was necessary as a foundation for the practical aspects of the course.

The Torrance Circle Test for Creativity was administered to the participants during the first and last week of the course in order that an assessment of change could be made by the instructor/researcher.

Short, two- and three-dimensional problem-solving situations were presented each day for practising the concepts of brainstorming,
visual thinking and graphic ideation. The first major visual project - the pouch - was given before the weekend so that the participants could think about it and begin their explorations.

Week two built on the theory and practice of the first week. There was further discourse on thinking; extending the early discussions, and focusing on divergent or lateral thinking; the relationship between thinking and creativity; Guilford's transfer theory; de Bono's concept of bundle and named ideas; insight and intuition; the awareness of cognitive processes especially the intuitive.

Several relaxation exercises were experienced and themes such as centering oneself, freeing up ideas, allowing newness, becoming flexible thinkers, visual and auditory relaxation techniques. Also, theory about inhibitors and facilitators of creative thinking and, therefore, intuitive thinking was presented. There was a specific emphasis on the relationship between the total learning environment and creative intuitive thinking.

The participants solved a variety of small three-dimensional exercises, using tooth picks, stir sticks, string, natural sticks, straws, etc. Brainstorming and visual thinking continued to be used, along with journal notations of the participants' thinking process.

The second major visual project, the natural aesthetic environment, was presented early in the week. Graphic ideation, brainstorming, and several preliminary exercises preceded the assignment. After the individual environments were completed, they were combined into a class environment surrounded by a sand garden that
was contoured with line to reinforce the total environment.

Shortly after the second project was initiated, the participants were given three equal-sized wood blocks to live with for several days. The theory of visual integration was introduced to the class and, finally, the third major project—a wood sculpture—was given to the class. This project was to be worked on from the date given until the end of the course as a long-term exercise while the other small projects were being completed.

During week three, the students began their work on either the fetish or their fabric sculpture projects. Notes from the journals about incidents of intuition or insight were shared and discussed by the class. Participants made verbal presentations of articles about intuition, creativity, and problem solving. Theory was expanded and related to the current problem-solving situation.

During week four, there were discussions about the implications of the course and the experiences in visual and intuitive thinking for the teacher in the classroom. Projects were completed; journals updated; discussion continued; and theory expended.

The participants were given their second Torrance circle test for creativity and were asked to begin their post-toy assignment, which was not to be done in the classroom. These were presented to the rest of the class on the last day, as a culminating activity.

Reflection on the learning experience, sharing of individual creative pilgrimages, and personal and class evaluation were carried out graphically as well as in written form.
The class invited other summer school students to see a display of their visual products, and explained the thinking that accompanied them, during an Open House morning.

**Procedures for Keeping the Journals**

Both the participants and the instructor were to keep daily journals as a record of their activities and thinking processes. These were to contain written and drawn work that reflected their cognitive processes. Each participant could organize their journal according to their own personal preference, but were given some guidance about its content, layout, and intention. Progoff's (1975) journal was used as an information source for the participants. The procedures for journal writing were:

a) After being given a task or project, the participants were to record, step by step, the kind of thinking they did to approach the problem; their choice of material; their decision as to technique; how they entered the problem; if they changed their ideas; how they arrived at conclusions, discarded ideas, experimented with new ones; how they intuited the completion of the visual problem. Journal writing was to be accompanied by graphic ideation—drawings that showed their thinking progression, visually. Periodically the journal notations were shared in class or were
reviewed by the instructor. Participants made verbal presentations of their thinking process at the end of each project. A summary of these was recorded on Form #1 (see Appendix A).

b) The instructor/researcher also recorded her thinking about the course as it progressed and her observations of the participants' thinking and visual problem solving. The daily notations reflected significant participant behaviour. The instructor shared relative information with the participants during discussion and theory sessions.

Class Sharing and Discussion

A group involvement area was designed for specific reasons. The partitioned space where participants shared their creations and their thinking process was intimate, nearly circular, and surrounded by large, white, paper-covered display boards. A circle of chairs lined the curving space. During the course, the paper became covered with visual and written graffiti. The paper was not removed during the course, but was added to with small and large drawings, written notations, comments of significance to the thinking being done. Because there was a choice of writing materials, a variety of colour was used by the participants and the instructor, giving the recording area a rich visual appearance. The participants reacted positively to the space and several thought they would use a similar idea in their own classrooms.
By leaving the daily notations on the paper, the space seemed less sterile and more inviting for the participants. As the course went on, they added to the ideation wall on their own accord, enriching it further. It was not uncommon to see one person using the space to describe something visually to someone else, at other than the appointed discussion time.

During the sharing sessions, the participants visually and verbally described their thinking processes and showed their creations to the instructor and other class members. This procedure allowed everyone to hear and see how others were thinking. Class discussion and instructor input followed these "show and tell" sessions. All verbalization was accompanied by graphic illustration.

**Work Space**

The participants' work spaces varied. The instructor had arranged a U-shaped formation of tables facing the blackboard area. There, the teachers and the instructor engaged in writing and problem-solving exercises, observations, demonstrations, and carried out the work on the given tasks and projects. Some participants designed their own preferred work spaces in other parts of the room, as well as having a space in the central formation. They were encouraged to move about to meet their own spatial needs whenever they wanted to.

An area for relaxation was created early in the month. It seemed apparent that those who came long distances (some as far as 75 miles) each morning, would need a place to rest. It was also realized that the participants needed a place to relax and allow their subconscious to take over while they mulled over an idea or problem.
The participants each brought cushions and the tile floor was covered so that there was a warm clean place to sit or lie down. Apart from about two occasions, however, no one voluntarily used the space. They seemed embarrassed about taking a rest time during formal class hours, even though some people appeared weary and tense at various times.

**Display Space**

The display space changed throughout the course. One long wall housed many of the displays, along with some tables that were set up against the wall; other tables sat as an island behind the "U" formation. Often the floor space was used for displaying projects and for visual exercises, using large material for spatial manipulation. Occasionally, the hall housed displays or allowed a spatial overflow for class involvement. Participants on two occasions used the university cafeteria and the surrounding garden for a place to work or gather visual material. The course participants were encouraged to invite other people into the classroom so that they had another opportunity to articulate their thinking processes to some one other than their peer group or instructor.

Slides were shown in a projection room near to the classroom. These were used for four different purposes: 1) as a meditative focus for relaxation; 2) as a facilitator for imagery; 3) to illustrate images that could be used by the classroom teacher for extending thinking through ideation, brainstorming, fantasy; 4) as samples of work that had been produced by students in classes where intuitive and creative thinking was encouraged.
CHAPTER IV

ANALYSIS OF THE OBSERVATIONS

Introduction

This chapter deals with 1) a description of the characteristics of intuitive thinking as defined by the conduct of the participants; 2) an analysis of the way in which intuitive thinking was perceived by participants; 3) an analysis of the instructor's perception of the participants' intuitive thinking, as evidenced in their visual work; 4) an analysis of the congruence, or lack of congruence, between the students' and researcher's perceptions of intuitive thinking, as evidenced in the journals; 5) evidence of some of the methods of intuitive thinking that promote further thinking and achieve satisfactory results; and 6) evidence of changes in thinking and creativity during the course. Numerous extracts from student journals are presented. Numbers accompanying these extracts refer to the identity of the student, and the occasion on which the behaviour was noted as present. For example, the notation 14-3 means that student #14 had indicated in the journal a third instance of intuitive thinking.

Characteristics of Intuitive Thinking as Defined by the Conduct of the Participants

From journal data obtained from the participants, four categories of intuitive thinking were devised. These describe the characteristics of intuitive thinking, as defined by the conduct of members of the summer school course. They are: reflective cognitive or incre-
mental, reflective intuitive, broad intuitive, and spontaneous intuitive thinking. These are summarized in Figure 1.

Figure 1. Four categories of intuitive thinking
a) Reflective cognitive or incremental thinking moves along gradually, without the element of surprise, toward an established objective. Each small decision during the process advances the thinking incrementally. Unlike analytical thinking, the reflective cognitive dimension is intuitive and emotional rather than intellectual by nature. It moves in an irregular, rather than linear pattern, changing direction with the arrival of small insights or intuited entry points. One increment spurs another on until a solution is arrived at which is satisfactory to the problem-solver or it is necessary to come to closure because of a time allotment or a material limitation.

b) Reflective intuitive thinking is characterized by a sequence of brainstorming activities which generate and freely associate ideas without evaluating them, followed by an intuitive leap or connection which arrives without seemingly passing through the incremental stages found in other modes of thinking.

c) Broad intuitive thinking is evidenced by several parts of the solution fitting into place in such a way that there is a broad intuition or clarification. This illumination comes in a general sense rather than through a small intense intuitive leap. The illumination, although significant to the visual decision-making process, is occluded, that is, having some light, but having more darkness than light. Therefore, in spite of the illumination, some of the problem remains to be solved.

d) Spontaneous intuitive cognition is an unpremeditated kind of thinking. It is synthetic and seems to organize and process material that is available to the subconscious through past experi-
REFLECTIVE COGNITIVE OR INCREMENTAL

- ability to move in an irregular manner incrementally
- ability to change entry point
- ability to solve small portions of the problem at a time
- ability to come to closure at the end of each increment

Figure 2. Summary of reflective cognitive or incremental thinking

Figure 3. A sequence of increments during reflective cognitive thinking
ences and associations without the thinker being aware of where it has come from. This sudden spontaneous intuition usually illuminates, with some intensity, one part of the problem. The intuition can, however, serve to affirm, anticipate or conclude the problem at hand. In spontaneous intuitive thinking, there is no conscious incremental sequence leading to the solution, rather there is a problem that needs a solution and a connection or synthesis is arrived at with immediacy.

Ways in which Intuitive Thinking was Perceived by the Participants

Reflective Cognition or Incremental Thinking

Reflective cognition or incremental thinking was recorded by the participants in such a way that they talk about cognition and elaborate on their thinking process. Each small insight, synthesis, change of direction, subtle evaluation or deliberate cognition is recorded. Characteristic of this thinking process is the way a single thought progresses, takes a jog, late rates, and moves ahead again in an irregular manner. Each change of direction leads toward a small portion of the larger solution incrementally.

General characteristics of reflective cognitive thinking are summarized in Figures 2 and 3.

While involved in incremental thinking, participants experience several entry points and closures during the decision-making process. When the entry point is intuited, thinking moves through an increment to a solution, then another entry point is intuited and this progression moves from increment to increment repetitively until closure,
satisfaction or some limitation (time, material) disallows further cognition. See Figure 4.

Figure 4. Elements of incremental or reflective cognitive thinking.

For example, one participant records:

When I changed the direction of my thinking with respect to the angles on my wooden blocks, I decided to reinforce it more by angling block three as well. Block three is not matching relatively well because the other two have definite curves. The relatedness of number three
is only implied by its shape. Therefore, make a groove from small to wide as a continuation of the downward curve of block two. Because block two is square...what about an angled notch? Perhaps an arrowhead gouge that continues in an upward direction. Why have a symmetrical pointer? Make it flat along one side. Why not tip it too? That leads the eye up better from block number three. Maybe carve a rounded notch or groove in blocks one and two so that they lead visually to three. Time does not allow much more and this would be a convenient "break point". It could always be continued if necessary. Probably never will be completed! (4-41)

The same student records incremental thinking during another project:

Trees won't stay. They're too big. Take off small section and try that down in middle of moss. It works! Why not have the second larger tree mounted behind? When I make the wooden mount, I can make a hole and support the tree in the hole with clay... (4-15)

Intuited entry points: e.g. "Trees won't stay; too big; something has to be done."

Increment: moving toward a solution, e.g. "Take off small section and try that down in middle of moss."

Closure: e.g. "It works!"

Figure 5. Visual description of participant example #4-15
Other examples of incremental thinking from the journal are:

Overnight I thought about the pattern and felt the red was too strong. I decided to use black instead....  (14-19)

No, black is not a colour, so I thought about reversing the above design and using a wide dark blue inside, with a fine red one. After trying this with coloured construction paper, I was satisfied that this is what I'd use.  (14-19)

In this example, the student experienced two small insights: "the red was too strong," and the need to "reverse the above design," to bring visual satisfaction. Each moved to another increment.

Similarly, other students wrote:

First I took paper cups, glued them together, ran straws through the middle but the cups wouldn't roll. They would only go halfway round so I decided to put a straw through the middle. Then taking the middle straw, I rolled it with my hand and the two cups -- rolling back and forth looked like one. (2-1)

After much deliberation, I thought of weaving my reeds through the bottom of the base. It would make the pouch stronger and help it to stand. It worked!  (13-14)

...I thought at first I would use wire and plastic but the plastic kept tearing. Finally I decided to use paper. I started braiding the paper through the wire and it worked fine so I kept braiding...then I knew at that moment that my unique form would be a reality.  (11-5a)

In this example, the first entry point did not prove to be satisfactory so the student had to abandon the direction for another one. The second increment was more successful and the project moved toward closure. In this case, the limitation of the material (plastic) was the reason for the change of direction.

One student, after recording the cognitive reflective process by which a visual decision was made, evaluated the results intuitively.
The student recorded this:

When I was finished, I realized that the material could have been put together in a more interesting way. I changed the rolls that were made of paper, to wood. I felt that my materials related more to wood than they did to paper. (7-5)

It would seem that the small illuminations are the intuitive entry point for the increments, which in turn need further illumination so the student searches for still another intuited entry point and advances the solution. The increments may be abandoned, or be reversed, at any time, according to the perception of the thinker. Through the journal record, the students clarified the thinking process for themselves.

Reflective Intuitive Thinking

<table>
<thead>
<tr>
<th>REFLECTIVE INTUITIVE</th>
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<tbody>
<tr>
<td>- ability to freely associate random ideas</td>
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<tr>
<td>- ability to visualize idea connections</td>
</tr>
<tr>
<td>- ability to delay closure for further exploration</td>
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<tr>
<td>- ability to arrive at a spontaneous conclusion</td>
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Figure 6. Reflective intuitive thinking
Reflective intuitive thinking was evidenced when participants allowed themselves time to think flexibly, engage in the new idea juxtapositions or forms, and delayed closure until a spontaneous association, connection or synthesis was made.

Figure 7. Reflective intuitive thinking

Brainstorming through graphic ideation aided this exploration of possible solutions.

Figure 8. Brainstorming during reflective intuitive thinking.
One student records her use of flexible thinking or brainstorming during reflective intuitive thinking:

I scratched this idea after working for a time with the plastic and covered wire braids.... I doubled them, curved them, bent them, and still I wasn't happy with the results. More thinking! Then a new idea! I got copper wire, made a spiral for the bottom of the pouch, and then continued to form the wire around a cylinder shape until I had the desired height. (14-7)

In some cases, the participants learned from observing children brainstorm ideas and manipulate materials. Ultimately, their own ideas leapt to the fore. For example:

...I was having trouble coming up with an idea for the post-toy form. I gave the springs to my children and watched.... They sprung them, rolled them, classified them, compared their springiness, etc.... I got the idea of putting a ring on a long spring and getting it from one end of the spring to the other, quickly...of shooting the springs...of releasing them quickly to see whose would go the furthest...of putting one spring inside the other. All these ideas were incorporated into the post-toy project. (13-18)

A number of ideas came quickly, following the manipulation of materials and idea exchange.

Another student described her thinking after cutting paper into segments:

...I find that there are many ideas which seem to flow around in my mind. I measure, curl, cut, roll, fold, and find that this is not a problem...intuitive thoughts seem to follow, one after another.(5-7)

Another example of ideation or brainstorming before intuitive thinking begins with an external stimulus, music, then through the free association of ideas and words, leaps to the idea of a new form:
Music playing - rhythm - beat - bongos - xylophone - what about a canophone - canophonus extraordinarius. (5-12)

In this case, the student freely associated ideas which explored the possibilities of musical instruments and variations of sound before deciding how she would visually alter the tin can. The can was a given material for a visual task to be solved in a limited time.

In her journal, a participant (#8) understates (according to the instructor's perception) a brainstorming sequence which took place during the first week of the summer school course, which the class was making decisions about spaces for work and relaxation. During a discussion period, the class examined ten to twelve suggestions for finding a comfortable floor covering upon which people could rest or relax during problem-solving sessions. The discussion seemed to have come to an impasse when, suddenly, participant #8 shouted, "I've got it! We can use gymn mats to cover the cold tile floor - and they're free and available right here at the university!" In her journal, she states:

I was happy to be able to make the suggestion to use mats from the gym to cover the tile floor. (8-1)

It would seem that the brainstorming time with the total group facilitated her intuitive leap. Others responded positively about a decision that seemed very obvious after the connection was made.

By brainstorming ideas, one student intuited fourteen possible ideas for his post toy. Lack of materials, time and an aesthetic sense caused him to eliminate many of the ideas before he selected a game that he called "elbow hockey". Many of the intuited ideas were humourous-
ly endowed. They varied in their complexity and their originality, but each, if they were actualized, would have fulfilled the stated visual problem, to make a unique toy. He records these statements in his journal:

Spring:
- Danglies
- Coaster
- Shark shooter

Water drive:
- Water-powered tipper

Musical:
- Overtone investigating monochord
- Note game
- "Marimba"

Board games:
- Coloured marble game
- Multi-puzzle
- Frustration game
- "Innovation"

Other:
- D & D mobile
- Mouth race
- Elbow hockey
- Variation on stone/paper/scissors (4-31)

In all examples, the students recorded deliberation, manipulation of ideas or materials and change before an intuition or solution was actualized. There seemed to be various intensities of "aha!" but in each case, there was at least one change of direction, a new idea, a solution, or the visualization of a new form. In some cases, the intuitive leap was very significant. In others, it was a facilitator for another sequence of brainstorming activity.
**Broad Intuitive or Occluded Intuitive Thinking**

<table>
<thead>
<tr>
<th>BROAD INTUITIVE OR OCCLUDED</th>
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<tbody>
<tr>
<td>- ability to bring several elements of the problem together in a broad illumination</td>
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<tr>
<td>- ability to see part of the solution clearly</td>
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<tr>
<td>- ability to continue searching for the occluded part of the solution</td>
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Figure 9. Broad and intuitive occluded thinking

The broad intuitive mode is evidenced by several things fitting into place in such a way that there is a broad insight or classification. Illumination comes in a general sense rather than a small bright spot as is found in spontaneous intuitive thinking. The illumination is occluded, having some light, but more darkness than light.
In other words, there is more to be solved even though some illumination is evident. Broad intuitive could be visualized in this way:

![Diagram of occluded and illuminated thinking](image)

**Figure 10.** Broad intuitive or occluded thinking visualized.

One student records this cognitive experience:

> When I changed the direction of my thinking, I came up with a new idea and new materials... Almost immediately I decided I would use plastic and covered wire and braid... these two together in strips... then manipulate the braids into a pouch form... I manipulated the braided materials and didn't seem to have much success. I think and plan again... came up with... copper wire and plastic strips but not braided... I finally succeeded. (14-7/8)

Several aspects of the problem fitted into place after the student changed her thinking direction. This intuited need for change facilitated the new possibilities. With the illumination came new ideas so that a new form could emerge. This did not come to fruition without more searching and manipulation.
I set out my blocks on the table and as I did my housework, I went back to them time and time again—felt this was more satisfying than pondering over them for a long time. I went to bed...determined that I had reached closure...I had a dream about them. I woke up...and this form was very strong: (visual). So I decided to...(12-16/17)

...I abandoned the short wires and decided on long lengths...not enough wire...use reeds! also...I felt that these two materials would be compatible but maybe not as easy to work with as...wire. At this point I was not confident that my pouch would be free standing upon completion. (6-5)

This student experienced illumination about the use of materials for her visual project, but the illumination left some portion of the problem unresolved or occluded. Even though the new materials were more compatible, her sense of pouch form as a free standing form was ambivalent.

One student (#12) struggled with the possible materials she might use for the fetish project. She explained her dilemma and feelings to the instructor. Broad illumination resulted so she was able to continue her art form. She wanted her family to be the theme for the fetish, but could not seem to intuit an entry point. She recorded:

I tell the instructor my feelings and my dilemma. I am an empty vessel...a virgin brain...and how our family's livelihood depends on wood. The instructor then suggested I use wooden pieces, dowels, different sizes for each member of the family...now ideas begin to form. I think I can do it... (12-30)

Another indicates how a change of direction and therefore a new focal point in her thinking facilitated illumination:
When I changed the direction of my thinking, I devoted more attention to the lines in my visual environment. I was then able to work with more confidence and therefore come up with a different arrangement that was pleasing to me for the garden. (6-106)

In one case, the student experienced a broad illumination which directed her to take immediate action but then left her to solve other unresolved areas in her wood sculpture.

The second block resolved itself easily. The block of wood looked like this [visual]. I saw that there was a loose cone inside the main block. I liked the idea of removing it immediately, so I grabbed the scissors to pry the wood pieces apart...then the next problem...how to smooth out the centre circle? (1-8/10)

The journals contained some short statements written by students that also articulate broad intuition. These often led to a variety of visual decisions.

Why limit it? [the fetish form]. Why not combine both so that the fetish can be worn around my neck...waist...over/under the shoulder? (4-26)

The simple statement, "Why limit it?" (4-26) is essentially an illumination or a broad intuition. Up to the point of illumination the student was experiencing limitations in thinking and solving the visual problem, then the student experienced a change in his thinking and this shed light on the problem. More remained to be solved but the intuitive thought was the breakthrough which enabled him to move on to a solution.

The same student recorded:
But why use the blocks flat in a pyramid shape when I could tilt one on its edge to support the other two? This is a new juxtaposition which would require visual backup...however, it must relate, so...

The student's broad intuition sheds light on the problem, but does not necessarily bring closure in the sense of a solution. The intuition solves a major portion of the problem by providing an occluded vision of it.

**Spontaneous Intuitive**

The spontaneous intuitive mode is the most direct kind of thinking. It, like the occluded mode, relies on an emotional, intuitive response rather than the intellectual, but it differs because it is characterized by an element of spontaneity. During spontaneous, intuitive thinking, a solution is arrived at by a sudden flash of intuition without the thinker knowing where it came from. The sudden flash illuminates a small part of the problem that could lead to a final solution or just a portion of it. In spontaneous, intuitive thinking, there is no incremental sequence leading up to the solution; rather there is a problem which needs a solution, and the illumination of the solution is arrived at instantly and spontaneously.

General characteristics of spontaneous intuitive thinking are summarized in Figure 11.
SPONTANEOUS INTUITIVE

- ability to look at the problem globally

- ability to synthesize information quickly and move directly to a solution

- ability to arrive at a solution instantly and spontaneously without realizing where it came from

Figure 11. A summary of spontaneous intuitive thinking

One example, recorded by a participant, states that the process for this project "pretty much came to me fully formed, with only the details to figure out..." (4-33a).

The phenomenon of instant form is difficult for the partici-
pant to explain. It happens instantaneously and with conviction. Others record similar cognitive experiences, leaving the participant surprised and unable to explain what happened except after the fact.

I just had an idea that took off on its own and left me to manipulate the materials. There was little conscious thought involved--it just seemed to go with the flow. For that matter, so did the first project. (4-5)

They use a variety of words and phrases to describe their spontaneous intuitive experience.

Bingo! I'll strip the wire and use the bare copper to weave through the two ends. (5-10)

When I saw the material, I knew right away the concept I had visualized in my mind would complement the material. (5-30)

Given a tin can as visual material...I thought, I'll make a view finder. No apparent thought came before this decision. It was out of the blue. (8-8)

One participant understated (according to the instructor's perception) a spontaneous intuitive moment:

Asked the teacher for help. She said..."Maybe you should start again"...I accidentally dropped the copper wire on the floor. I saw a new cylinder-like form of...wire coil. [Others responded around her too, at the same time]... A new idea for the project...How to hold the form together? I'll weave reeds into it. (9-6)

Another participant recorded this spontaneous experience:

On Thursday night, while completing another assignment dealing with related shapes, I suddenly saw an idea I had sketched, which I thought could be done with these blocks. (10-27)

Other journal entries which describe spontaneous intuition are:

...these two original shapes came to me immediately when I was asked to change my block as the problem stated.. (11-13)
...I knew right away that the ...carton would be my main material.

...I recognized immediately, even in this rushed situation that...

...No apparent thoughts came before this decision. It was out of the blue.

...At supper it came to me - just like that.

...immediately the prospect of...appeared almost naturally.

...then it began to take shape. I could see the fetish in front of me.

In each case, the intuition was arrived at unexpectedly. Although the student was aware that a solution had to be found, it was not necessarily that aspect alone that the participant focused on. Often, while involved in another activity, washing dishes (13-18), walking, manipulating art materials (10-27), trying to solve another visual problem, the flash or intuition arrived "suddenly," "out of the blue," or with "no apparent thought."

The Instructor/Researcher's Perception of the Ways in which Intuitive Thinking was Manifested by the Participants in their Visual Work.

Introduction

It is important to note that the participants in the university summer course were generalist teachers who had no art training. Some indicated an ease with creative ventures, but most expressed anxiety about doing anything visual. They said they were not artistic, but would like to develop their ability to think and teach creatively so that they might facilitate this kind of thinking in their students.
The participants were, for the most part, willing to learn and explore the techniques and visual problems presented to them. Because they lacked experience in visual problem solving and exhibited a high anxiety level at the beginning of the summer school course, due to fatigue, personal or employment problems, a negative reaction to a spring session course, etc., it was necessary to provide opportunities for relaxation and encouragement at the beginning of each day's session. This was particularly true during the first three days when external influences were still very high.

As a result, the instructor/researcher used the first two days to talk about the participants' personal space—both psychological and preferred work space—as well as encouraging the group to discuss and share the thinking process they used while preparing a toy that they had created at home before attending the university course. The participants used graphic ideation to describe the thinking process that they used to make their toy. This served three purposes:

1) the participants became better acquainted with each other;

2) they verbalized, for the first time, how they had intuited their visual solution; and

3) it allowed the instructor/researcher to listen to, and get in touch with the level of thinking and ideation used by each participant at that time.

After sharing and discussing the small thinking tasks that had been given before the course started, the instructor introduced
some of the vocabulary and techniques that would aid understanding and communication during the month. Also the instructor described the kind of study and work format that would exist for the next four weeks. Knowing what was expected seemed to lessen the participants' level of anxiety somewhat.

It should be noted that the instructor used music, breathing exercises, relaxation drills, visualization, mind-freeing games, humour, tactile objects, slides, discussion, writing and no-fail visual problems to relax and to introduce the participants gradually to the positive learning environment for the month. In addition, all class members, during the first week, participated in a field trip to Port Morien, a fishing port of beauty and visual interest. There, they engaged in a visual search, renamed common objects, completed sentences metaphorically, intuited new juxtapositions, extended imagery imaginatively and fancifully. Again, the experience introduced concepts that would benefit the participants' divergent and intuitive thinking for their major projects.

For the remainder of the month, the participants were involved in a sequence of preliminary visual exercises that introduced and had a relationship to the five projects they were to solve visually. These exercises were for the purpose of examining new idea juxtapositions; exploring a variety of material; developing divergent thinking; and developing an awareness of intuitive thought.

Most participants approached their visual problems with readiness but some were inhibited by past experiences, their perceived
lack of skill or their minimal awareness of the possibilities provided by the exercise. Still others were influenced by their own attitude or temperament, peer group or family pressure, their thinking patterns, their preferred work space, and the instructor's inferences.

Preliminary Exercises

Each day the participants were involved in a series of exercises which preceded and related to the five major visual projects. Before being introduced to the major project, the participants explored materials, techniques, ideas, and new juxtapositions that related to that project. They found out what the limitations and possibilities for each material were, and tested out their new ideas. They were, therefore, less anxious when faced with the major project. The participants were able to use this information to intuit their choice of material and the technique that they would use to solve their visual problem. One participant recorded that she was

beginning to understand why it was so important to become very familiar with the materials before attempting to work with them in a formal way. The blocks of wood are a good example...I examined them [their characteristics] closely...really concentrating on them...suddenly...I had reached the [intuited] entry point for my new project. (10-16)

Another expressed the importance of being able to experiment and try new forms, lines, shapes, colours, and ideas in a "no fail" situation. Others articulated their need to be "freer in their thinking," to "risk," "not come to closure too quickly," and to "test out new ideas." One participant expressed a desire to "forget things she had done before" and be completely original. Still another wrote
that she had always been positively reinforced for having her work finished first in early schooling, so the exercises helped her to show, and explore, and visualize more ideas. She also claimed not to be a "doodler" so she appreciated, but felt anxious about the graphic ideation exercises she was encouraged to do in preparation for the other projects. She wrote:

...and I was anxious to finish and didn't allow my mind to wander and see other possibilities...I plunged ahead. (8-15)

and also:

I was very concerned about trying to show an image on the paper. I don't draw and I'm not a doodler so to present a diagram was a big undertaking...however, I survived and...shared with the group. (8-15)

When engaged in idea exploration and changing juxtapositions of form, the participants used relabelling, metamorphosis, idea extensions and such literary techniques as simile and metaphor. For example, during the field trip to Port Morien, they recorded the following phrases, which were the result of intuiting new associations and relationships. Some recorded examples are:

- the boats stood waiting for their masters to take them to sea
- the boats are like young teenagers who resent being tied down
- the water was like a desert at midday yet, beneath the arid surface, so full of life
- the rocks, laying scattered as though tossed by a careless demi-god, thrust their strong arms out of
the placid waters.

Some other written forms that were intuited as a result of exploring new juxtapositions, were:

- lobster trap: catchums; boat: business-partner;
- boats: water-riders; buoy: baby-sitter; anchors: water-brakes; houses [on the embankment]: guards;
- fish crates: ocean sepulchre; odor: living/dying;
- rocks: earth fruit; seaweed: waterhair; rocks: beach seats; truck tires: rubber donuts.

Many of the activities, although purposeful, were play-like and, for that reason, humourous. Others posed a small problem to be solved. For example, the participants were asked to create a visual ice-cream sundae, using a variety of materials within a time limit and given construct. Coloured paper was used instead of ice-cream. The products exhibited a high level of creativity and visual problem-solving ability. This was done in pairs and with the exception of one pair, there was laughter and positive feedback. One pair of participants recorded these suggestions for the sundae toppings:

> the flavours we selected were spaghetti and meat sauce, and vanilla crackers interlaced with vanilla icing. (4-45)

This thinking process gave many opportunities for creativity and intuitive behaviour to be manifested.

The participants, through being involved with visual problem solving situations, became aware of the intuited entry point through which they could attack the task at hand. They also intuited the
suitability of a material, the technique to be used, and the need to change their thinking, as well as the appropriate moment of closure. At the beginning of the course, because participants lacked awareness, many entry points were ignored. However, when the participants became interested in what triggered their illuminations, or intuitions, they became aware of the initial intuition - the entry into the problem.

Participant #10 recorded this in the relevant journal notation:

I have experienced many times during the course what Bruner describes as the intuited entry point; that first ray of light towards an idea for a project. Actually we experience this many times throughout the day when solving house­hold problems, without knowing it. (10-19a)

Visual Project #1. A Pouch Form Containing Five Natural Objects

Most of the participants chose the substance and technique they would use for their pouch, after experimenting with a variety of collected materials. They then used the material and the technique to actualize a form that they had visualized or graphically explored.

In some cases the visualized form was not compatible with the chosen material or technique and therefore a change of direction was necessary. Most participants had to alter their original idea either by changing the material or accepting a form that had not been originally planned.

Participant #14 recorded this:

My first thoughts were about the materials I would use and how I would put them together. Almost immediately I decided I would use plastic and covered wire braided together in strips, then manipulated into a pouch form. (14-8)
Like many others, she "scratched the idea" after trying it because it did not work out. She then explored other possibilities:

More thinking! New idea! I got copper wire, made a spiral for the bottom of the pouch, then continued to form the wire around the cylinder until I had the desired height... This became complicated. I took it apart several times, pondered over it and tried it again. I finally figured out that because the strands of copper wire were going around in a spiral, the problem regarding the weaving could not be overcome... so I proceeded [in spite of this] to complete my pouch. (14-8)

At each stage of visual problem solving, participant #14 had to intuit what was wrong, decide what to do, and correct the situation. Sometimes the illumination only came after a struggle. Many participants recorded a challenging time as they attempted to make the material, the technique and the form compatible.

Participant #5 recorded these changes of idea while choosing the most suitable material and method. Each choice was intuited and elimination advanced some part of the decision-making process:

I am unhappy with the rope (too bright) and the twine (too stringy). I decide to change the design of the rope (it is twisted: 3 strands)... weave the braids...too thick...use grass to weave into the braids...too thin... (5-9)

Participant #5 makes several aesthetic decisions by visualizing in her mind how certain materials or forms will look. She discards and moves on from one to another until she is satisfied with the visual decision.

One participant recorded how she and others wrestled with their visual thinking in order to arrive at a satisfactory pouch form:
Today each person described in detail how and why they chose their materials and the difficulties they encountered while working with these materials...I had been so confident of my materials in the beginning and when I finally came to the point where I could mold them together, I had great difficulty reaching closure. As a matter of fact, it was the wee small hours of the morning when it all came together. (10-4a)

She, like others, experienced intuition during the thinking process especially when faced with a problem which had to be overcome. She recorded one of these moments of illumination:

As I held the jute braid and manipulated it in various ways, I felt that if I made a disc...with each braid, and sewed them together with a finer grade of jute, something different might happen. It did! The more I pulled the discs together, the more interesting the form. (10-5)

Manipulation seemed to have been the key to the discovery of the disc shape. Without this form of material brainstorming, the participant might not have intuited the new form—a conglomerate of small discs pulled together into a pouch.

Some participants record small intuitions that enabled them to move ahead incrementally in their problem-solving. One participant recorded "a bright idea" that enabled her to make the shape in whatever way she wished. By lengthening the wires and securing them with two guide wires, her cradle-shaped pouch was "more structurally solid and easier to work with." She also intuited the need to use masking tape as a "rough bracing to keep the wires apart." Another realized the need to keep the braids separated, so she used clothespins.

Participants had to intuit their points of closure, that is, how to finish the final form. They faced the problem of finishing off
the ends of braids etc., reinforcing the form so it remained stable, completing the top or opening to the pouch, so that the natural objects could be housed safely, and providing a lining or inner surface, if necessary. Participant #3 wrote:

Because I felt that it didn't look finished, I looped a piece of reed inside the top and bottom of the pouch. Then, after many thoughts and ideas, I decided that a clear plastic...would be good for inside the pouch.


This project was accomplished in three phases:
1) by preparing an individual environment,
2) by combining individual gardens into one visual environment,
3) by adding line-contoured sand plane around the environment.

The participants manipulated a number of natural materials that were collected from the woods, the seashore, the lake front, and the riverside. Some of these were: rock, moss, drift wood, shells, sand, shale, grass. No colour was to be introduced so they focused on texture, shape, tonal value, and visual relationships. The only man-made element allowed in the project was a reflective material. Everyone in the class used mirrors. They made a variety of visual decisions about their placement while constructing their own environment, but these had to be changed in many cases when the individual gardens were combined as one interacting environment.
During the process of joining the gardens together, the participants moved their environments around until they found an edge that related visually to their own. There was much discussion and decision making during this phase. Members of the class intuited decisions that affected others and they therefore had to defend their validity to their classmates.

Participants also had to intuit the point at which the new visual arrangement reached visual satisfaction. Through formal and informal discussions, the class developed a criterion with which to assess this final form.

One participant recorded her intuited response to her initial decisions:

...less is more. I realized that I had been trying to fill up this surface--use all the materials, which was giving a cluttered effect ...

(12-9)

She then gathered more information that would help her to intuit her next visual decision:

I went to the books on Japanese gardens and looked at the pictures. Gardens had always meant flowers to me. This was a new concept.

(12-9a)

Likewise, participant #9, after brainstorming ideas and looking for new ideas, recorded that:

...it was like a weight lifted and my problem solved. I knew where I was going and what I wanted. Like the garden, I became calm within myself...

(9-13)
This intuitive experience brought an occluded solution so that further thinking could take place. Again #12 noted that drawing out the gardens helped her to delay closure and actually get to know the materials better. The "end result wasn't that important to me but working through the ideas was very satisfying."

The next part of her intuitive thinking was recorded in this way:

I decided to keep the driftwood and not switch to a rock. I felt that the wood might be a bit more challenging because of the slant, but I didn't need to take the easy way out...I could see which of the objects I wanted to keep in and where I wanted them to be...  

(12-9)

Participant #12 recorded her satisfaction with her final visual decision:

I was pleased with the outcome individually, but even more so when it was related to others on the display table. I felt proud to be part of such a project.  

(12-9c)

Some participants recorded that they had to remind themselves to slow down their thinking process in order to explore other ideas. One writes in her journal: "Go slowly, go slowly - I want to race ahead - draw each attempt." Another writes how she had to "begin again and change everything but the small green plants." One participant intuited her treatment of the driftwood: "Its beautiful lines should not be covered up and I must find some way to anchor it since my rocks and moss keep falling off."

Participant #1 gives evidence of intuitive thinking following a need for changing the spatial relationship of the elements in the
garden. She records this:

> When I changed the rocks...I liked the three rocks closer together rather than scattered over the garden... (11-7)

This intuited spatial response was based on an emerging sense of spatial possibilities which could have come from class discussion, the manipulation of actual material during formal presentations, and from looking at, and talking about the philosophy behind the Japanese garden.

One participant indicated that in order to select her two visual elements, she had to do a great deal of thinking about rock relationships and object relationships before she could come to closure. She records:

> Too many elements make it seem cluttered, so I finally decided rocks and moss plus some sand would be the only materials I'd use...After this we (the group) drew lines on the paper garden and we began to realize that we should follow the contour of the shape so that the line would reinforce the shape. We could then see what was needed around the gardens so we drew contour lines around each garden shape, in the sand... I was really pleased and surprised. (3-5b,5c)

Each illumination moved the thinking along until some portion of the solution was formed or until aesthetic satisfaction was achieved.

**Visual Project #3. Wood Sculpture**

**Introduction**

Before starting on the wood project, the participants explored visual relatedness, using paper and clay. The clay blocks
were used to simulate the visual problem to be solved with wood. The class also "lived with the blocks" for most of the week to develop an awareness of their physical characteristics. From this exercise, the participants knew where the structural problems and possibilities were before altering them.

The class expressed their ideas graphically through visual brainstorming sessions. They then began to alter the form. Many of the participants feared using the tools that were necessary to complete the project. One session was used to introduce the tools, to explain how they could aid the project, and to develop the skill level needed to accomplish this task. This lowered the students' anxiety level considerably.

The Project

After deciding on a plan for the wood sculpture, the students chose tools that would enable them to accomplish the form. Each decision was intuited, either through an elimination process after visualization or while manoeuvering the actual blocks. In some cases, another form, the clay shapes, or an associated idea triggered the idea. Participant #10 writes:

...while completing another assignment dealing with related shapes, I suddenly saw one idea that I had sketched, which I thought could be done with the blocks. I worked with the clay blocks first and the shapes very easily formed...I found it difficult to visualize at this point how I would cut the blocks but it was an entry point into the idea...I was very clumsy with the saw. The chisel and hammer were more comfortable for me to use...The other two blocks were cut with the band saw...this was not a
The real problem occurred when I tried to chisel out the centre of the third block to fit over the rounded form of the other. (10-26/28)

The technical skills needed to execute the design were considerable. When certain tools were not compatible to the participant or their skill level did not match the task, another tool had to be chosen.

Intuitive thinking took place both in the visualization process and in the ability to see the relationship between the tools and the proposed form. One student records two flashes of illumination that extended her initial ideas. She records that while I was discarding the wood scraps, I thought one of the pieces could be arranged at different angles on the form to make the shape more aesthetically pleasing... (10-28a)

Also, she writes:

...as I looked at it, I could visualize where slight bands of colour would pick up the contour lines in the wood. I liked what happened and felt satisfied with just this amount of embellishment. (10-28b)

In the last case, she intuitively considered the possible ways she could embellish the blocks; then she decided to repeat the curve of the wood grain with coloured stripes. In the first example, she sees a new possibility for something she had considered a scrap. Her intuitive thinking contributed two important elements to the wood sculpture—embellishment and a more versatile, related form.

Many students used reflection to consider their possibilities. While reflecting, they would think about the ways they could cut out,
trim down, try new juxtapositions with the form, or add embellishments. This thinking often led to an intuition that moved the solution closer.

One participant records this reflective process in her thinking:

I was still thinking and looking - looking and thinking. I felt I could add to the aesthetic intricacy of my design by changing my measurements and adding a bit of design. Why? Because if it could be cut - why would it have to have sharp edges? Why not smooth, yet related to each other? (5-25)

The same student, when at an impasse because the tool would not cut the shape she had designed, was able to intuit that the plan could not be accomplished and that it would have to be changed again. She re-designed her wooden sculpture several times before the form, technique and tool limitations became compatible.

**Visual Project #4 - The Fetish** (anything to which one is irrationally devoted).

A major task for participants in this project was to define the word fetish for themselves. Without an understanding of the fetish concept, they were not able to decide on a theme or the appropriate materials to execute it.

The fetish, because it was to be a personal statement, had to be dealt with on an individual basis through introspection and self-analysis. Many participants, surprisingly, chose their family as the thing to which they were irrationally devoted. Others selected nature, children and religion, or a combination of both, as their theme. After much discussion, brainstorming, instructor explanation, the participants began to narrow down their ideas.
Having decided on a fetish, the students then had to intuit what material would actualize their ideas. One participant wrote in her journal:

The first thing I thought about was how the family loved the outdoors...I went to the beach, then to the woods. When I saw the collected material, I knew the fetish would have quite a lot of nature pertaining to it...eventually I was able to arrange the symbols of each family member on a separate dowel and used the natural material related to that person. (11-10)

One participant indicated that he was irrationally devoted to a material—metal and plastic rings! So when he heard the problem, he decided immediately that whatever he made should be made with metal rings. In other words, the illumination directed the participant to a certain basic visual form that was within the limitation and possibility of the material he enjoyed using. After working on several ideas, he intuited the need to combine two of them for aesthetic value. He then embellished the final form with coloured wool and feathers.

The participant, after intuiting his entry point, moved cognitively through a short brainstorming session, then leapt to another part of the solution which in turn generated more decisions that had to be thought out incrementally and intuitively.

He recorded evidence of this thinking in his journal:

Sketch time for ideas! Rings yield two practical construction techniques - chains (or belts) and "plates". Being "flat", disk-like objects, they do not lend themselves to three-dimensional objects without external influences, but they can be used none the less... (4-30/30a)
During a small cognitive sequence, he illustrated some intuited decision-making:

...two rows of square-shaped sections - yuck! Four is too much. Try some other ideas...maybe three "chains". One looks good, two triangle shaped--fairly good, and three together are fussy...idea...put on a "one-row" chain at the top, then it can be a belt or belt ornament, a neck band, etc...

I can hang something from it...aha...why not have two short pieces or make a loop with the long one...this adds to the options...and to add to the visual effect--a repeated pattern of rings and feathers that is thrust out at right angles to the main piece...to both contrast and reinforce...add two more...that's overdoing it...why feathers? They are independently supported by central spine yet billowy, a nice textural contrast to the metal rings. (4-30/30a)

Participant #4, like others, proceeded incrementally but experienced small occluded illuminations that had to be tested out visually, practically, and aesthetically before progressing. The decisions were based on an awareness of form, material, embellishment, contrast and texture.

At least two of the participants made decisions intuitively by associating the material symbolically with the person to be expressed in their fetish.

One wrote this record of her thinking process:

My husband likes wood in its natural state so I'll use no varnish or paint. Wire denotes strength - try winding it around the dowel... don't hide too much of the wood. Now the leather...tied knots...not pleasing to me. Now what?...Yes, loop it! Five loops for the family members...now add a nail to hold things in place...like his caring for the family. (12-30a)
During this project there is little evidence that the participants experienced a spontaneous intuition which presented the solution in toto. Their records show that most thinking took place incrementally, with a few occluded intuitions during the visual decision-making process, which led them on to further thinking and finally a conclusion.

Visual Project #5. Fabric Sculpture- An Unusual Canadian Commodity for Export

Several participants chose to do a fabric sculpture rather than a fetish. They found the fetish concept difficult to grasp and some others related more to stitchery, colour, fabric, and sewing.

The participants undertook a search for ideas and materials in a similar way to that expressed in the last project. There was a general exploration of ideas and available materials that eventually alluded to a direction or an entry point for the project.

Participants #10 and #8 indicated that their choice of project was based on the fact that the fetish idea had no meaning for them and that they enjoyed working with familiar materials and tools such as fabric, scissors, needles. One, however, considered making a fetish out of many different fabrics so that she could combine the two projects.

Canadian commodities such as beaver teeth, Bras d'Or lake waves, fire and clouds were among the themes selected for fabric articulation. Brainstorming and reflection about the things Canadians take for granted in their environment were part of the decision-making process.
process.

One participant used a variety of "what if" and "why not" statements to encourage her thinking process. She records these statements of flexible thinking:

What if I made a sample package of waves... small, medium, large, muddy, icy, gentle, angry, frozen? Why not export unpolluted Bras d'Or lake waves to polluted areas of the world?... Once I got started, the ideas just came popping into my head...however, I don't have enough time to complete all these ideas so I'll select a few... (10-29,31,32)

The brainstorming technique and attention to visualizing and fantasy enabled the participant to survey a much larger vista. She opened up so many possibilities that she was unable to actualize them and had to intuitively select those that would complement each other visually. These she executed in both fabric sculpture and crochet and they were enclosed inside a large wave-shaped folder. In other words, not only did she intuit the idea for the wave project, but she had to think about its form, content and material execution. Small intuitive leaps led to further thinking before illumination came again.

One participant records a sequence of thinking that was influenced by a number of external criteria. Also, her intuitions were often abandoned due to time limitations or lack of suitable material. These changes in the thinking process caused her to explore other ideas.

Firstly, she thought about exporting Canadian "trees, leaves, bugs, bees, ...feet...good idea! What about toes? Transport
toes inside a big foot..." However, she could not find suitable material so she eliminated these possibilities. She then thought of a "cloud as a carrier...inside this cloud I could transport rain, hail, a rainbow..." Then her mother said something about "clouds with silver linings"... She responded to this idea positively and set about planning for a cloud with a silver lining inside a cloud with a silver lining...a continuum of happiness. She could find no way to visualize closure so she changed her thinking again. She finally arrived at transporting a variety of silver linings inside a big cloud shape. While sewing her project, she imagined another idea and sequence of events, which she recorded in her journal:

This is turning out to be more difficult than I thought. Not difficult - time consuming. Perhaps I could have done something that would take less time. How about no time! My mind actually began to think of something that I wouldn't have to work on. Imagine that! Aha! Imagine—imagination—an imaginary suitcase to carry everyone's imagination! I could visualize a little drama featuring my carrying an imaginary suitcase, which could be described vividly but not seen. Logically, this could not be assessed properly...Oh well, back to the cloud! (5-33)

It should be noted that although the participant was working on and thinking about the actualization of the fabric sculpture, she was able to overlay this activity with another cognitive sequence, much like a day dream. She fantasized a drama that could take place for the presentation of her fabric sculpture. This she actually did for the class before showing them her cloud sculpture. It would seem that the awareness of her cognition had grown sufficiently that she could state
with clarity what she actually thought.

An Analysis of the Congruence, or Lack of Congruence, between the Students' and Researcher's Perceptions of Intuitive Thinking, as Evidenced in the Journals.

Participants recorded their thinking processes in journal form, but also filled out a prepared form for each major project. In addition, the instructor/researcher recorded her perception of the participants' intuitive thinking process while they solved their visual problems. Because some of the visual thinking took place at the participants' homes, that is, outside of class time, this record is not always as complete as that of the participants. In other cases, however, it is more detailed because the instructor's level of awareness by the end of the session was more developed.

The journal notations of the participants varied in the amount of detail presented, their level of focus or awareness of the thinking process, and their level of articulation as well as the seeming motivation to scrutinize intuitive thinking in depth.

For example, one participant's entry about her intuition shows a lack of awareness for what happened as well as an inability to express that experience in depth or in detail. Her entry understates what was perceived by the instructor and other class members to be an intuitive moment.

Participant's journal entry:

...we discussed having a quiet corner in which to relax and think and I was happy to be able to make a suggestion to use mats from the gym to cover the tile floor.
Instructor's journal entry:

...for about twenty minutes the group brainstormed ideas about a relaxation centre in the room where participants could rest, dream, think, sleep, during the creative problem solving process.

Covering the cold tile floor posed the greatest problem. Scatter rugs, an old rug from someone's home, heavy blankets, foam mats, were all suggested but were dismissed as being unavailable or too expensive to purchase. Most classmembers made suggestions during the discussion. Sharon, (#8), however, had participated very little until she suddenly intuited a solution which she presented in a very animated way. Her face lit up and she said: "Let's use the gymn mats that are available right here at the university! They are clean, warm, mobile, and can be procured and returned easily."

Participant #8 had taken in the information during the discussion and synthesized it. The result was an intuitive leap—a solution to the problem at hand. She records the incident as a helpful suggestion, without realizing that intuitive thinking had taken place. Only after visually graphing the thinking sequence could she recognize an intuitive leap after a brainstorming session.

Similarly, participant #9 recorded an intuition in an understated notation. She recorded it in two places, one much skimpier in content than the other. This is the most detailed and articulated of the two:

Participant's journal entry:

While examining the wire, I dropped the coil on the floor...a new shape began to form. It looked like a slinky...my new form or shape was much more interesting and solid. At least now I knew what to do. I began to realize what the assignment was...my pouch does look very natural and my two
materials (wire and natural reeds) make a nice pattern.

Instructor's contrasting journal entry:

Pat's wire pouch form is causing her difficulty. She seems pleased to be experimenting with new material (wire) but has not been able to deal with the limitation of the basic form she has started. She asked me what she might try to solve the problem. After some discussion, she realized (intuition) that the wire ribs are too far apart so most weaving materials would have difficulty covering the large spaces. I suggested that she could add more wire ribs or revamp the form in a new way. She doesn't seem too happy about the prospect of change. However, she plays with the shiny coil of wire she's holding in her hand, stretching it one way and another. Then she accidentally dropped it on the floor. All at once, she and the other participants see a new possibility (intuition) - a long tubular coil with a distinct new shape. Several respond: "That's it! The coil can be the form for the pouch." Several participants bring tape to secure the form at each end, then they try to weave in different materials: (intuited choice of material) e.g. plastic straws, wire, green reeds. There is great excitement about the thinking that has taken place.

One participant was aware of the subtleties in his thinking process and constantly recorded these in careful detail. His ability to generate ideas and scrutinize the thinking that accompanied their execution was highly developed. He was aware of many of the subtleties within his thinking process, including intuitions of varying magnitude. In one unit he tested fifteen ideas that he had explored for his post-toy. He recorded other instances of brainstorming before intuiting the final form. In other case, he intuited a final form and then moved incrementally toward it. In all cases, the participant's
journal records thinking sequences in much more detail than those of the instructor/researcher. This was due to the amount of time and enormity of the task of documenting the participant's prolific and complex thinking process as well as others in the class.

For example, the participant records this sequence of thinking:

Today is a think-tank type day. I'll use steel wool and re-oil the blocks; then start doodling, thinking, etc. for my fetish form.

Several ideas came immediately for the fetish - a linear, belt-like or strap-like form of metal rings, connected somehow [visual of a long row of rings] or an assembly of rings set up in a shape [visual of a cluster of 13 rings] would be interesting to look at. Not useful, but that was not a requirement. Doodle time again!

Could make the linear form with two colour yarns (or more), and tassel-like objects. [Visual] but that has been done before (shades of Indian head-dress, neckbands and belts!)

Explore with rings. The rings fit best as a hexagram. Why not exploit this? [Visual of three rings forming a triangular shape] It is more natural and stronger than [visual of four rings forming a square]. Math says - three points are always co-planar; it may or may not be true. It will be rough enough to do anyway. What about a big triangle? Simply interlinked with little ones. Experiment with triangle form. There are only 19 rings here so... How to fasten? Must interweave green!... Why not integrate the belt band (strap/do-flicky with the triangle?) [Visual of triangle and band joined] The idea had separate strength. "What if" we combined them? Would they have any such strength together? Experiment--make several "ring rows" and put them side by side to experiment...to explore options...belt-like (head band, neck band, etc.) can be done by looping [triangle
visual] differently, but the total length must be great enough. Measure out a strip of twelve, and calculate about 1\frac{1}{3} inches per ring. Twenty-seven rings needed (one at top, 26 added)... looks good... take a couple of seconds to analyse... kind of plain though... Had an interesting idea while getting ready to leave for class... my original sketch had tassels of yarn (or whatever) held like so [visual of a wool tassel dangling from a piece of wool]. These are attached to the belt. Idea! Why yarn? Why not my multi-coloured feathers?

First thing to do - check it out. What does it look like? When it proves eminently satisfactory, fasten it on. (4-41)

The participant used a variety of thinking during his visual decision-making process. In addition to his incremental and reflective intuitive thinking, this participant used deliberate or analytic thinking to support his intuitive behaviour. For example, "the total length must be great enough. Measure out a strip of twelve and calculate... take a couple of seconds to analyse."

Once having established that the length was correct, he then focused on the need for embellishment, that is, some additional adornment for his fetish. He then intuited the material and form that he would use conclusively.

Concerning the same thought sequence, the instructor/researcher recorded that participant #4 was "obviously going through a number of cognitive gyrations since he was moving things about, trying different forms - elongations, triangles, squares, circles. He seemed highly agitated. All at once, he sat down and began to attach the small rings together. It seemed as though his brainstorming
When the participants described their intuited changes, they used phrases such as "I knew right away;" "the answer is quite clear;" "I get the feeling it needs something else;" "another idea came to me immediately;" "I saw the material and knew...it would;" "finally it came to me;" "no apparent thoughts came before." The instructor/researcher used similar phrases that were clothed in a slightly different language. However, both the participants and the instructor/researcher identified and recorded similar examples of intuitive thought. For example, when describing similar intuitive thoughts, the instructor/researcher recorded phrases such as "the participant realized intuitively that the material was not compatible for...," or that "#-- seemed to change direction suddenly, and abandoned the original idea, revamping the form completely," or that "after much drawing, talking, playing around with the material, the participant finally seemed to see [intuit] the direction that was needed."

Another time she recorded: "Today #3 seemed to go ahead in fits and starts. She would work away arranging the natural forms for several minutes, then clear the total surface and begin again. She did this several times. She had to intuit the need to change and find an alternate way to place the forms in a new juxtaposition."

In their journals, the participants also identified moments when they felt their visual form had come together aesthetically.
They described these intuited, aesthetic decisions in this way:
"This shape I like!"; "...finished my blocks to my liking;" "I added
a little more yellow, which did the job;" "I came up with a different
arrangement that was pleasing to me;" "the change in my idea did the
trick, it worked!"; "it seemed an obvious solution;" "I am pleased
with my efforts...I am finally finished...it looks quite good;"
"If I cut it off slightly, it may work...I did, and I am pleased with
the final result."

The instructor, on the other hand, recorded this example of
intuited conclusiveness:

The participant looked at the clay shape for
a time then said to her neighbour: "I think
[intuit] that I'm finished. I rather like
it." She had assessed it visually and decided
that nothing had to be changed, so she decided
to share her conclusion with someone else.
According to her level of aesthetic decision-
making, she had reached closure.

Although the participant's and instructor's records were
congruent in that they identified a moment of conclusiveness, the
language used by the participant did not always describe it as an
intuitive thought.

Methods of Intuitive Thought that Promoted
Further Thinking or Achieved Outcomes Satisfactory
to the Participant and/or the Instructor as Ev-
denced by the Journal Records.

In the journals, spontaneous intuitive thinking, because it
was characterized by a cognitive leap that "comes from nowhere" and
reached closure "without any doubt," did not encourage further
thinking. The participants who recorded this kind of thinking, reached conclusiveness quickly and accepted the intuitive form without question.

In some cases, the final form was not as visually integrated as it could have been if the participant had "worried over it" a little more, or tossed it back to the drawing board to be challenged further. In other cases, intuition was based on inadequate or incorrect information or it conformed to the ineffectiveness of the idea or the material.

For example, one participant, when given a common tin can, decided immediately that she would make it into a milk pitcher. Her spontaneous response was not based on a sensitivity to the material or to any aesthetic decision. Her mind leapt from a simple tin can to an ordinary milk jug with a spout. In other words, because her thinking was convergent, no new ideas were generated.

Another participant, when confronted with the same problem, recorded that she immediately "thought to make a viewer. No apparent thoughts came before this decision." Because the idea "came out of the blue," spontaneously, the participant did not question or think about it further. She proceeded to execute the idea in spite of the limited impact of her visual decision.

Participant #12 records this cognitive sequence:

As I spun it, I got the feeling that it needed something to spin in it - a small ball! Aha! I added a red ball which worked fairly well... and had added appeal for a child. (12-37)
The participant's decision to accept her illumination without further inquiry was, in this case, very successful. It not only enhanced her form visually but added another moving part to the toy. Both function and form benefited from the spontaneous intuition.

On the other hand, the participants who used incremental and reflective intuitive thinking continued their thinking beyond their small intuitions that they experienced.

One student recorded:

...I saw where the wood should be painted. Wonderful! Next problem...What should I colour it with...Paint? Marker? (9-17)

She then continues her visual decision-making:

I'll try a marker. Another problem! My red marker runs. Oh no! What a disaster! I'm so disappointed. Should have thought and thought before I acted. I'm too impulsive. I am beginning to dislike this wood project. I wish we were working in groups...I'll have to sand it off. (9-17)

Some of the decisions taken did not always work for participants so they then had to solve the problems they created. In this case, the initial intuition was correct, but the participant had difficulty with its execution. Thinking did continue, however, after the intuition.

Another student recorded the thinking sequence that followed her reflective intuitive thinking:

Through brainstorming...we came up with many interesting ideas...it was the first time that I could see the advantage of brainstorming. I have decided, for the fabric project, to export Canadian beaver teeth, beaver tails and
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Perhaps, beaver hair... I think I have too many ideas... maybe I'll just make one of them... an insight... I could export beaver teeth inside a beaver tail, instead of beaver... that was never done before! (9-16, 18)

It should be noted in this sequence that the reflective-intuitive thinking was followed by occluded intuitive thinking. The new illumination set the direction for the actual project. Following this illumination, the participant moved incrementally through the selection of material for the tail and teeth, the shapes and size, the choice of texture, and colour to be used.

Checked out the texture of a beaver's tail... looked at a picture in a book... wooden teeth would be fun, different... unique... (9-18)

Many recorded that the brainstorming as part of the reflective-intuitive method was advantageous to their thinking process. It provided multiple ideas from which others were generated, thus moving the thinking progressively onward.

An Analysis of the Changes in Intuitive Thinking and Creativity as Evidenced by the Pre- and Post-Toy Projects and the Results of the Torrance Creativity Tests.

In order to record and measure that change did, in fact, take place during the course on intuitive thinking, the researcher used two evaluation tools: pre- and post-visual tasks as well as the pre- and post-Torrance Circle Tests for Creativity (TCTC). Results of the TCTC, along with ranking of each student, are shown in Table I.

The Pre-Toy Task

The pre-toy task was given three weeks before the teachers arrived in the summer school class, so that they would have an opportu-
nity to solve one visual problem before their thinking was influenced
by new experience, theory, their peer group or instructor.

The participants were given a suggested time limit and were
asked to use materials that were available to them at home. The same
task was given again the last week of class, as a post-toy project.
The same criteria applied to the post-toy project that had applied to
the pre-toy. Both toys were brought to class and shared with others.
The participants' thinking and the pre-toy product were discussed
early in the first week of class, whereas the post-toy was presented
to the class and the instructor as a culminating activity on the last
morning of the course.

The instructor and the participants noted several observable
changes between the pre- and post-toy products. For example, most of
the toy ideas had changed categorically between pre- and post-toy
tasks. In other words, they had made a post-toy that was not from
the same idea category as the pre-toy. Analysis showed that all but
two participants changed categories for their pre- and post-toys.

For example, one of the two people who made wheeled trucks
for their pre-toy, constructed an elaborate wooden bird that walked
along flapping its feet, while the other carved a wooden creature
that carried a wooden man with a hat. The creators of the two pre-
toys that required only passive involvement, constructed post-toys
that needed active participation. Ten of the fourteen pre-toys could
be categorized as being traditional ideas (e.g. truck, puppet, game)
whereas only six of the post-toy ideas could be categorized in this
way. These included a spring toy, elbow hockey, a unique creature and rider.

Most of the participants changed the spatial dimension of their pre- and post-toys. Only one made two-dimensional toys for both pre- and post-toy tasks. In one case, a participant used the same basic idea for both tasks, but extended the two-dimensional pre-task toy into a three-dimensional toy for her post-task.

Also noted was the change in the level of skill and craftsmanship. The skill level for the post-toy was observably higher than that of the pre-toy for all but four of the visual products. For these, the participants' skill level remained consistently high or, in one case, consistently low. The participants displayed in their post-toys a high degree of skill change.

It is also interesting to note that eleven of the fourteen participants chose wood as the material for their post-toy as compared to two who used wood for their pre-toy. Most participants indicated in their journal that they now felt comfortable and interested in working with wood, whereas earlier in the course, they considered it an anxiety-causing medium. In other words, their experience in working on the wood sculpture had developed a skill level that enabled them to make a choice that they would not have made before taking the course.

Results of the pre- and post-Torrance Circle Tests for Creativity showed that all participants except two had significantly increased their creativity during the summer school course. The scores for the Torrance Circle Tests for Creativity are based on four
separate criteria: fluency, flexibility, elaboration and originality. Fluency means the number of ideas generated by the individual; flexibility, the number of different idea categories used; elaboration, the amount of embellishment or detail that has been added; originality, the uniqueness of the idea.

Summary

The characteristics of intuitive thinking evidenced by the participants' thinking behaviour fitted four basic cognitive categories: cognitive reflective or incremental; reflective intuitive; broad or occluded intuitive; and spontaneous intuitive.

These forms of intuitive thinking and their combinations were used and described by the participants during their visual problem solving processes. Some kind of intuitive thinking promoted more divergent thinking than others. The students' awareness of their thinking process appeared to increase during the month and they learned to use techniques to facilitate intuitive or productive thinking. There appeared to be observable change in the participants' thinking, in their visual products and, therefore, in their creativity.
CHAPTER V

SUMMARY: CONCLUSIONS AND IMPLICATIONS FOR TEACHING ART EDUCATION

Summary of the Study

This study was undertaken to discover and describe characteristics of intuitive thinking as manifested by fourteen participants in a summer school class in visual problem solving. The participants were classroom teachers selected for their competence as practitioners.

Participants kept journals in which they recorded their thoughts as they undertook five projects over the summer term. The course instructor, who was also the researcher, kept a journal in which evidences of intuitive thinking by the teachers were noted. Further evidences of intuitive thinking were supplied by the Torrance Circle Test for Creativity (TCTC), administered as a pre- and post-test to all fourteen course participants.

Results showed that intuitive thinking could be manifested in at least four ways. These were: reflective cognitive or incremental; reflective intuitive; broad intuitive; and spontaneous intuitive.

Journal items contributed by the participants, and instances from the instructor/research's notebook, were assigned to whichever one of these four categories was appropriate. Projects were photo-
graphed and used as referents against which notes were checked. Differences in pre- and post-scores on the Torrance Circle Test for Creativity were also noted.

Conclusions and General Implications

Responses made by the teachers who participated in this study, and the comments they recorded in their journals while the study was under way, contain potentially useful implications for the structure and character of exercises in intuitive thinking in the art classroom. It is apparent that:

1. People need time to think about and ponder a given problem. They have to explore and examine facets of the problem leisurely, allowing it to sit in the subconscious until it is consciously retrieved for solution. Therefore, educators need to schedule time for relaxed cogitation to allow for exploration, questioning and the examination of all aspects of the problem. They should positively reinforce exploration, guessing and questioning rather than arriving at an instant answer.

2. People need to use mind-freeing techniques, such as brainstorming, relabelling, statement reversal, and to ask: What if? Why not? to encourage divergent and intuitive thinking. Students should be trained to ideate randomly, visualize, brainstorm, think laterally, fantasize and create tension between ideas so that new juxtapositions can be formed.

3. People need to make a practice of relaxing their minds and bodies so that they can benefit from subliminal thinking and visualiza-
tion. It is important for students to learn how to relax by using images, sounds and forms, meditatively; to use deep breathing exercises; to image sequentially in order to centre and focus thinking.

4. People need to immerse themselves deeply in a problem; search for information; expect new associations to form; direct attention to particular facets of the whole. Educators should teach students to use basic research skills so that vital information can be carefully collected, selected and scrutinized; to develop a range of techniques and thinking skills that can be used as vehicles through which to solve the problem; to set aside time for thinking about the problem at hand.

5. People need to have their ideas responded to by others. Interaction encourages more thinking and decision making. The instructor should allow time for groups of students to share, discuss and brainstorm ideas. Students should be encouraged to challenge and extend one another's ideas. They should learn to clarify ideas by discussion, interaction and graphic ideation.

6. People need varying amounts of time to integrate the information they have taken in. Problems should be presented for solution at a pace compatible with the students' capabilities and interest. Time should be allotted for the integration of ideas and information related to the problem. Closure should be delayed until the preconscious has dealt with the idea as fully as possible or until new relationships or associations are formed intuitively.

7. People need to image while problem solving, thinking, creating. Students should practise imaging exercises under the instructor's
direction and then on their own. They need to draw their visualized imagery (graphically ideate); talk about what they have seen; use body movement to describe what has been imaged so that they can intuit a solution.

8. People need to group random or particular ideas together so that new associations have the potential to form. The instructor should encourage students to place old ideas in a variety of new juxtapositions; test out clusters of ideas together; move ideas around randomly to spark new ones so that problems can be solved creatively and intuitive behaviour fostered.

9. People need to overcome blocks to their thinking. The instructor should help the student to identify the block, talk about it, image it and graphically express it. The student should practise working with the block in a small problem, then use it in more complex situations until it is no longer inhibiting.

10. People need to overcome their anxieties about tools, techniques and materials before they can think creatively or intuitively. Students need therefore to examine, talk about and practise using a variety of tools under expert supervision. They should also talk about their fears, anxieties and negative associations with past experiences. Opportunity should be given for the student to practise with one tool until a comfort level has been reached before moving on to another. The instructor should give students a variety of problem-solving situations which challenge them to use different tools and techniques.
11. People need to be positively reinforced so that they feel free to think divergently. Instructors should therefore make a concerted effort to foster a positive relaxed attitude in the classroom enabling students to feel at ease, to talk about their problems, thinking processes, ideas, and possible solutions. The instructor should phrase critical comments positively rather than judgementally, and encourage novel ideas, thinking and imagery.

12. The environment needs to be conducive to learning. Therefore students should be given the opportunity to work and create in a preferred work space, with sound, colour, objects, and positive interacting classmates that are compatible to them.

13. In order to think divergently, people need to delay closure for maximum idea exploration. Students therefore need to question and revamp existing ideas; consider more than one solution; brainstorm new ideas and solutions before moving to a conclusion.

14. Projects need to be compatible with people's interests and abilities. It is important that students are allowed some degree of choice for themes and projects undertaken and the materials, media and techniques used. At the same time, they should be encouraged to approach and solve less familiar problems so that they can extend their creative thinking experience.

15. The instructor needs to be a catalyst, a support person and an enabler. They therefore have to encourage change, risk taking and guessing during problem solving; allow trial and error as part of
the learning continuum; keep the thinking going and discuss what could be tried.

**Implications for Art Teachers**

This study has identified a number of general educational and human needs that have implications for teaching art. These identified needs have to be met before productive or creative thinking can be evidenced.

The study would indicate that art teachers and educators need to allot or programme in time for mental and physical relaxation, experimentation, the manipulation of ideas and materials, as well as to encourage research, graphic ideation, visualization and cognitive lateration, if effective visual problem solving is to occur.

The study implied that intuitive behaviour was most evident when the teacher's attitude fostered a positive, non-threatening, anxiety-free learning environment.

It would seem, therefore, that these socio-psychological orientations are important for the art teacher to be aware of when planning for and teaching art in the classroom, so that the students' productive thinking behaviour is encouraged. Students in this kind of environment should be free to choose their personal space, listen to sound that is compatible with their creative activity, and to work with those who are positive and interactive.

These abstract concepts and implications from the study can only become a reality if they are implemented at the classroom level. Educators and curriculum writers therefore have to include these
concepts in art programmes and art curricula. Time for, and the encouragement of the kinds of orientations that bring about creative or productive thinking have to be written into plans, programmes and timetables. Students need to know that relaxed, exploratory thinking behaviour is not only acceptable but expected and encouraged.

It is recognized that this point of view appears to run counter to current efficiency models of education, but the distinction is made between a deliberate programme of relaxed activities that enhance thinking behaviour and a situation characterized by aimlessness.

Art teachers have to define or re-define their roles in such a way that they become positive catalysts or enablers of productive thinking and trainers of the kinds of thinking behaviour that manifests itself in intuitive and creative thought.
REFERENCES


Taylor, C.W. Clues to creative teaching: the creative process and education. *Instructor*. 1963, 73, 4-5.


APPENDIX A

- Pre-course Tasks
- Form #1: To Record Preliminary Statements about the Thinking Process
APPENDIX A

UNIVERSITY COLLEGE OF CAPE BRETON

Education 499: The Intuitive Process; Implications for Teaching

It is the intent of the course that we grow in awareness of ourselves as teachers and as whole individuals who wish to develop our own intuitive thinking ability so that we can encourage others to think creatively in the classroom.

In order to do this we will talk about and experience methods which enable, rather than inhibit creative thought; we will solve some visual problems using a variety of material; we will explore some of the literature written about intuitive thinking as it is related to expression and creativity.

Before the class convenes in July, I would like you to complete several tasks in preparation for the course. The first two tasks have to do with collecting materials and equipment for the visual projects you will complete during the course; the third task will help you become acquainted with some of the terms you will need to know; while the last two tasks relate to thinking something through on your own.

Marilyn Dyer
APPENDIX A (contd.)

TASK ONE: PREPARE AN EQUIPMENT KIT

Begin collecting now:

- scissors
- bond fast glue or the equivalent
- stapler (not the tiny kind) and staples
- a set of non-toxic coloured markers, large nib
- 2 large nibbed black felt markers; bevelled nib
- 2 large nibbed black felt markers; pointed nib
*- hammer
*- pliers; wire cutters and plain blunt and pointed
* wood rasps; round flat, curving
*- electric drill with several bits
*- electric sander: can be the kind that is attached to the electric drill
- sand paper, a selection of course and fine

Note: *Please locate, bring and share when needed. Please do not buy these for the course. I'm sure these are available in the community.

- plastic safety glasses
- face masks for saw dust
- 1" hardware brush
- ½" hardware brush
- any small brushes you already have (e.g. water colour)
- linoleum knife or xacto knife
- ruler
- other tools and equipment that you feel are useful

Marilyn Dyer
APPENDIX A (contd.)

TASK TWO: SEARCH FOR MATERIALS

We will be doing several visual projects during the course. Each needs a variety of material which cannot be ordered or purchased from a shop. Some material might be found at home, but others can be hunted for among the packing materials thrown out by K-Mart, Woolco, etc. What you collect will supplement the art material that the University College of Cape Breton will purchase for the course. There may be a lab fee for the purchased materials.

Please begin collecting now to share with the class and for use with your own projects:

- cardboard tubes, any size (from T.P. tubes to curtain containers)
- pieces of dowelling, any length or circumference
- pieces of planking, any length or size (e.g. 2" x 4", 2" x 2", 4" x 4")
- old photographs
- magazines, printed or xerox materials, advertisements, computer forms, etc.
- small partly-used cans of bright-coloured enamel
- foil (coloured, silver, gold) from candy or cigarettes
  Please flatten carefully
- reeds, long grasses; tie in bundles
- pieces of textured or coloured cloth, string, bits of lace or trim, feathers, beads, buttons.
- bamboo sticks, straws, toothpicks, stir-sticks, etc.
- pieces of wires, any length (copper, plastic, stovepipe)
- raffia
- pieces of cardboard from packing material, plain, corrugated, interesting shapes
- any coloured or textured packing material
- small boxes or containers of firm construction
- large, thin, pliable plastic bags (e.g. dry cleaner bags)
- please bring any other things of a similar nature from home that you think will be useful.

Marilyn Dyer
APPENDIX A (contd.)

TASK THREE: SEARCH FOR LITERATURE RELATED TO INTUITIVE THINKING OR INTUITION

Do a library search for books and articles about creativity; productive thinking; divergent thinking; lateral thinking and intuitive thinking.

Some suggested books are:


Write a definition for each of the following terms:

- creativity
- thinking
- productive thinking
- divergent thinking
- lateral thinking
- intuition or intuitive thinking

Resource books and articles will be available for your perusal during July, and Robert McKim's book Experience in Visual Thinking has been ordered as a text for the course. It is a book that integrates the practical with the theory in a way that makes it useful as a teacher resource.

During July we will build a resource file for everyone to use. If you come across a chapter in a book or an article which you think will be useful, please xerox a copy for the file. It would facilitate the collection process.

Marilyn Dyer
APPENDIX A (contd.)

TASK FOUR: PRE AND POST TASK

ASSIGNMENT: COMPLETE A VISUAL PROJECT

Using materials found at home, make a toy that can be moved or has a moving part. It should be able to fit into a shoe box. Bring the completed project to class on July 4th along with a written statement about the thinking process you used to arrive at the toy you made.

Note: When you are making your toy, please do not discuss or get input from anyone about your creation. It is most important that the idea and the concept of the toy be entirely your own. Trust your own decision-making. Do not spend more than 4 hours on the creation of your toy unless you feel you need more time to complete your project for your own satisfaction.

When you write the comments about your thinking process, use phrases which are personal since you are the one who actually had the experience, e.g. before I could....I had to..... Trace the sequence of thought from your first floundering for ideas and materials, through the steps of decision-making, to the point where it came together as a product.

Please use the attached form as a guide to your comments and notations about your creative process.

The artistic nature of the project is not as important as the thinking process which you use to accomplish the task.

Marilyn Dyer
APPENDIX A (contd.)

UNIVERSITY COLLEGE OFCAPE BRETON
EDUC. 499: INTUITIVE THINKING:
ITS IMPLICATION FOR THE CLASSROOM.

NAME ____________________________
STUDENT NO: ______________________

FORM #1

PROJECT # __________________________
DATE: ______________________________

NAME OF PROJECT:

MATERIALS USED:

INTENTION OR OBJECTIVE:

PRELIMINARY STATEMENTS RECORDING YOUR THINKING PROCESS

Please complete the following statements then write your own more
detailed journal* entries about your thinking process on other paper
which you will attach to this form when the project is completed.
These preliminary statements will help you get your journal writing
started and will guarantee that everyone in the class initially
comments on the same aspects of their thinking process. If you need
more room than what has been provided, please copy the statements
onto another piece of paper and proceed from there.

- When I heard or read the problem, I ........................................

- When I saw the material, I .....................................................
APPENDIX A (contd.)

- When I cut or changed the (paper, wood, etc.) I 

- When the instructor said 

- When I did/didn't understand, I 

- When I changed the direction of my thinking, I 

- When I changed my visual form, I 

- When you said/didn't say................, I .................

- When .............said/or responded to my visual form, I .............

- When the new form came together, I .........................

*By journal writing, I mean a series of sequential statements which tell the thinking process and feelings you experienced while you solved your visual problems.

Marilyn Dyer
APPENDIX A (contd.)

TASK FIVE: BECOME AWARE OF YOUR OWN THINKING PROCESS.

Begin thinking about the way you make simple decisions and solve everyday problems. Think about your approach to the problem and how you isolate what the problem is in the first place (e.g. deciding what you will have for supper; how you will get from A to B in the car; what you will do when the tire goes flat.)

When you have solved a simple problem, see whether you can remember how you did it. Were there any moments of insight; a breakthrough that you didn't expect; an answer that came from "nowhere"? Did you approach the problem the same way that you approach all your problem solving? Can you think of any other way to solve the same problem? Think about it. Try it.

ASSIGNMENT:

(a) Write down two everyday problems such as the ones given above. They should be actual situations which you have to solve. Do not choose any that are too complex. Write down how you will solve them. This assignment is to help you become aware of your thinking process.

(b) Here are two given problems for you to solve by yourself. Read them carefully. Sketch out the situation using words and imagery (visual thinking), then write down in a fair amount of detail how you accomplish the solution. No explanation need be over 250 words.

PROBLEM ONE:

You have to go across a completely empty room without walking or touching the floor with any part of your body, to get your wrist watch which has been left on the window sill. You will return to the door through which you entered. Unfortunately, the painters have already painted the first four feet of floor under the windows so you cannot get near the sill where you see your watch. The only things available to you in this situation are: 2 short planks one metre long; 3 ordinary-sized bricks; 1 coat hanger

PROBLEM TWO:

You have to remove and suspend a number of items which are sitting on the floor so that a new carpet can be layed. There is one hook in the lintel of the door frame from which they can hang. These items are:

1 empty plastic yogurt container with lid
1 pair of scissors
1 piece of string 1' long

2 eggs
2 paper clips
1 rubber sealer ring
APPENDIX A (contd.)

PROBLEM:

You have to make an ice cream sundae using three flavours of topping which are not to touch each other. You have an oblong container, two scoops of ice cream, three toppings and one wafer to work with. Have fun!

PROBLEM:

You are expecting a telephone call from your boss at a pre-arranged time at one of the several pay phones with a specific number at the bus depot. There is a complication in that you have also said that you would phone some vital information to a client at about the same time. You know that you have a small amount of flexibility in your time schedule, but you also know that it is imperative that you do not tie up the phone for which your boss has the number in case he tries to get you when you are using it. You know also, that you must make the other phone call to your client, or miss an important opportunity. No one else is using the other phones. How will you solve your problem?

Marilyn Dyer
APPENDIX B

- Visual Projects
APPENDIX B.

UNIVERSITY COLLEGE OF CAPE BRETON
EDUC. 499: THE INTUITIVE PROCESS: IMPLICATIONS FOR TEACHING

VISUAL PROJECT #1.

MATERIAL BASE: PAPER, PLASTIC, WIRE, TWINE, REED.
cartridge, white or brown Kraft paper, nice paper, newsprint, thin plastic bags, tag board, pliers, wire cutters, scissors, glue, stapler and staples, sewing thread, large needles, lacing.

VISUAL PROBLEM:
1. Using weaving, braiding, looping, etc., make a unique form which can sit by itself and has a space inside it (e.g. pouch). Use any combination of the materials listed above. Then prepare and package five natural objects for depositing inside the space.

Procedure:
- explore the limitations and possibilities of the material
- free-wheel with ideas searching for those that are compatible to both the material and yourself (e.g. brainstorm; idea sketch; think visually)
- state the intention of your idea visually and in writing
- prepare the material; organize equipment
- manipulate the material; test the idea with the material
- re-order ideas; think ambidexterously (logically and intuitively)
- synthesize
- bring the form to conclusion
- evaluate aesthetically
- assess the visual product

Resource: The New Basketry by Ed. Rosbach

2. Journal Notations (visual and written)

Record the thinking process that you use while planning and creating your creation or new form. Approach the writing from inside yourself as the one experiencing the thinking and the doing. Be aware of the logical sequences of thought, changes of idea direction, idea selection, small insights, intuitive thinking (skilled leaps of knowledge, guesses, hunches) and gestalts. Write and draw out your thinking experience as spontaneously as possible. Form #1 will help get you started.

Marilyn Dyer
APPENDIX B (contd.)

UNIVERSITY COLLEGE OF CAPE BRETON
EDUC. 499: THE INTUITIVE PROCESS: IMPLICATIONS FOR TEACHING

VISUAL PROJECT #2.

MATERIAL BASE: CLAY, NATURAL MATERIALS
clay (terra cotta, tan); wood, rock, moss, dried grasses, reeds etc., mirrors

VISUAL PROBLEM:
1. Using some or all of the above materials, make an aesthetic environment which concentrates on creating texture and contrast similar to that found in nature and in the Japanese garden. Add mirrors to your environment so that it becomes a reflective piece showing the repetition of shape and textured form. The mirrors should be incorporated in such a way as to be part of, rather than in opposition to the natural form.

Procedure:
- explore the limitations and possibilities of the material
- free-wheel with ideas searching for those that are compatible to both the material and yourself (e.g. brainstorm; idea sketch; think visually)
- state the intention of your idea visually and in writing
- prepare the material; organize equipment
- manipulate the material; test the idea with the material
- re-order ideas; think ambidexterously (logically and intuitively)
- synthesize
- bring the form to conclusion
- evaluate aesthetically
- assess the visual product

Resource:
2. Journal Notations (visual and written)

Record the thinking process that you use while planning and creating your creation or new form. Approach the writing from inside yourself as the one experiencing the thinking and the doing. Be aware of the logical sequences of thought, changes of idea direction, idea selection, small insights, intuitive thinking (skilled leaps of knowledge, guesses, hunches) and gestalts. Write and draw out your thinking experience as spontaneously as possible. Form #1 will help get you started.
APPENDIX B (contd.)

UNIVERSITY COLLEGE OF CAPE BRETON
EDUC. 499: THE INTUITIVE PROCESS: IMPLICATIONS FOR TEACHING

VISUAL PROJECT #3.

MATERIAL BASE: WOOD

pieces of dowelling and portions of planking, glue, sander, drill, sandpaper, saw, hammer, wood carving tools, clamps, plastic safety glasses, face mask

VISUAL PROBLEM:

1. Alter three or more pieces of wood so that they relate spatially to each other in an aesthetic way (e.g. interlocking; interesting juxtaposition; constructual or visual dependency; as sections of a larger form). The finished surface should show that you have taken care to get the most out of the material, and have used good craftsmanship. It can be sanded, buffed, oiled, painted, carved, drawn on, etc. At least one section of the wood sculpture should have colour, line, pattern or texture as a focus for the sculpture.

Procedure:
- explore the limitations and possibilities of the material
- free-wheel with ideas searching for those that are compatible to both the material and yourself (e.g. brainstorm; idea sketch; think visually)
- state the intention of your idea visually and in writing
- prepare the material; organize equipment
- manipulate the material; test the idea with the material
- re-order ideas; think ambidexterously (logically and intuitively)
- synthesize
- bring the form to conclusion
- evaluate aesthetically
- assess the visual product

Resource:

2. Journal Notations (visual and written)

Record the thinking process that you use while planning and creating your creation or new form. Approach the writing from inside yourself as the one experiencing the thinking and the doing. Be aware of the logical sequences of thought, changes of idea direction, idea selection, small insights, intuitive thinking (skilled leaps of knowledge, guesses, hunches) and gestalts. Write and draw out your thinking experience as spontaneously as possible. Form #1 will help get you started.

Marilyn Dyer
APPENDIX B (contd.)

UNIVERSITY COLLEGE OF CAPE BRETON
EDUC. 499: THE INTUITIVE PROCESS: IMPLICATIONS FOR TEACHING

VISUAL PROJECT #4

MATERIAL BASE: CARDBOARD, METAL, FOUND OBJECTS

cardboard pieces (corrugated or flat), tubes, boxes, string, wire, feathers, straws, toothpicks, cloth, twine, yarn, beads, cloth, etc.

VISUAL PROBLEM:

1. Make a personal *fetish using any of the above materials. The fetish should be a conglomerate form showing skill and craftsmanship. It should be one which you can relate to aesthetically and emotionally because of its shape, colour, texture, etc. Size is not a limitation but you should be able to carry it with you when you go on a hike. The fetish should be a highly personal expression of yourself.

*fetish - anything to which one is irrationally devoted!

Procedure:

- explore the limitations and possibilities of the material
- free-wheel with ideas searching for those that are compatible to both the material and yourself (e.g. brainstorm; idea sketch; think visually)
- state the intention of your idea visually and in writing
- prepare the material; organize equipment
- manipulate the material; test the idea with the material
- re-order ideas; think ambidexterously (logically and intuitively)
- synthesize
- bring the form to conclusion
- evaluate aesthetically
- assess the visual product

Resource:

2. Journal Notations (visual and written)

Record the thinking process that you use while planning and creating your creation or new form. Approach the writing from inside yourself as the one experiencing the thinking and the doing. Be aware of the logical sequences of thought, changes of idea direction, idea selection, small insights, intuitive thinking (skilled leaps of knowledge, guesses, hunches) and gestalts. Write and draw out your thinking experience as spontaneously as possible. Form #1 will help get you started.

Marilyn Dyer
APPENDIX B (contd.)

UNIVERSITY COLLEGE OF CAPE BRETON
EDUC. 499: THE INTUITIVE PROCESS: IMPLICATIONS FOR TEACHING

VISUAL PROJECT # 5

MATERIAL BASE: FABRIC
cloth, yarn, thread, trims, cardboard form

VISUAL PROBLEM:
1. Use stitchery and textured materials to make a soft sculptured fabric form of some obvious Canadian commodity (e.g. people, water, clouds, snow, etc.) which we would not usually think to package or box for export. The package should be able to be carried in two hands and must relate visually in some way to that which it contains. It can be an open or closed construction.

Procedure:
- explore the limitations and possibilities of the material
- free-wheel with ideas searching for those that are compatible to both the material and yourself (e.g. brainstorm; idea sketch; think visually)
- state the intention of your idea visually and in writing
- prepare the material; organize equipment
- manipulate the material; test the idea with the material
- re-order ideas; think ambidexterously (logically and intuitively)
- synthesize
- bring the form to conclusion
- evaluate aesthetically
- assess the visual product

Resource:
2. Journal Notations (visual and written)

Record the thinking process that you use while planning and creating your creation or new form. Approach the writing from inside yourself as the one experiencing the thinking and the doing. Be aware of the logical sequences of thought, changes of idea direction, idea selection, small insights, intuitive thinking (skilled leaps of knowledge, guesses, hunches) and gestalts. Write and draw out your thinking experience as spontaneously as possible. Form #1 will help get you started.
APPENDIX C

- Summer Course Schedule
- Instructor Notes
EDUC. 499: INTUITIVE THINKING: IMPLICATIONS FOR TEACHING
Instructor: Marilyn Dyer
July, 1983
University College of Cape Breton

June 27-30
Pre-course assignment - visual project and written statement of awareness

Week I: July 4-8
- Presentation of philosophy of the course.
- Definitions of thinking - divergent/convergent
  - reproductive/productive
  - intuitive
creativity
problem solving
- Torrance Test of Creativity - circles
- Relaxation exercises; left/right brain theory
- Visual projects - 2 dimensional exercises (lines, shapes, colours, textures)
  - brainstorming; visual thinking; verbalization
- Journal writing - purpose of; suggestions for methods; relationship to problem solving and creativity
- For presentation - overheads, charts showing characteristics of various modes of thinking; their cross-over characteristics
  - sample journal notations (visual and written) e.g. Connan Doyle; Proghoff; McKim.

Week II: July 11-15
- Further discourse on thinking
  - especially productive; divergent; lateral
  - relationship to creativity
  - use of information
  - transfer theory (Guilford)
  - insight and intuition
  *- awareness of cognitive processes, especially intuitive thinking
APPENDIX C (contd.)

- Relaxation exercises - getting in touch; in tune with self.
  Freeing up; becoming flexible thinkers; allowing newness;
  controlling and developing fantasy, imagery, ideas; over-
  coming blocks
- Theory about inhibitors/facilitators of creative thinking
  and therefore intuitive
- Discussion about inhibitors and facilitators in the course
  environment
- Visual projects:
  - small three-dimensional exercises
    (toothpicks, stir sticks, string, sticks, straws)
  - brainstorming and visual thinking
  - journal notations on thinking process

Visual Project #1.
Visual Project #2.

Week III: July 18-22

- Intuitive thinking
  - characteristics; literature on it
  - development of; inhibitors/
    facilitators
  - examples of (during cognition)
- Journal sharing
  - from Projects #1 and #2
Visual Project #3
Visual Project #4

Week IV: July 25-29

- Implications for classroom
  - creative thinking; divergent/
    lateral/intuitive
  - method of teaching
  - expectations if used
  - relationship to language expression;
    movement; music; problem solving
  generally
APPENDIX C (contd.)

- response to material
- (personal visual statements
  (emergence of imagery-sources

Visual Project #5 - Toy (same as pre-assignment)

A look at visual problem solving Projects and Journals

- discussion, sharing and evaluation
- photographs of work (diaries and projects)
APPENDIX C (contd.)

EDUC.499: INTUITIVE THINKING: IMPLICATIONS FOR TEACHING
Instructor: Marilyn Dyer
July, 1983.
University College of Cape Breton

Ambidexterous Thinking: Using the integrated mind to facilitate creativity and intuitive thinking

- How can I solve this? Are there alternate ways?
- What if I...?
- What is the implication of the poem, story, material beyond the obvious?
- Why have I accepted the solution I did?
- Did I consider whether the answer was right or wrong?
- What influenced my decision?
  - peers?
  - past experience?
  - could not see any other way?
  - instructor?
- Is the opposite also true? e.g. birds eat seeds; seeds eat birds
- Many simple rhymes and stories can be used as catalysts for moving beyond the obvious. A well-known rhyme can be memorized and parroted back without the implication of the message ever having been examined. When ambidexterous thinking is used (LB + RB), the rhyme becomes a pivot point around which new experiences and creative thought can grow.

For instance, a tin can is so common that we hardly give it a thought. We know it is a container for food, oil, juice, and many other substances, but it is in itself a geometric metallic form with an inner space, unique texture and temperature.
• We could look at the tin can as
  - a roller
  - a round edge
  - a continuous metal idea
  - a place to live
  - a vehicle

• We could ask it about what it experienced between the earth and the can.

• We could ponder what it would feel like to be caught in a fixed form without being able to change.

• We could ask, what if....the tin container could change shape?

• We could design a form which is a container but not a traditional shape
Exercises completed in written and visual form by the participants during the Port Morien field trip.

Students were asked to:

- look for and draw six things that were round and had different colours
- look through a space and then draw what they saw
- find and draw five things that were beside each other
- look for and draw something that had pattern
- write down and scramble into new words the names of at least three fishing boats
- do a rubbing of something that was textured
- complete the given sentences metamorphically
- find, record and draw three things that were made from natural fibre
- make a list of common things found in the fishing village; re-name them
- find a tall pole, mast, etc. Draw something unlikely hanging from it
- stretch out a boat so that it looked flexible
- draw a pile of rocks and cover them with unique patterns
APPENDIX D

Participant's Letter of Permission to do the Study.
Dear Participant:

I am pleased that you have elected to take the summer course 499: Intuitive Thinking: Its Implications For Teaching, and that you have been recognized by the college as one of Cape Breton's creative and resourceful teachers.

This course is designed to take teachers through a month of intensive work in intuitive thinking while solving visual problems. As part of my graduate work at the University of British Columbia, I would like to investigate the nature of intuitive thinking as it is reflected in the course.

Any course such as this requires evaluation and response. Therefore, as part of my graduate work, and as a means of evaluation, I would like to use the projects you do, and the written notations about your thinking process to observe the changes in intuitive thinking which may result from the course.

As a participant, this will not change or add to the work required in the course. However, I would like to ask your permission to use your course projects and journals as a basis of my investigation.

You may, of course, choose not to have your projects used in this evaluation and you may withdraw your permission at any time during the course. Such participation will have no influence on your course grade.

If you consent to your project being used in this evaluation, please mark the appropriate box, sign and date the form, before returning it to me.

I give Marilyn Dyer permission to use my projects and journal for her graduate study in intuitive thinking. YES

NO

Name: ...........................................................................................................

Date: ...........................................................................................................
APPENDIX E

- Identification of the Slides for the Study
APPENDIX E.

IDENTIFICATION OF SLIDES

1. Preferred work space
2. Graphic ideation
3. Presenting
4. Presenting
5. Presenting
6. Solving visual problems
7. Working with peers
8. Preliminary tasks
9. Pouch
10. Pouch
11. Pouch
12. Pouch
13. Pouch
14. Pouch
15. Pouch
16. Pouch
17. Pouch
18. Pouch
19. Pouch
20. Pouch
21. Natural environment
22. Natural environment
23. Natural environment
24. Natural environment
25. Natural environment
26. Preliminary exercise
27. Sand contour line
28. Wood sculpture
29. Wood sculpture
30. Wood sculpture
31. Wood sculpture
32. Wood sculpture
33. Wood sculpture
34. Wood sculpture
35. Wood sculpture
36. Wood sculpture
37. Wood sculpture
38. Wood sculpture
39. Wood sculpture
40. Wood sculpture
41. Oiling blocks
42. Embellishment of blocks
43. Embellishment of blocks
44. Embellishment of blocks
45. Fetish
46. Fetish
47. Fetish
48. Fetish
49. Fetish
50. Fetish
51. Fetish
52. Fetish
53. Fetish
54. Fetish
55. Fetish
56. Fetish
57. Fabric sculpture
58. Fabric sculpture
59. Fabric sculpture
60. Fabric sculpture
61. Fabric sculpture
62. Pre and post toy
63. Pre and post toy
64. Pre and post toy
65. Pre and post toy
66. Pre and post toy
67. Pre and post toy
68. Pre and post toy
69. Pre and post toy
70. Pre and post toy
71. Pre and post toy
72. Pre and post toy
73. Pre and post toy
74. Pre and post toy
75. Pre and post toy
76. Pre and post toy
FOR FURTHER INFORMATION ON THE SLIDES LISTED ON LEAF 148, CONTACT SPECIAL COLLECTIONS DIVISION, LIBRARY, 1956 MAIN MALL, UNIVERSITY OF BRITISH COLUMBIA, VANCOUVER, B.C., CANADA V6T 1Y3.