PATTERN IN CHILD ART AND ITS RELATIONSHIP TO THE DEVELOPMENT OF LOGICAL THOUGHT

by

Lidi Kuiper

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Chapter 1

INTRODUCTION

This study examines pattern in child art and its relationship to the early development of logical thought.

Observation of young children engaged in art activities led to this study. Although the art of children from nursery to grade one and two is often considered to be quite free and spontaneous, this researcher noticed that young children usually worked at art activites in very systematic and thoughtful ways. While doing so, they frequently created delightful patterns and designs. When working with clay, children often produced identical items in series. Sets of small airplanes, nests with eggs, and rows of small to large clay balls or bowls are examples. Upon examining their pictures, it was obvious that children spent a great deal of time and effort repeating and manipulating simple visual symbols. The use of repetition and pattern appeared to be very persistent elements and formed an integral part of early childhood art process and production.

What is pattern? Pattern exists whenever units are combined in ordered ways. They can be found throughout the environment. The natural world abounds with examples of pattern and order. Growth rings on a tree trunk, for example, show circles inside circles, ordered from small to large. A structure such as a bee hive is based on multiple repetition of a single unit. Pattern and order are also essential parts of human understanding and expression. They are found in all forms of art and science and in all things produced by humanity. Basic rhythyms in music and dance are patterns that have been expressed and enjoyed through the ages. Pattern is an integral component of visual art. This can be seen in many

examples of art and design from prehistoric to modern times. Religious and intellectual philosophies that have guided civilisations through history to the present day have also followed patterns. Pattern, therefore, is not only an element of child art, it is a fundamental aspect of human existence.

Pattern is a topic that has been examined by several art educators and educational psychologists. Rhoda Kellogg (1969) writes that children produce elaborately patterned designs because all humans strive for a sense of order and balance in their lives. Jacqueline Goodnow (1977) feels that order in a child's drawing represents an understanding of the order in the child's world. Rudolf Arnheim (1969) writes extensively on perception and order. He proposes that the perception of pattern and order is essential to intellectual understanding and writes that "the cognitive operations called thinking are...the essential ingredients of perception itself" (p. 13). Jean Piaget and his followers (Droz and Rahmy, 1976; Furth and Wachs, 1974; Ginsberg and Opper, 1979; Sime, 1973) examine the relationship between specific patterns and the development of logical thought. Piagetian theory proposes that the development of logical thought is based on understanding simple concepts of classification and seriation, concepts that can be expressed visually. These theories and others are examined in this study.

In short, pattern is an integral part of life and appears to be an essential component of both intellectual and intuitive understanding and expression. These broad observations intrigued this researcher and prompted a closer examination of pattern. Pattern is a part of art and a part of a child's cognitive development. But, are the seemingly

spontaneous patterns of child art related to the systematic and orderly patterns basic to the development of logical thought? Does expression through art help a child understand concepts of structure and order? A desire for the answers to these questions led to this study. Several steps were involved in exploring this issue. Literature and research from the fields of art, art education, and educational psychology were consulted. Field research was carried out with children from nursery to grade two. They were engaged in a variety of art activities and a large body of descriptive data was collected. To conclude the study, data was analysed and conclusions were made.

Statement of Problem

Patterns are created whenever units are combined in ordered ways. Patterns that exist in different modes of experience and expression can be remarkably similar. Are such patterns related to each other? Do patterns in one mode of expression and understanding have an influence on patterns in other modes? This topic generated the following research question:

Does a child's use of pattern in art have an influence on the child's development of logical thought?

To help answer this question, patterns in child art were investigated. The study identified, examined, and described the order, structure, and sequence found in examples of pattern in the visual art of nursery to grade two students. These qualities were related to Piagetian theory concerning the early development of logical thought. Special attention was given to evidence of classification and seriation,

the roots of logical thought.

Significance of the Problem

Does a child's use of pattern in art have an influence on the development of logical thought? This question merits consideration for several reasons. First, the topic is an emerging one in the field of art education. Research in the area of art and cognition has only just begun. Second, the study produced a large body of data which is potentially valuable to future research. Last of all, the conclusions to the study contribute to an expanded rationale for elementary art education.

Stanley Madeja (1978) identifies a need for studies in the area of art and cogntion. In The Arts, Cognition, and Basic Skills he recommends four areas in need of research. The first is "to bring together existing developmental theory and instruction in the arts." The second issue concerns "how the expressive qualities of the arts relate to the arts as a cognitive process" (p. 15). Third, researchers should examine the transfer of symbol usage between visual and verbal areas. Last of all, perception is identified as an area of current concern. That there is a need for art education research in these areas is supported by Elliot Eisner (1981). He remarks that "to talk about the cognitive character of the arts or about the kind of meaning that they convey is not particularly common" (p. 48). This study deals with these topics of current concern.

The data collected in this study are also relevant. Over 300 coloured slides, 30 sets of checklists, anecdotal notes, and actual examples

of children's artwork form an interesting and varied body of data. Not only does this contribute to the present study, but it could be used for future analysis and research in related topics. Although this study does not attempt to use data in a statistically significant way, the data and interpretations do provide a preliminary exploration of the topic. Future studies could be based on the information collected here.

Last of all, the study is significant because it contributes to an expanded rationale for elementary art education. By considering the cognitive aspects of art activites, teachers and administrators can plan and carry out art programs which satisfy both aesthetic and intellectural objectives.

In short, the study deals with significant issues that are particularly timely. It synthesises knowledge from a wide variety of areas and has created a large and useful body of data. Finally, this study contributes to a deeper understanding of the role the visual arts can play in a child's early education.

Definition of Terms

Classification. The operation of sorting or grouping collections of objects according to some common characteristic.

Cognition. The process through which a living creature becomes aware of its environment. The nature of cognitive growth is "how human beings increase their mastery in achieving and using knowledge" (Bruner, 1966, p. 1).

Logical Thought. The process of thinking through which one can infer the implied variables of a situation or concept. De Bono (1976)

states that "logic is used as a tool to make explicit what is implicit" (p. 73).

Order. The system or procedure which controls the regular arrangement of elements or units in space and time. Through understanding the concept of order people can predict what comes next in a sequence or what should be in a certain place.

Pattern. Units or elements combined in ordered ways.

Perception. The process through which information is received and processed by the mind. Rudolf Arnheim (1969) writes that perception uses the same operations as cognitive processes. These are operations such as "active exploration, selection, grasping of essentials, simplification, abstraction, analysis and synthesis, completion, correction, comparison, problem solving, as well as combining, separating, putting in context" (p. 13). Perception and thinking are interdependent.

Seriation. The arrangement of elements into a sequence based on successive order within a given quality. For example, elements can be seriated from small to large, light to heavy, smooth to rough, bright to dull, or short to long.

Summary

The purpose of this study was to identify, examine, and describe patterns in child art and to determine whether the use of these patterns had an influence on the development of logical thought.

To answer the question raised in this study, a theoretical framework was established by reviewing literature and research in the fields of art, art education, and educational psychology. Field research was then carried out with nursery to grade two students. These subjects were engaged in a series of art activities. Their behaviour and their art productions were recorded and later analysed. From the data and analysis, conclusions were made.

The remainder of this study is organised in this fashion: Chapter II presents a review of relevant literature and research; Chapter III describes the research procedures used in the study; Chapter IV presents and discusses the data and interpretations of the data; Chapter V contains the conclusions and implications of the study.

Chapter II

REVIEW OF RELATED LITERATURE AND RESEARCH

Pattern is an element that is found in many forms all around us. It is basic both to structure in the physical world and to simple or complex thought processes. Pattern plays an important role in the organisation of our perceptions and in our understanding and expression of concepts and ideas. Pattern is also a visible element of art and is an integral part of the creative process. Child art is often examined and explained in terms of pattern. Kellogg (1969) views the presence of this element as evidence of a basic need for order, balance, and beauty. Arnheim (1969) links pattern in child art to perception and visual thinking. Goodnow (1977) examines pattern within the process of art production.

Pattern is an essential aspect of both cognitive development and child art. Are patterns in these two areas linked? Is a child's use and expression of pattern in art related to the pattern basic to the development of logical thought? To help answer this question the various aspects of pattern in thinking and in child art were identified and examined. To this end, the fields of art, art education, and educational psychology have been consulted.

Pattern

The word "pattern" has many meanings. It can be used to describe a visual design on a piece of wrapping paper or it can be, as Edward De Bono (1976) writes in Teaching Thinking, "the most important word

we have... Pattern covers the areas of meaning, recognition and relationship. Pattern is the basis not only of how the mind works but of how the world itself works" (p. 78). Pattern is a complex concept associated with order. De Bono describes order as being "a means for predicting what comes next or what should be there" (p. 82). Pattern and order are a part of each other.

Rudolf Arnheim (1971) also writes about the relationship between pattern and order. He emphasises the importance of order to anything the human mind is to understand. Order is not only essential to the creation of art, it is necessary for survival throughout the universe. Arnheim feels that evolution has inbred "the impulse to produce orderly arrangements" (p. 3). He describes how this is evident in nature's patterns, in social structures, and in physical and biological processes. Pattern represents order.

Adelaide Sproul (1971) talks about patterns in the natural world and in art. She too feels that "pattern is much more than skin deep" (p. 70). All materials are made from molecular patterns which have been ordered in predictable ways to create larger patterns. Artists work within the pattern and structure of a chosen medium. They create through understanding the structure of their material and adapting the patterns of their thoughts to fit those of the medium. Expression through an art medium represents the transformation of mental to physical patterns.

Jacqueline Goodnow (1977) is concerned with perception of pattern and children's expressions of these patterns in art. In <u>Children Drawing</u> she summarises:

> Patterns are all around us. They may be physical... they may be conceptual...graphic, physical, conceptual: is it possible that all patterns have similar features or can be described in similar terms? Finding such similarities is a source of pleasure and reassurance: they provide both a sense of "elegant economy" and a sort of reassurance that one is "on the right track," not inventing a complete new set of terms that have no relevance outside a small world. (p. 47).

In the simplest terms, pattern represents the repetition of a unit. In the most complex, pattern represents the relationships and interrelationships of all the elements within the universe. Both interpretations are correct for they represent different aspects of the same concept; that of order. Patterns are created whenever units or elements are repeated or organised in ordered ways.

Pattern in Perception, Thinking, and Cognition

Before we can understand or create pattern we must be able to perceive it. We perceive the world through our senses. According to Arnheim (1969), Kepes (1956), and De Bono (1976), pattern is an integral part of the process of perception. Our responses to the world through our senses are themselves patterns which organise and order perceptions and interpret them. Arnheim states that basic patterns consist of similarity and repetition. Things that resemble each other are "tied together in vision" (p. 55).

Similarity is a basis for perceptual organisation. Simple repetitive patterns, however, do not exist in isolation. They are usually parts of larger, more complex patterns. Although the perception of larger patterns is also based on the concept of similarity it is of a higher order than the simple perception of like units. For example,

more perceptual intelligence is required to understand the relationships of parts to the whole or to understand that the perception of one set of patterns is affected by the other patterns surrounding it.

Visual perception, perceptual intelligence, and thinking are vitally linked. Arnheim calls this amalgamation "visual thinking". His theories on visual thinking are important to this study since he describes visual thinking as being fundamental to both visual art and scientific thinking. He feels that visual thinking is as basic to the development of the cognitive functions as it is to creating aesthetically satisfying art. Arnheim distinguishes between intuitive and intellectual cognition. Intuitive cognition "takes place in a perceptual field of freely interacting forces" (1969, p. 233). This process itself is not conscious although its outcome is. Intuitive cognition is the mode of thinking used by many creative people in both art and science. Intellectual cognition, on the other hand, deals with perceptions in a linear fashion. Logical reasoning and writing are examples of this. Both cognitive modes are based on perception. The most productive type of thinking is born from an interplay between the two.

Edward De Bono (1976) agrees that thinking and perception are related. "The teaching of thinking is not the teaching of logic but the teaching of perception" (p. 72). He stresses the importance of "directing attention across the perceptual field" before moving on to the "processing stage of thinking (logic)" (p. 74).

Arnheim (1969) proposes that the "visual arts are a homeground of visual thinking" (p. 254). Before an artist can create, a great deal of visual thinking must take place. This applies to young children as

much as it does to professional adult artists. In order to express a concept artistically, children must not only form and identify visual concepts, they must unravel the concepts and discover their underlying structures (p. 257). Artistic statements become more than mere visual diagrams depicting this process. "Here, as everywhere else in art, 'beauty' is not an added decoration, a mere bonus for the beholder, but an integral part of the statement. Every aspect of the picture...is in perfect fit with what the child understood, felt, and tells" (p. 260).

Not only is visual thinking an essential part of artistic expression, it is also an important factor in the development of logical thinking. Piagetian theory proposes that children do not master symbolic logical thought until they leave the stage of concrete operations at approximately 11 years of age. Until then, their concepts are based on concrete interactions with the world. This applies to concepts that lead to the development of logical thought as well as to other formal operations. According to Piagetian theory the origins of logical thinking lie in the skills of classification and seriation (Sime, 1973, p. 45).

Classification involves the concept of a collection of things that have something in common. Classes do not exist in the physical world but are created in the mind. Seriation refers to the ordering of a collection of objects or symbols in a sequence. Sequential order can be based on many different qualities: small to large, light to heavy, bright to dull, or smooth to rough. According to Piagetian theory, children evolve naturally through the stages of classification and seriation. Ginsberg and Opper (1979) review Piaget's theories on classification:

> In stage 1 (2 to 5 years) the child fails to use consistently a clear rule or defining property to sort the objects into different classes. He instead constructs graphic collections which are small partial alignments or interesting forms. In stage 2 (5 to 7 years), the child sorts the objects by a reasonable defining property and even constructs a hierarchical classification, but he fails to comprehend inclusion relations. Stages 1 and 2 are termed PREOPERATIONAL. In stage 3, which is CONCRETE OPERATIONAL (7 to 11 years), the child has a mature notion of class, particularly when concrete objects are involved. He sorts them by defining properties, understands the relations between class and subclass, and so forth. (pp. 129-130).

In seriation, children progress through stages similar to those of classification. In stage one, children usually cannot form systematic orderings of objects although they can sometimes order a few of them. In stage two (five to seven years), ordering can be accomplished largely by trial and error, accompanied by a great deal of difficulty. Equivalency between two orderings, such as the matching of 10 small to large dolls to 10 small to large sticks can be done through one to one correspondence, and again, only by trial and error. In stage three, children can easily construct orderings. Their work is guided by an overall plan and they can also place separate orderings into one to one correspondence. Children are adept at understanding and manipulating ordinal relations when they can deal with objects on a concrete level.

Classification and seriation are based on concepts of similarity and repetition. Children have been found to develop these skills by manipulating physical objects into patterns that have, for the children, satisfying visual appearances. Apparently the influence of visual design is stronger than any other motivation for classification. Piaget refers to these visual examples of logical thinking as "graphic

collections" (Sime, 1973, p. 45).

The importance of visual thinking in childhood is stressed by other educators as well. The authors of The Teaching of Young Children state that:

> Children at the intuitive stage...make judgments on the basis of certain perceptual aspects of the situation...and they have not yet acquired the concepts...necessary to an understanding of the mathematical relations involved. (Bott, Davies, Hitchfield, Johnson, and Tamburrini, 1969, p. 46)

It is interesting to note that Arnheim (1969) writes that one of the simplest rules of visual perception "is the rule of similarity, which does indeed confirm...(that)...things that resemble each other are tied together in vision" (p. 55). According to Arnheim and De Bono, the importance of visual intuitive thinking does not decrease with age. It is the basis for productive, creative, and logical thinking throughout life.

Visual thinking and cognitive functions are related. Does this mean that art can play a valuable role in a child's cognitive development? Elliot Eisner (1981) thinks so. He writes that "the arts are cognitive activities, guided by human intelligence, that make unique forms of meaning possible" (p. 48). He associates cognition with the process of becoming aware of the environment, of seeing it, perceiving it, and forming concepts of it:

> The process of forming concepts is one of construing general features from qualitative particulars. The perception of the qualitative world is always fragmented: We never see a particular immediately, in an instant. Time is always involved. General configurations are formed - that is, built up from parts to wholes. Through time they yield structured patterns that constitute a set. The patterns formed in this way are concepts. They are root forms of experience that we are able to recall

and to manipulate imaginatively. (p. 50)

Cognitive and mental activity is based on sensory perception. Eisner feels that "any conception of intelligence that omits the ordering of qualities through direct experience is neglecting a central force of intellectual functioning" (p. 52). Since art experience cultivates sensory perception and deals with direct experience, art has the potential of making a large contribution to a child's cognitive development.

Other educators also feel that art can contribute to a child's cognitive growth. This possibility is explored by several educators who apply some of Jean Piaget's theories to theories of art education. Willian and Katherine Ives (1975) state:

> The sensorimotor manipulation of art materials lets young children explore and experimentally develop their understanding of such logical operations as classification or such scientific operations as causality. (p. 19-21)

Lansing (1966) summarises Piaget's ideas on a child's conception of space and applies the main points to art education. Golomb (1974) reviews Piaget's view on imitation and symbolic play and points to the contribution that these studies can make to an understanding of a child's creative activity.

Piaget's theories on the development of logical thought can also be applied to art education. Pattern and pattern making are prominent aspects of classification and seriation, the roots of logical thinking. Pattern is also an important element of visual art. Does the use of pattern in child art have an effect on the use of pattern in logical thinking? This is the main question in this study.

Pattern in Child Art

Literature from the fields of art education and education in general offers several views on the topic of child art and pattern. Rhoda Kellogg (1969) proposes that children strive for order in their drawings and designs. She cites the mandala design in child art as an example of a pattern which expands in all directions and feels that children create mandalas because of their innate desire for good balance and design. Like Arnheim, Kellogg feels that child art is highly aesthetic and that visual pleasure is an essential part of the process of child art. She does not, however, feel that child art is related to intelligence or to other symbolic systems such as language or mathematics:

> The visually logical system of child art represents "visual thinking", but this is not the same as rational thinking, language development, or the expression of the emotional states. The Gestalts of child art may coincide with other Gestalt systems, but they differ for the most part, and the difference often is a source of confusion tothe child (p. 47)

Arnheim (1969) would not agree with Kellogg's statement. His primary concern is with the relationship between art and visual perception. He proposes that pattern in a child's art is based on the structure and pattern of a child's perception. Perception represents visual thinking. As children develop mentally their perceptions and their compositional patterns become more complex. Pattern is an integral part of the order that is necessary for human survival. Pattern in child art cannot be isolated and considered as a separate entity. It is an essential aspect of perception, of thinking, and of a child's interaction with the world. Pattern is a vehicle for pleasure and aesthetic expression and represents intellectual understanding.

Jacqueline Goodnow (1971, 1977) offers yet another view of pattern in child art. She is concerned with the patterns and sequences that children use while creating art. She also considers the "relationships of parts of drawings to one another and to the page" (p. 47). To this end, she examines a variety of elements in children's drawings. The placement of arms, legs, and other body parts and the use of boundaries between different parts of drawings are all analysed. Goodnow views pattern in a broad context. Unlike Kellogg, she asks:

> Is it possible that all patterns have similar features or can be described in similar terms? Finding such similarities is a source of pleasure and reassurance: They provide both a sense of "elegant economy" and a sort of reassurance that one is "on the right track", not inventing a complete new set of terms that have no relevance outside a small world. (1977, p. 47)

Goodnow (1971) explores this question through research in an area of psychology called cross-modal transfer. She inquires whether the perception of a pattern through one sensory system (auditory) can be expressed via another sensory system (visual). She reports that pre-school children are generally not capable of such a transfer but that older children are (pp. 1187-1201). Her research in relation to reading skills shows that there is a transfer from auditory perception to visual expression of simple patterns. Although Goodnow reports on relationships between senses, could her study shed light on the transfer of pattern usage in art to pattern usage in logical thinking? Could the use of pattern in one symbolic system (visual art) be transferred to another symbolic system (logical thinking)? If so, art education could become the cornerstone of a child's elementary eduction.

Lavin and Silver (1979) report their success in helping handicapped

children develop cognitive skills through art. Like Arnheim, they feel that imagery is a basic instrument in thinking and that many concepts are perceived and interpreted visually. Lavin and Silver designed art procedures to stimulate abstract thinking and reasoning and to develop readiness for math and language. They describe three studies in which handicapped children show significant gains in expressing concepts of space, order, and class as a result of the new art procedures. They demonstrate that art can definitely help children deficient in linguistic processing develop cognitive concepts and solve thinking problems.

Many educators hint at this possibiltiy. While writing about "Reading, Logic and Perception" David Elkind (1974) suggests:

> Good readers appear to have well developed perceptual activities whereas slow readers appear to be deficient in this regard. Accordingly, it seemed reasonable to suppose that training in perceptual activity might benefit at least some retarded readers. (p. 169)

In the journal Mathematics Teaching, K. Delaney and J. Dichmont (1979) describe how a class of primary children were inspired by an art book on Islamic design. The children became totally absorbed in building up and creating their own geometric designs. The excerise "involved a good number of children in doing mathematics of a much higher quality than usual." The authors go on to comment that "it has been rare to find children able to work with such sustained intensity - or in such a creative way - at a task involving numbers" (p. xix). In the same journal, M. Armstrong (1979) describes a young girl's artistic and mathematical exploration of pattern creation with small sticky stars:

> She had shown wonderful dexterity and precision, of hand and eye and mind, and an exhilarating delight, playful

> and deeply serious, in the logical, ordered construction of forms, and patterns. (p. xxv)

Both articles describe high quality mathematics done by children through the medium of visual pattern making. Although the authors do not draw conclusions from their observations, the excellence of the work they describe may be due to the presence of art.

Seymour Jennings (1973) in Art in the Primary School writes about the value of stimulating young children to be sensitive to pattern:

> Ultimately, apart from the pleasure such recognition brings, an understanding of the different ways in which units can be grouped in ordered ways may assist children to visualise the reality behind ideas of order stated symbolically in mathematics and science. (p. 16)

Summary

Literature and research relating to the topic has been reviewed. Educators and psychologists present several views. Kellogg states that child art activities are aesthetic experiences and that their patterns and designs depict the balance and good order that all humans crave. Arnheim writes that pattern in art represents pattern and structure in perception and visual thinking. Goodnow examines patterns in the process of child art and in perception and expression. Other authors also suggest that pattern, visual perception, and visual thinking have a positive effect on cognitive as well as artistic growth. Training in visual perception through art can help slow readers and children deficient in linguistic processing develop cognitive skills. Art activities help children do high quality mathematics. Learning about order through art can help children learn about order in mathematics and science. This review has disclosed several valuable opinions and

theories relating to the original research question. Most of the authors consulted would agree that there appears to be a positive relationship between pattern in art and the development of logical and cognitive growth. All would certainly agree that there is much more to pattern than meets the eye!

Chapter III

RESEARCH PROCEDURES

Structure for research should be compatible with the structure of the topic under investigation. This study examined the occurrence of classification, seriation, and other logical skills in child art. These skills have definite characteristics. Child art, on the other hand, has many diverse qualities. Research procedures had to be open - ended enough to examine the broad area of child's art experience and specific enough to record the logical skills under investigation. Initially, the field research and data collection was carried out in an open - ended fashion. Then, as patterns started to emerge, more specific research tools were employed to examine the particular skills which were observed.

In The Education Imagination, Elliot Eisner (1979) supports an open - ended approach to art education research. He writes that a child's art experience and expression are of a divergent nature and should be researched in a like fashion. Many factors contribute to learning and expression in art. Research must, as its first necessary condition, have "the ability to see, to perceive what is subtle, complex and important" (p. 193). For example, examining isolated logical skills would have been of little importance to a study such as this one unless the many other factors that are a part of child art were also considered. An appropriate mode of research for this study was a descriptive one. This type of research does not, in any way, attempt to alter a state of affairs. It attempts to discover, through examination and description, what the state of affairs actually is.

Eisner describes a model for art education research through which a researcher can recognise and record charactereristic art qualities. The model has three aspects: description, interpretation, and appraisal. The descriptive stage comes first. In this phase the researcher makes use of a variety of techniques through which to record an accurate and vivid representation of the research situation. Photography, tape recordings, and descriptive writing are appropriate methods. In the second phase, interpretation, the researcher attempts to explain what has occured. Models or theories from art education and other fields contribute to this process. As a result of this interpretation, the last phase of the research is possible. Through analysis and appraisal the researcher makes suggestions and recommendations aimed at improving future practice in art education.

The approach described by Eisner is not a new one. It has been used successfully by many prominent art educators. Rhoda Kellogg (1969) examined approximately one million children's drawings. Her descriptions and interpretations of this data led to her final analysis of child art. Viktor Lowenfeld (1970) also used the process described by Eisner. Although the final conclusions and recommendations made by these educators are sometimes questioned, their descriptions and interpretations of child art have inherent value. Their data constitutes a valuable contribution to knowledge on child art.

The present study utilised the descriptive mode of research. Its primary goal was to observe, describe, and analyse patterns in child art and to inquire whether these patterns were related to patterns in the development of logical thought. Throughout the study it was essential

to maintain a relationship with what Arnheim and De Bono call a "broad perceptual field". It was important to have a framework which would allow for both intuitive and intellectual interpretation. To this end, a variety of art activities and research procedures were designed and used.

Sources for the Data

The study was conducted in an inner city elementary school in Winnipeg, Canada. The school had a student population of about 300, ranging in age from 4 in nursery to 14 in grade six. About 75% of the children were of Native ethnic origin, the remaining came from a variety of ethnic backgrounds. Economically, many of the children were from needy homes, where families had to struggle to meet their basic requirements. The area around the school was a transient one, and at the time of the study the migrancy rate (percentage of transfers in and out of the school per year) was 75%.

Two factors were considered in selecting the children for the study. First, they had to be at a certain stage of cognitive development. Second, the children had to be at a certain level of artistic development. The child's level of cognitive development was significant to the selection of appropriate age groups. According to Piagetian theory (Droz and Rahmy, 1976), children from 2 to 12 years of age are in the stage of concrete operations and make logical decisions based on physical, visual, and perceptual information. Within the stage of concrete operations, 2 to 5 year olds almost always organise objects through physical manipulation. Slightly older youngsters organise objects visually and

then, around the ages of 8 to 10, they learn to organise things with mental images. Pre-adolescents and adolescents are finally capable of formal logical operations. Since this study focused on classification and seriation, the first logical concepts acquired, it was important to work with children in the manipulative and visual stages of development. Therefore the study was conducted with the youngest children in the school, those in nursery, kindergarten, grade one, and some of the children in grade two.

The second factor considered in the selection of children for the study was their level of artistic development. According to Lowenfeld (1970), children around the ages of 9 and 10 become acutely aware of their peers and tend to adapt their own artistic expressions to conform to those of the children around them. Many children start to feel that there is a right way and a wrong way to do art and they loose much of their spontaneity. Children at this age would not have been appropriate candidates for the study. The younger children chosen for the study were still uninhibited, interested in self expression, and had not been made to feel that there was a right way and a wrong way to do art.

There were about 85 children involved in the study. Numbers fluctuated from activity to activity because of absenteeism and transiency. However, the numbers in each grade averaged about 10 in nursery, 40 in kindergarten, 20 in grade one and 15 in grade two. These numbers represented all the children enrolled in the school from nursery to grade two with the exception of one mixed grade one and two class. Observations and records were kept for all children involved in each activity.

Structure of the Research Activities

The field research was conducted over a period of four months. During this time the children were involved in a series of six art activities. The activities were divided into two phases: Phase I, an introductory set of three activities and Phase II, a set of three follow-up activities.

Phase I. This phase consisted of introducing all the children to the three media involved in the study: sculpture, printmaking, and clay. The primary objectives for the activities were to introduce the children to the nature of each medium and offer them opportunities to practice manipulative skills in each one. Since these media were also used later in Phase II, it was important to acquaint the children with each medium. The activities were basically introductory and exploratory. In the sculpture I activity, children developed visual and tactile awareness of three - dimensional shapes and practiced skills in assembling and gluing small constructions together. In printmaking I, children developed skills in inking and printing small blocks and found objects. In clay I, the children became familiar with the origins of clay, discovered the many visual and tactile qualities of clay, and developed skills in manipulating it. The lesson plans for these activities; sculpture I, printmaking I, and clay I, are found in Appendix A.

The first phase was also important to the study for it gave the researcher an opportunity to experiment with various methods of data collection and observation. After using several different approaches, the researcher decided which ways were best suited for use in Phase II of the study. Some of the methods tested were checklists, anecdotal

note taking, the collection of actual artwork, and photography. The final forms for the checklists and notes are included in Appendix B.

Phase I was an interesting and useful one. Not only did the children receive adequate preparation for the next phase, many patterns also appeared in their work. This was an encouraging sign for the researcher.

Phase II. The second phase also consisted of three art activities; sculpture II, printmaking II, and clay II. The primary objective for these activities was to introduce children to ways of using and expressing pattern in each medium. In each activity, children observed a demonstration of ways of using concepts of classification, seriation, and pattern. They then had opportunities to express their understanding of these concepts in the art activities. In sculpture II, the teacher demonstrated the assembly of a simple symmetrical construction which depicted most of the logical concepts. After the demonstration, the sculpture was quickly disassembled and then children were free to make a sculpture of their own design. Printmaking II followed a similar format. After a demonstration of how the printing blocks could be used to classify, seriate, and make patterns, the teacher's example was removed. Children were then free to print patterns or pictures as they wished. In Clay II, the last activity, the teacher quickly demonstrated ways of making coils, balls, and flat circles. These were assembled to show a variety of logical concepts. The examples were then crushed and the children were allowed to make what they wished with the clay. The detailed lesson plans for these activities can also be found in Appendix A.

During and immediately following the activities in Phase II, data

was collected. Three main tools were utilised. They were photography, anecdotal note taking and a skills checklist. The checklist was designed as a result of the Phase I experimentation. The skills represented a variety of simple to complex logical concepts. Both children's behaviour and their final products were examined for the occurrence of these skills. The checklist can be found in Appendix B.

Both phases proved to be very fruitful and provided the researcher with a wealth of data. Activities were carried out on 27 different occasions, with 10 to 15 children attending each session. All these children were observed and checklists and anecdotal notes were recorded for each session. Over 300 coloured slides document the children's behaviour during the activities and their final art products. This large body of descriptive data was invaluable to the interpretation and formation of conclusions to this study.

Chapter IV

DATA AND INTERPRETATION OF DATA

Three methods were used to collect data during the study; checklists, photography, and anecdotal notes. First a checklist (see Appendix B) was used during each activity to record evidence of logical skills in a child's behaviour. These observations were usually carried out by a non - teaching researcher. After each activity, the checklist was also used to record evidence of logical thinking in the child's art product. To do this, the work was collected and/or photographed. It was then examined and analysed. Evidence of the use of logical skills was recorded on the checklist. Information from the checklists was interpreted and transferred to a table (see Table 4.01) which lists the percentage of children in each grade and each activity who exhibited evidence of using the logical skills.

The second method used to collect data was photography. During and immediately following each activity 20 to 40 coloured slides were taken of children working and of their art products. Examination of these photographs confirmed and added to data already recorded on the checklists. They also offered the opportunity to carefully examine a child's involvement with specific skills. The photographic method of data collection was well suited to the structure of the field research. Photographs could be taken with ease during the activities. Afterwards, they could be examined for details which may have been overlooked during the activities. In the interpretation of the data, later in this chapter, photographs are used to illustrate children using the logical skills

on the checklist. They are also used to illustrate the three case studies.

The third and last method of collecting data consisted of jotting down anecdotal notes and comments during and immediately following each lesson. These notes contributed to a richer interpretation of the data as a whole. Together with the photographs, the notes offered opportunities for in-depth examinations of the works and actions of various children. The notes contributed to more complete written interpretations of the photographs and to the three case studies.

Interpretation of the Checklists

Table 4.01 depicts the percentage of children at each grade level who demonstrated evidence of using the logical skills on the checklist. Each activity (sculpture, printmaking, and clay) has a separate percentage column for each grade level. All children for whom records were kept were included in the percentage calculations. For example, if 10 children participated in an activity and four of them showed evidence of using a certain skill, then the table reads that 40% of the children exhibited evidence of using the skill. If there were 28 children participating in an activity, then 11 children would have had to show evidence of using a skill to reach roughly the same score of 40%. The table offers an opportunity to see, for each activity, what percentage of children at each grade level used each skill on the checklist.

Initially, the results on Table 4.01 appear disorded. Sometimes nursery children scored higher than the older children (Sculpture: Classification skills). In the same skills the same grade sometimes

achieved different percentage scores in different media (Kindergarten: Classification skills). Yet, in some other skill areas (Printmaking: Pattern skills) there is a degree of uniformity between grade level scores. These, and other variations and consistencies in the table lead to some interesting observations and conclusions.

The table is examined by comparing percentage scores of skill usage in the three media; sculpture, printmaking, and clay. The skills are organised into three areas; classificiation, seriation, and pattern skills.

In the classification section, nursery children often scored higher than the older kindergarten and grade one children. This is clear in the sculpture and clay columns. In sculpture, 71% of the nursery children matched elements one to one, 85% ordered elements into classes, and 100% of the children arranged elements into rows. These are mugh higher scores than those of the kindergarten youngsters. In the same activity, however, nursery scored lowest in making representational items. This tendency is repeated in the clay activity. It appears that the more children became interested in making representational objects, the less they were involved in working with concepts of classification. Perhaps representation and schema development offered new and greater challenges to the older children. They probably had already mastered simple classification skills and were no longer interested in depicting them in their work.

The next section on the table to be examined is that of seriation skills. The skills involved are: "the child pairs small to large", "sequences three or more items", and "makes equivalent sequences". In

seriation, children across the grade levels scored in somewhat similar fashions but again, younger children had the highest scores in a few skills. In the sculpture column, the three grades have similar scores in pairing small to large items, but only the grade ones scored anything on the second two skills. In printmaking, the kindergarten children have higher scores than the grade one children in all three skills, In clay, the nursery group has the highest scores in the two more difficult skills: "the child sequences three or more items" and "makes equivalent sequences".

The scores in the seriation section show that children at all the grade levels examined could use the skills in one or more of the media. It is interesting to note that in the clay activity, nursery children scored highest in the more difficult skills. Perhaps children advance through stages of development earlier in the medium of clay than they do in other art media.

The last section to be examined is that of pattern skills. This includes: "uses repetition: one item", "repeats schema", "uses repetition: two or more items", "uses linear symmetry", "uses point symmetry", and "creates mandala designs". In sculpture, nursery children scored highest in simple repetition and in making mandala - like designs. The oldest children scored highest in repetition of schema, repetition of two or more items, and in linear symmetry. In printmaking, percentage scores of the kindergarten and grade one children are quite similar. In the clay activity, nursery children scored slightly higher than kindergarten in simple repetition but kindergarten scored higher in repetition of schema and in creating mandala designs.

Several conclusions can be drawn from the examination of the table.

Generally speaking, it can be concluded that many behaviours associated with the development of logical thought and cognitive growth occured in the art activities. They were apparent in the behaviour and products of the youngest children examined. Art activities, therefore, must have great potential for contributing to a child's logical and cognitive development.

Two more specific conclusions can be drawn from the examination of the data in the table. First of all, in clay and sculpture, nursery children scored higher than kindergarten children in classification skills. Children appeared to use skills and explore concepts when they found them to be new and interesting. When the skills were mastered in a medium, children were no longer challenged and went on to explore other skills, such as developing schema for representational items. Children seemed to use a skill most often when it was new to them. After the skill was apparently mastered, they did not appear to be very interested in depicting it in their art work.

A second conclusion deals with the nature of different art media and the ease with which children use logical skills in these media. Upon examining seriation scores, it can be seen that nursery children seriated items in clay much more than they did in sculpture. Kindergarten seriation skills peaked in the printmaking activity and grade one seriation skills peaked in the sculpture activity. Some media are more appropriate than others for developing certain logical skills with different age groups. Clay appears to be an appropriate medium for the early development of seriation and classification skills. Printmaking appears to encourage the use of these skills in kindergarten

Table 4.01

Percentage of Children Exhibiting Evidence of

Classification, Seriation and Pattern Skills

Skills	Sculpture			Printmaking		Clay		
Grade:	N	K	1	K	1	N	K	2
The child:								
1.makes representational items	42	53	56	25	20	33	82	66
Classification skills								
The child:								
2.matches elements one to one	71	56	62	32	35	22	13	80
3.orders elements into classes	85	60	62	60	85	66	7	66
4.orders elements into rows	100	60	75	46	85	55	7	53
5.enumerates and/or counts	-	3	-	-	-	22	13	-
6.orders classes in classes	-	-	-	4	15	-	-	-
Seriation Skills								
The child:								
7.pairs small to large	14	16	12	60	35	11	13	46
8.sequences three or more items	-	-	37	25	20	44	7	6
9.makes equivalent sequences	-	-	18	11	-	11	-	-
Pattern Skills								
The child:								
10.uses repetition: one item	85	43	43	68	80	22	7	86
11.repeats schema	-	-	62	18	15	11	21	60
12.uses repetition: two or more items	14	6	25	28	35	-	-	20
13.uses linear symmetry	57	50	75	10	20	-	4	66
14.uses point symmetry	14	-	6	10	10	-	-	40
15.creates mandala designs	42	23	12	4	25	11	21	53

Note: A dash (-) indicates that this skill was not observed in a child's behaviour or final product.

and sculpture seems to help reinforce seriation skills in the older grade one children.

Interpretation of Photographs and Anecdotal Notes

Roughly 300 coloured photographs document the children's behaviour and products from both phases of the study. These photographs reveal many things that cannot be seen on a checklist or a table. They reveal the degree to which children were involved in using the various skills. They show the concentration, enthusiasm and enjoyment with which the children were engaged in the art activities.

The anecdotal notes made during and immediately following the art activities added to the information contained in the photographs. One of the outstanding observations of the activities as a whole concerned the involvement and enthusiasm of the children. They were very eager to do the activities, usually worked with great concentration, and in many cases, produced several final products relating to the activity. The children also used patterns frequently and appeared to enjoy working with these concepts.

The photographs and anecdotal notes have been analysed in two ways. First, photographs have been selected to illustrate the skills listed on the checklist. Descriptive comments and observations accompany each selection. Second, the photographs and notes have been used as a basis for in-depth examinations of the work of three children, Phoebe, Derrick, and Delanie. All of their work from both phases of the study has been examined, resulting in three case studies.

Figure 1. Andy and John (N), printmaking I. This figure illustrates "the child make random series" and "the child makes graphic

collections". According to Piagetian theory, a graphic collection is made when the child "fails to use consistently a clear rule or defining property to sort out the objects into different classes" (Ginsberg and Opper, 1979, p. 129). These works do not seem to use consistent, clear rules in the sorting and placement of objects. However, it is not possible for an observer to fully know what Andy or John were considering while creating these pictures. They may indeed have been following a logic not visible to an outside observer.

Figure 2. Christian (K), clay II. This figure illustrates "the child makes representational items". Most (82%) of the kindergarten children made representational items with clay. Christian's examples were a house, a volcano, and a boat with oars and a loose outboard motor. These objects were very real to him. While making them, they became a part of his world of play and fantasy. When representation was dominant, it was difficult to analyse works in terms of pattern. Clay seemed to be one of the easiest and most flexible materials for young children to work with. As was mentioned in the interpretation of Table 4.01, children advanced through stages of development earlier in clay than other media.

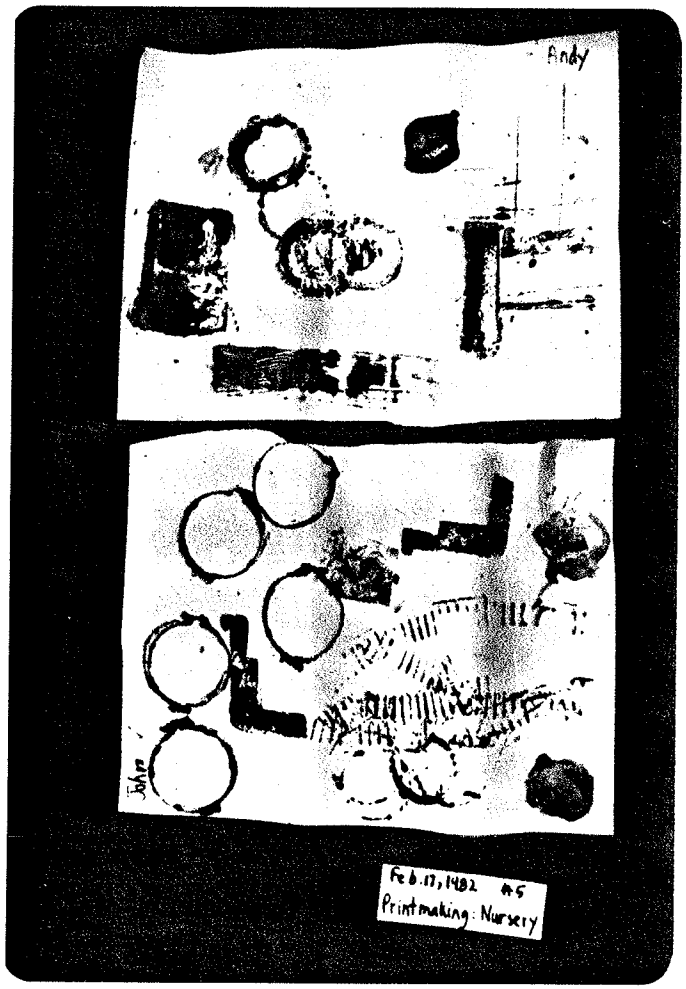

Figure 1

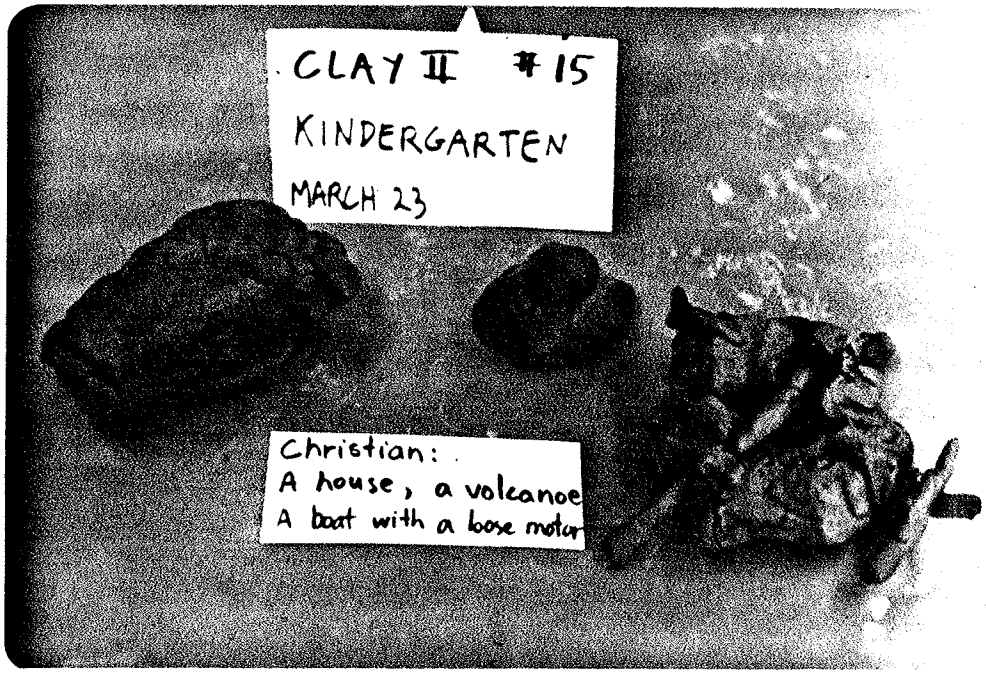

Figure 2

Figure 3. Alonso (K), clay II and Figure 4. Crystal (N), sculpture II. These figures illustrate "the child matches elements one to one". Almost all the children seemed to have advanced beyond the basic concept of matching elements one to one. Many children, however, seemed to enjoy creating pairs of representational objects. Alonso made two identical clay circles. He placed them side by side and called them his "drums". He played his drums for quite a while by slapping his hands upon them. Crystal assembled a pair of "beds". Several other children in other classes also made pairs of beds like the ones Crystal made. Most (71% in nursery) children took great care in lining up and carefully matching their paired objects.

Figure 5. James (K), sculpture II. This figure illustrates "the child orders elements into classes". James selected and lined up eight identical blocks and glued them onto a wooden slat. This was a good example of classification through sorting and arranging elements into classes as well as arranging elements into rows. It was not known whether this piece was representational. He then made three crosses (repetition of schema) and left the row of blocks on the table. Another child later used the row of blocks in one of his sculptures.

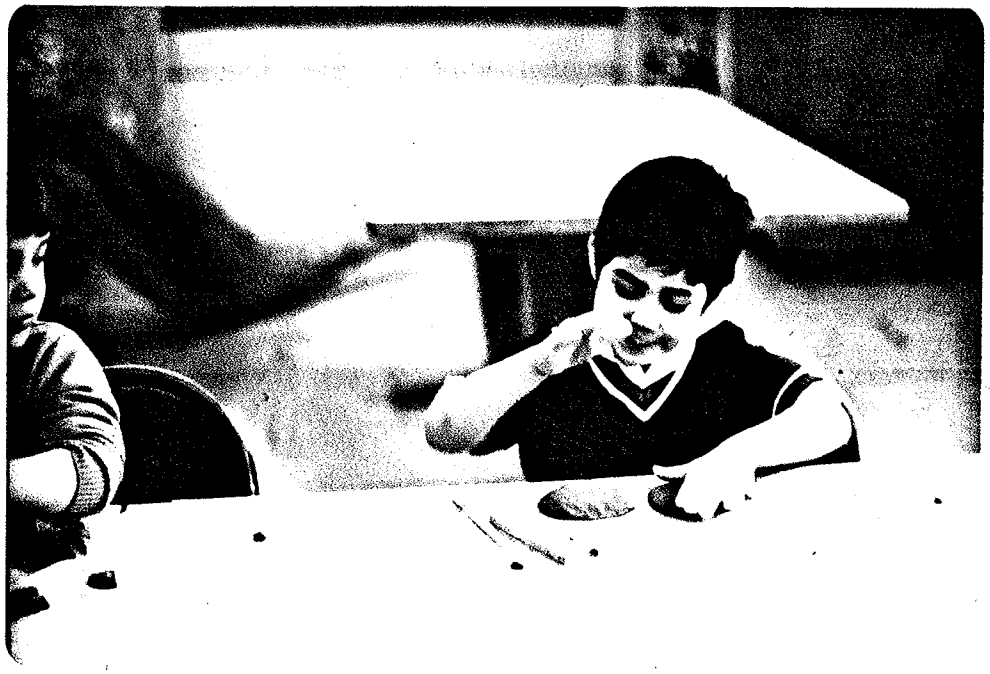

Figure 3

Figure 4

Figure 5

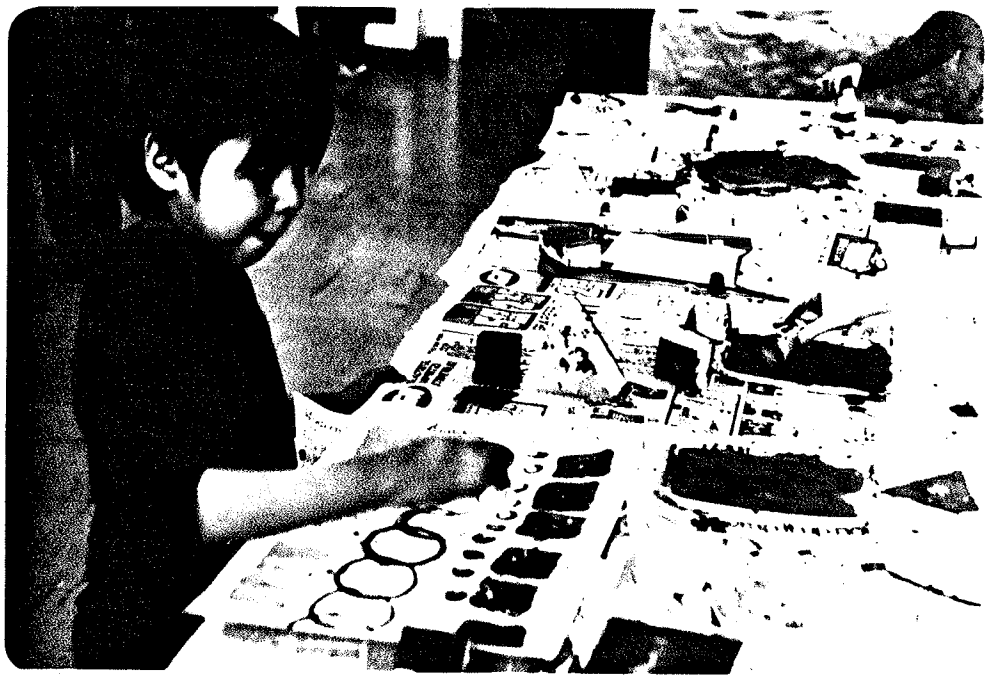

Figure 6

Figure 6. Timmy (1), printmaking II. This figure illustrates "the child arranges elements into rows". Timmy filled his page with rows of large squares, circles, and rectangles. The spaces left were then filled in with rows of smaller shapes. Timmy was working from left to right. This is one of many excellent examples of a child using this concept (85% of the grade ones printed elements into rows).

Figure 7. Andy (N), clay II. This figure illustrates "the child enumerates and or counts". Andy was playing with his clay and formed a rough lump. He then cut off little pieces and lined them up in a row, counted them, arranged, and rearranged the little pieces. When asked what he was doing he replied, "cutting meat"! Nursery children often played this way with clay.

Figure 8. Ian (1), printmaking II. This figure illustrates "the child orders classes within classes". During the printmaking activity Ian discovered that soap bubbles sometimes formed inside the circular printing blocks. This fascinated him and his main concern seemed to be to ink the circle so that the bubble formed and then to print the bubble. Nevertheless, he organised his print into rows and also organised his overall design into classes within classes according to size and colour.

Figure 7

Figure 8

Figure 9. Joshua (K), clay II and Figure 10. Joshua (K), sculpture II. These figures illustrate "the child pairs small to large." Joshua put a great deal of effort into making what he called "a turtle" (see Figure 9). It had a head, legs, a tail, and other turtle like qualities. When he was finished the large turtle he made a tiny little object and put it by the big one. He called them "mommy turtle and baby turtle". Joshua often made small and large versions of his schema. Another day, after he had completed the sculpture activity, he went to the painting table where he produced a small and a large version of a house schema (see Figure 10).

Figure 11. Gordon (N), clay II; Figure 12. Gordon (N), clay II and Figure 13. Ricky (I), sculpture II. These figures illustrate "the child sequences three or more items". Gordon made sets of seriated coils and balls quickly and seemingly effortlessly (see Figures 11 and 12). This was one of the skills demonstrated to the children at the beginning of the activity. The fact that he was able to make these ordered objects probably meant that he perceived and understood the concept when it was demonstrated. Seriation seemed to be easier for children when they created the objects themselves (44% of the nursery group seriated with clay). Perhaps their perceptions of the various sizes of the objects was more accurate when they made the objects themselves. When confronted with wooden slats of various lengths, neither nursery nor kindergarten children were interested in seriating them, even though the skill was demonstrated. Ricky (see Figure 13) and a few other children in the grade one group (37% in total) were the youngest children interested in seriating the wooden slats. It appeared

to be quite a challenge to them.

Figure 11. Gordon (N), clay II; Figure 12. Gordon (N), clay II and Figure 14. Phoebe (K), printmaking II. These figures illustrate "the child makes equivalent sequences". This skill was seldomly observed. Gordon (see Figures 11 and 12) made equivalent sequences of coils and balls and Phoebe made equivalent sequences of her small and large house series. (Figure 14 is described in the case study on Phoebe).

Figure 15. Darryl (K), clay II.

This figure illustrates "the child repeats schema". While working with clay, Darryl created the first of his little objects; a little ball with a small mandala - like design incised on top, placed on a flat clay circle. It was not a representational item. He was sufficiently pleased with his invention to produce another just like it. This is a common occurrence in child art. Children are often inventing, refining, and repeating schema.

Figure 9

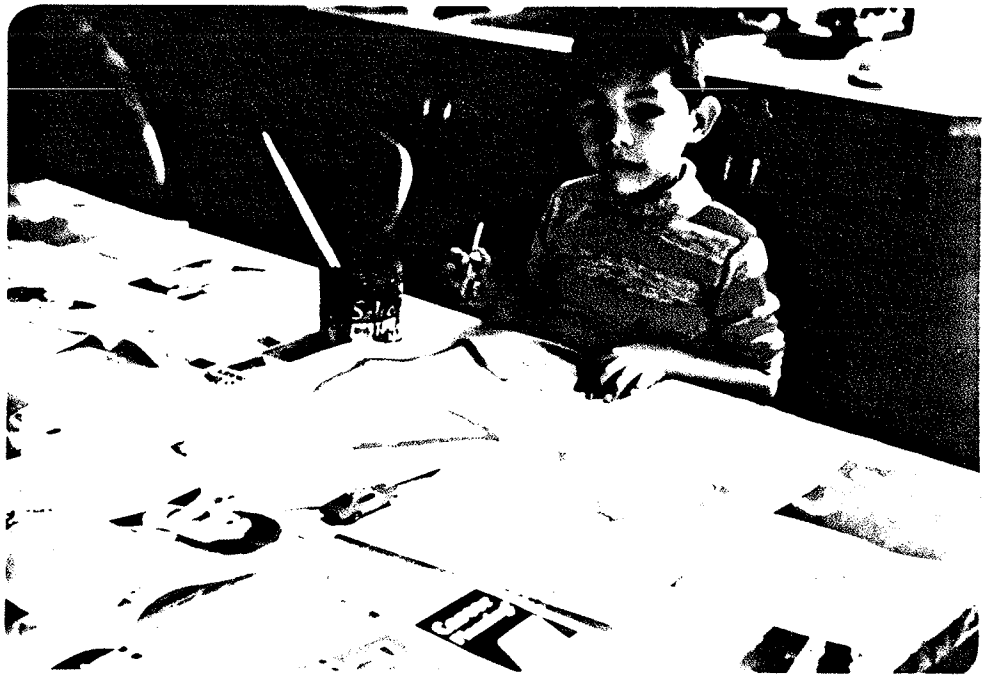

Figure 10

Figure 11

Figure 12

Figure 13

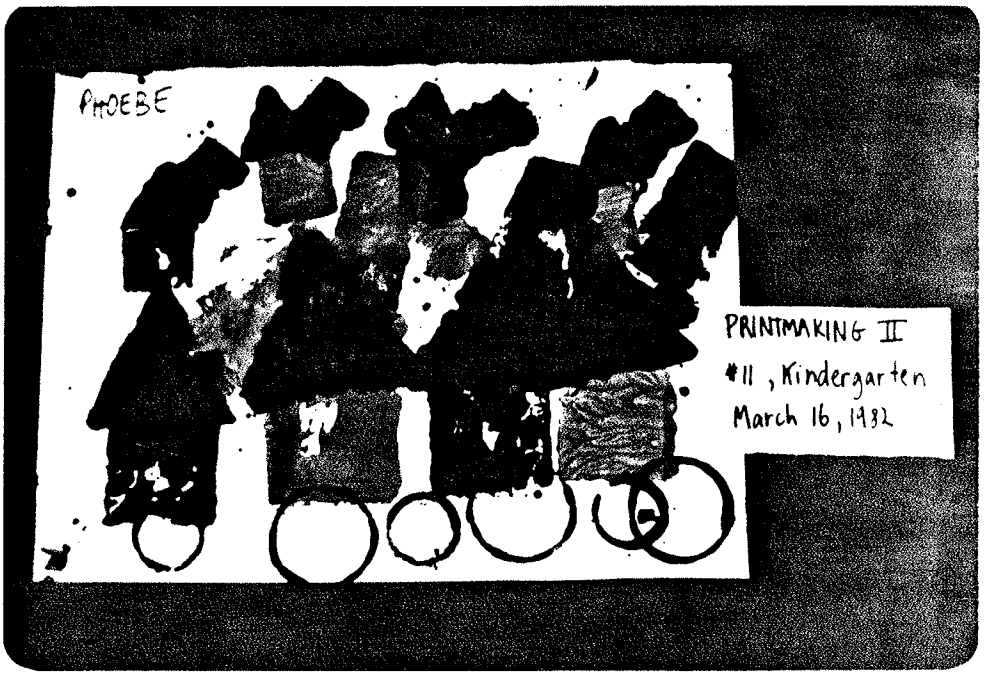

Figure 14

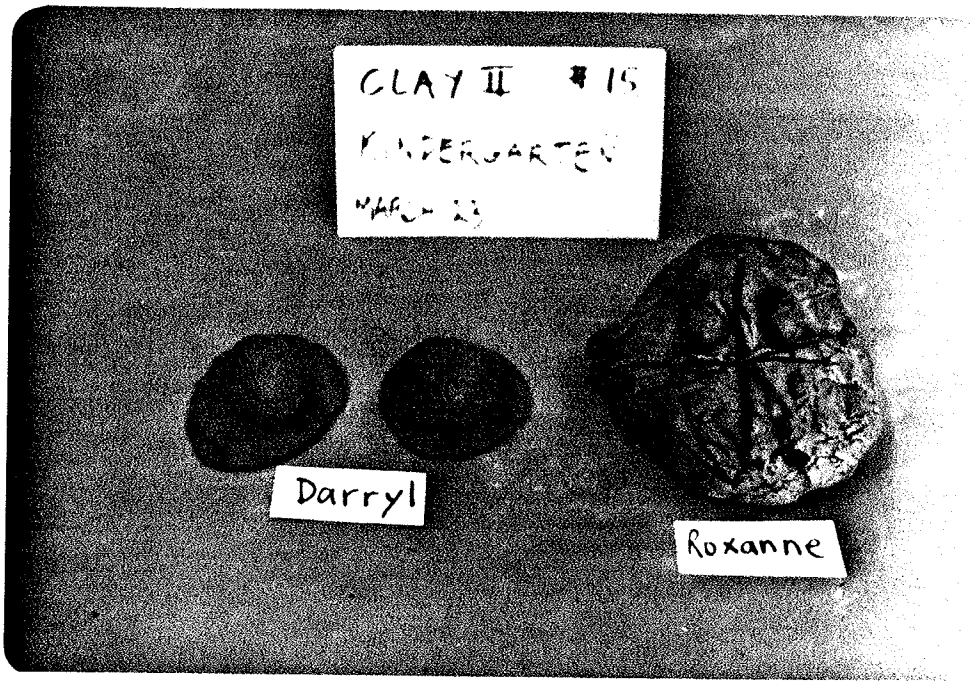

Figure 15

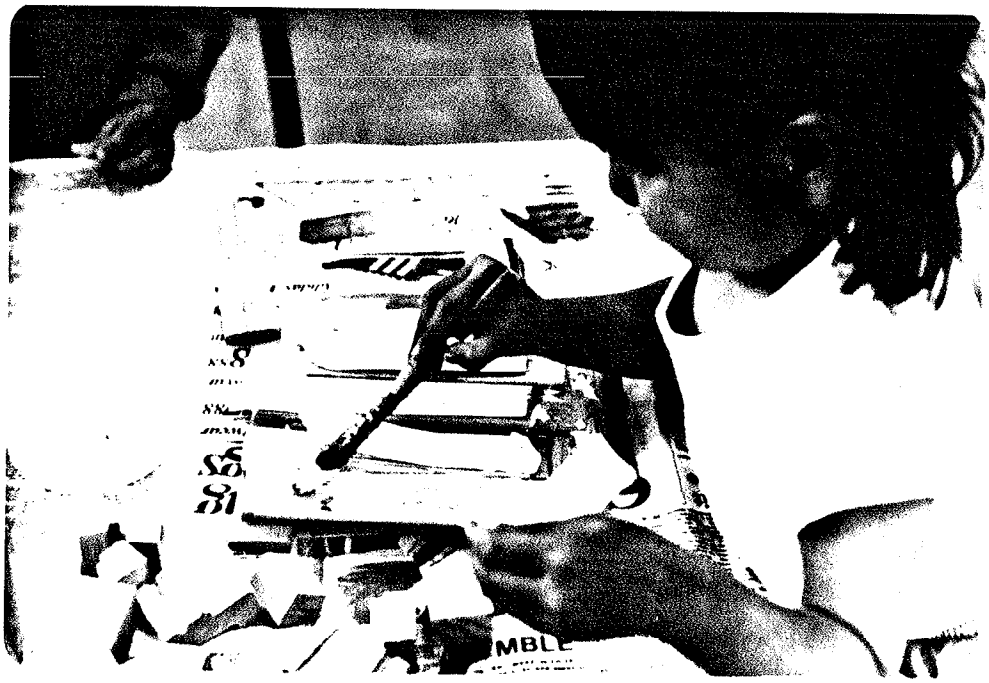

Figure 16

Figure 16. Beverly (N), sculpture II and Figure 17. Beverly (N), sculpture II. These figures illustrate "the child uses repetition of one item". Beverly made a sculpture through a series of repetitions. First she collected flat slats and glued them onto a cardboard base, one by one, each alongside the other. Then she gathered flat pieces of styrofoam and glued those onto the flat slats, one by one, and matching one piece of styrofoam to each slat. While painting her sculpture she applied one long line of green paint to each styrofoam piece. As a final touch she placed one orange dot to the base of each slat. Beverly was working in a systematic logical way. She selected one item and repeated it until her cardboard base was covered. Then she chose another item and repeated it in the same fashion. Her painting procedure followed the same process used in the assemblage, that of repetition of one item.

Figure 18. Paul (1), printmaking II. This figure illustrates "the child uses repetition of two or more items". Paul started at the upper left corner and printed a row of yellow circles and red triangles in an alternating sequence. He then printed red triangles over the yellow circles and yellow circles over the red triangles. The next row was a pattern with repetition of three shapes and the third row repeated two different schema. Paul was definitely exploring pattern making in a thorough fashion. His big smile revealed a pride in his accomplishment.

Figure 19. Julie (1), sculpture I and Figure 20. Julie (1), sculpture I. These figures illustrate "the child uses linear symmetry". Symmetry was apparent in children's art work in all the activities, especially sculpture (57% of nursery, 50% of kindergarten, and 75% of grade one children used linear symmetry). Julie's sculpture had two views and

each one consisted of a symmetrical composition. If an imaginary line was drawn down the middle of her construction from top to bottom then each view could be considered to have perfect linear symmetry. Julie made this sculpture during Phase I of the study before concepts of pattern or symmetry were introduced to the children.

Figure 21. Blythe (K), printmaking II. This figure illustrates "the child uses point symmetry". This symmetrical arrangement was Blythe's first and only print during the printmaking II session. She quickly produced the print, held it up and pronounced, "finished"! When asked whether she was going to put anything else on the page she emphatically said, "no"! She also did not want to do another print but moved over to the painting table. Did Blythe intuitively recognise the perfection of her design? Not wanting to mar its simple beauty, she may have felt she had to leave it and move to another medium. She may also have been satisfied that her one print was the best that she could do, and did not feel a need to pursue printmaking any further at that moment.

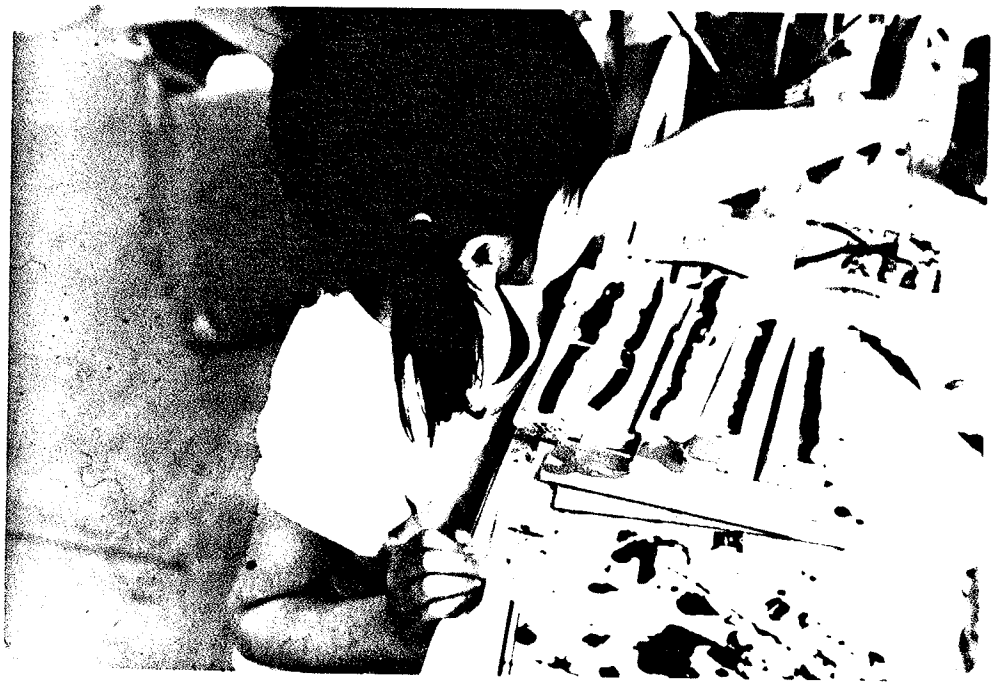

Figure 17

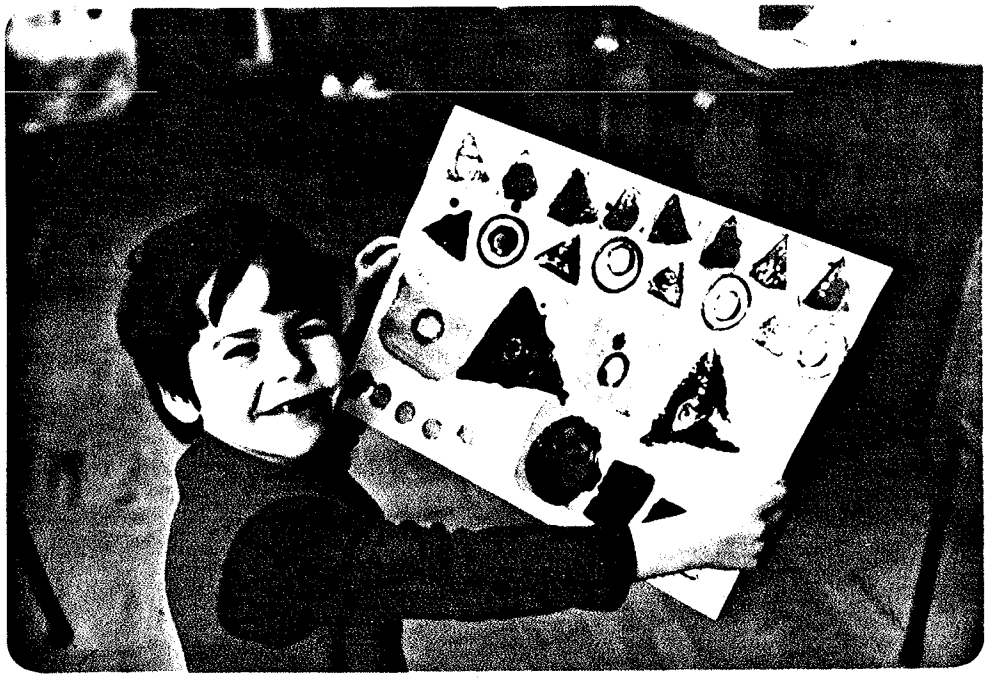

Figure 18

Figure 19

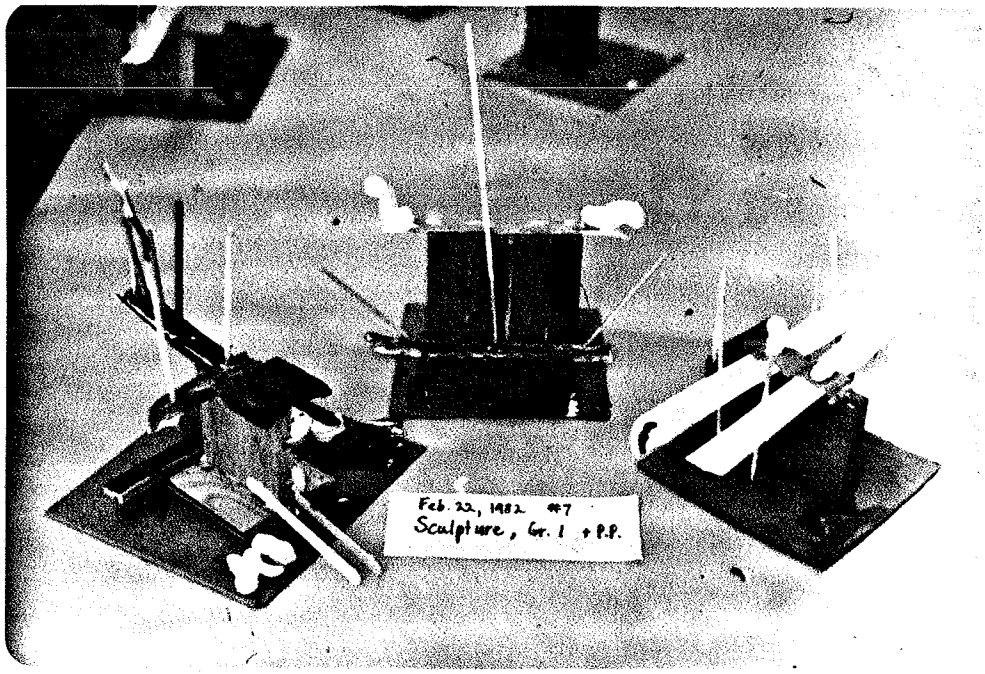

Figure 20

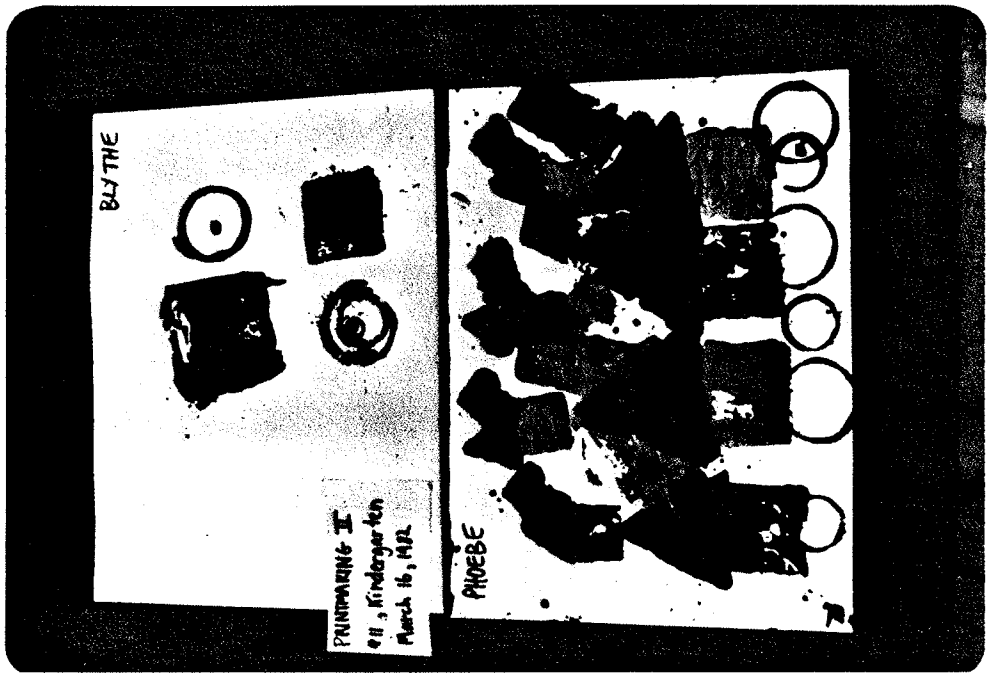

Figure 21

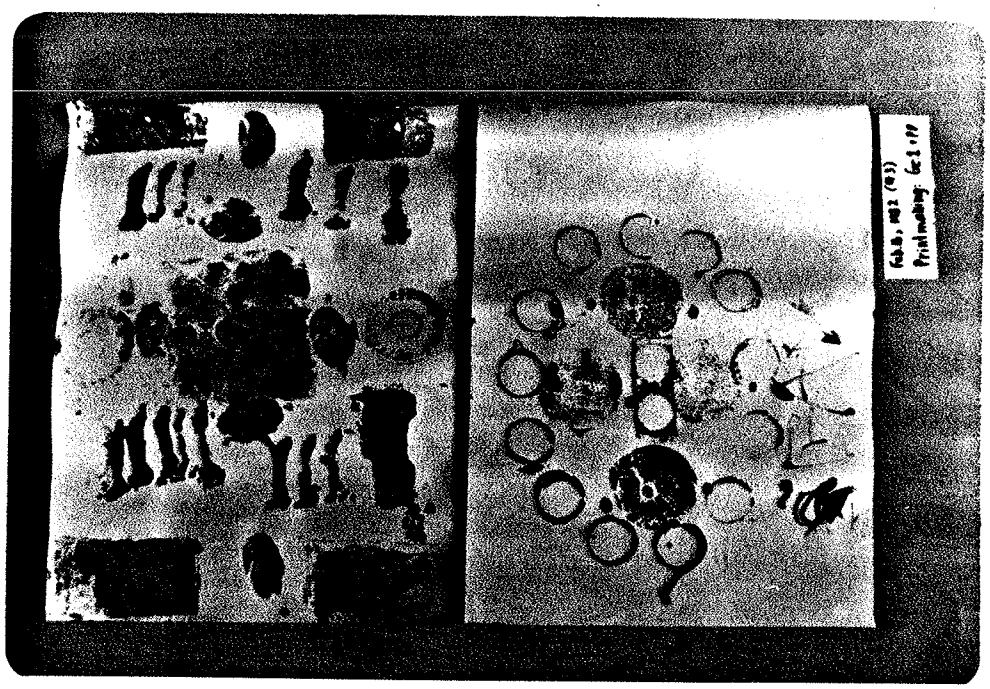

Figure 22

Figure 22. Sean (1), printmaking I; Figure 23. Sean (1), printmaking II and Figure 24. Sean (1), clay II. These figures illustrate "the child uses symmetry in a mandala design". Some children seemed to be especially drawn to mandala - like designs. Sean almost always produced a mandala design in his work, whatever the medium. His designs in printmaking I were involved and elaborate (see Figure 22). The first thing he made during the clay II activity was again a mandala design pressed into the clay (see Figure 24). The process of making this design must have been more important to him than the end product for he immediately went on to squash up his clay and made something representational. In printmaking II his procedure was repeated. He first made a flower like design upon his blank page (see Figure 23). After that was completed he proceeded to completely cover his mandala with another design.

The preceeding figures represent a selection of photographs chosen to illustrate the quality of work done in the activities and to summarise the ways in which the children used the logical concepts under investigation. The next part of this section will examine all of the work done by three different children. Phoebe and Derrick were both in kindergarten, but in different classes. Delanie was in grade one.

Figure 23

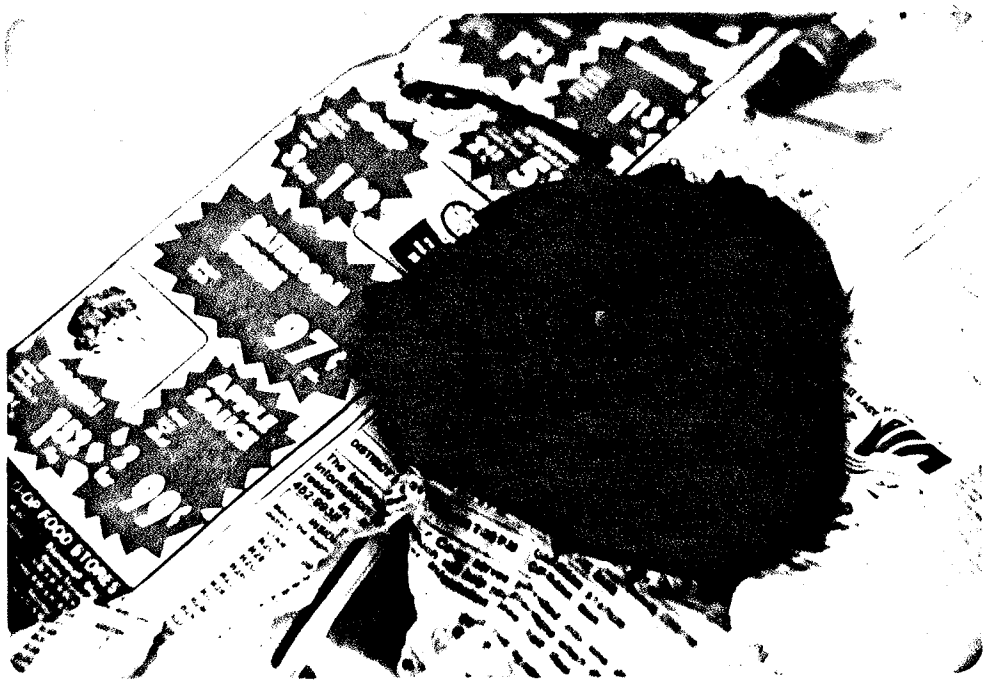

Figure 24

Phoebe (K), a case study. Phoebe usually worked quietly and with great concentration. Her printing of the house (see Figure 14) was typical of her style of working. She started at the lower left hand side with a red square and a blue triangle to form a house schema. Then she made a yellow and red house and completed the house pattern across the page. After finishing the bottom row she walked around the printing table and carefully collected smaller squares and triangles of the correct colours. Then she started at the upper left corner and carefully matched her schema to those below. Upon completing the upper row she found some rectangles for chimneys which were added to the houses. Last of all, she included the pattern of large and small circles at the base of her picture. This work shows a great deal of evidence of logical thinking. According to the checklist alone, Phoebe made representational items, matched elements one to one, ordered elements into classes, arranged elements into rows, ordered classes within classes, paired small to large, made equivalent sequences, used repetition of one and two items, and used symmetry. This was the only piece that Phoebe make during the printmaking II activity. She spent most of the class time working on it.

As in printmaking, Phoebe's work in clay was also representational (see Figure 25). Her first piece was called "a lady sitting on a chair", a piece which expressed that concept delightfully well. She also made several variations of dishes and, last of all, a piece which she named "a swimming pool full of people". Phoebe's imagery was well developed in her clay work. Unlike some other children of her age, she did not seem to find it necessary to repeat schema. Each piece was

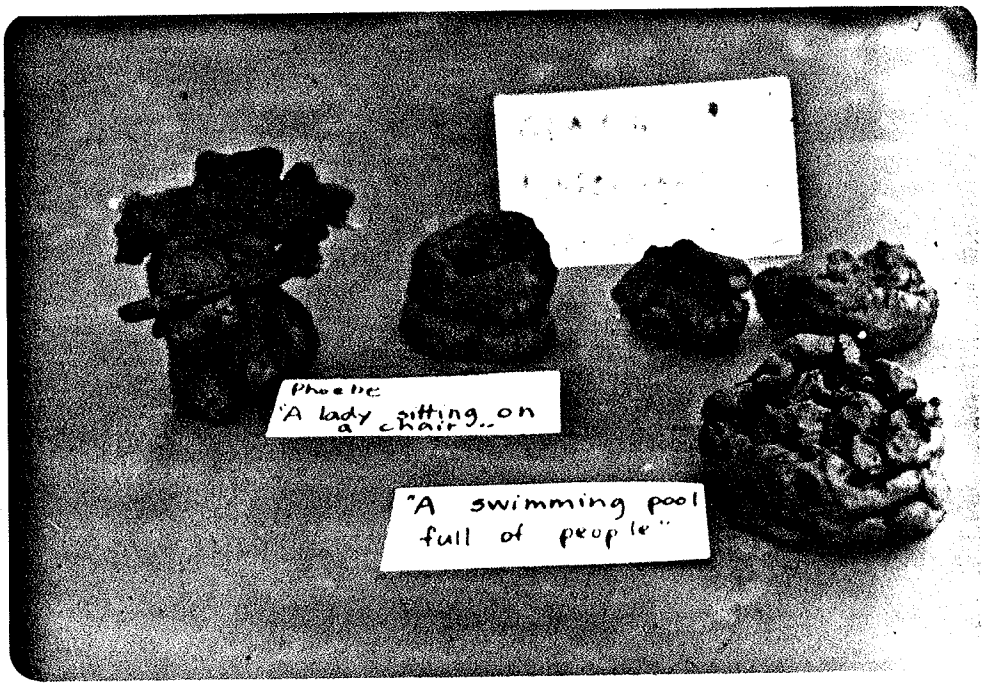

Figure 25

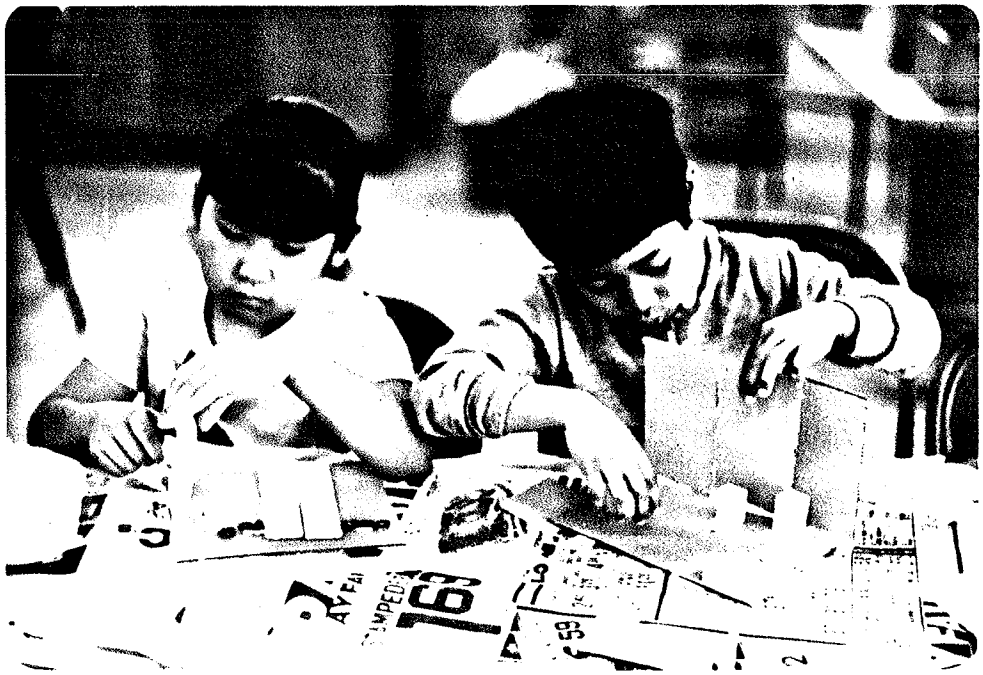

Figure 26

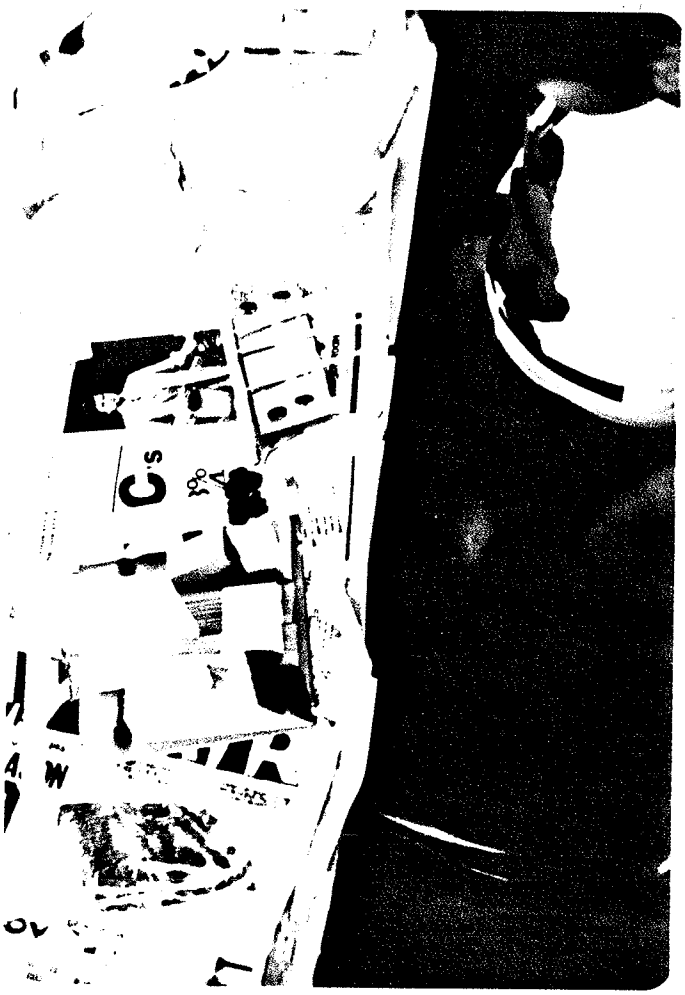

Figure 27

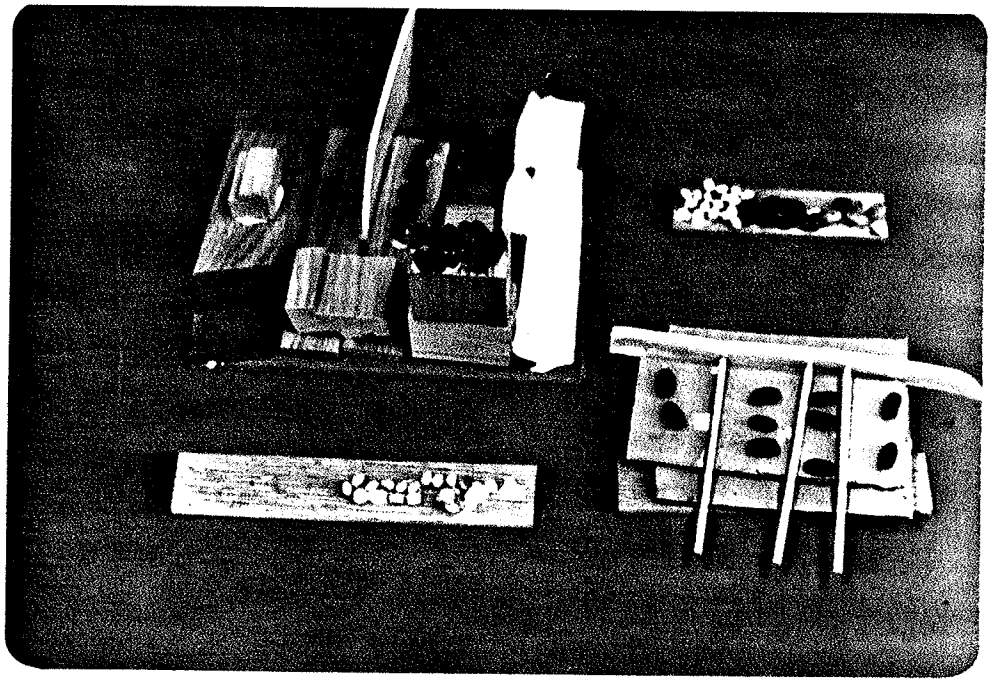

Figure 28

Figure 29

Figure 30

different.

In the sculpture II activity (see Figure 26), Phoebe spent quite a while arranging and rearranging items to create a base. She was finally satisfied when the items were arranged in perfect linear symmetry. She then proceeded to construct a sculpture which represented the interior of a house (see Figure 27). Again, her construction contained many examples of competency in logical thinking. After completing this piece to her satisfaction Phoebe quickly assembled three more small pieces (see Figures 28 and 29). The beans glued upon the slats showed evidence of classification skills. The last piece, two cardboard rectangles glued on top of each other with styrofoam, dowels and beans, showed use of repetitive pattern making and again, linear symmetry.

Phoebe always appeared to work quietly and intensely. Whenever the class time was up and it was clean-up time, Phoebe usually wanted to go on working, to complete her current piece. She worked steadily and alone, with little apparent influence from her peers. Phoebe's work was almost always representational. Each time she came to the art room she expressed different ideas in her work. Shortly after the study had been completed, Phoebe and a friend were working independently at the clay table. Phoebe had made about 15 flattened clay "pancakes". Each one had a beautiful star-like mandala design incised upon it. When asked what she was making, she looked rather astonished that someone could ask such a foolish question. "Cookies", she said.

Derrick (K), a case study. During the introductory printmaking activity (see Figures 30 and 31), when most children were involved with experimenting with colours, shapes, and tactile experiences, Derrick

carefully composed a well organised, ordered picture. Working from right to left he printed four vertical rows of squares. His entire print was in one colour and his primary interest seemed to be in seeing how the squares lined up. After completing the four vertical rows, he filled in the rest of the space on his page with other blue shapes.

During the second printmaking activity, exactly one month later, Derrick started out by printing a row of squares along the bottom of his page (see Figure 32). He soon discovered, however, that a small circle could be printed inside a big circle in rapid succession if he held the different circles in each hand. This innovation dominated the rest of his printmaking activities (see Figures 33 and 34). His prints consisted of rows of circles with a few squares added here and there for variety. Derrick seemed to be delighted with his prints. He worked at the printing table much longer than most of the other children.

The example of Derrick's work in the clay II activity (see Figure 35) shows a tightly organised piece. He made a mandala-like composition consisting of a flat circle with a fat "X" upon it. An equal number of holes were pressed into each arm of the "X", creating a design with point symmetry.

In the sculpture II activity, Derrick appeared to be again exploring the concept of symmetry. A great deal of effort and time went into gluing and balancing the upright stryofoam pieces (see Figure 36). After this was completed he sorted out and grouped beans onto the centre slat of his sculpture (see Figure 37). Not only did this represent classification skills, the order in which he placed the light and dark colours of beans also showed evidence of symmetry. The last touch, a

Figure 31

Figure 32

Figure 33

Figure 34

Figure 35

Figure 36

Figure 37

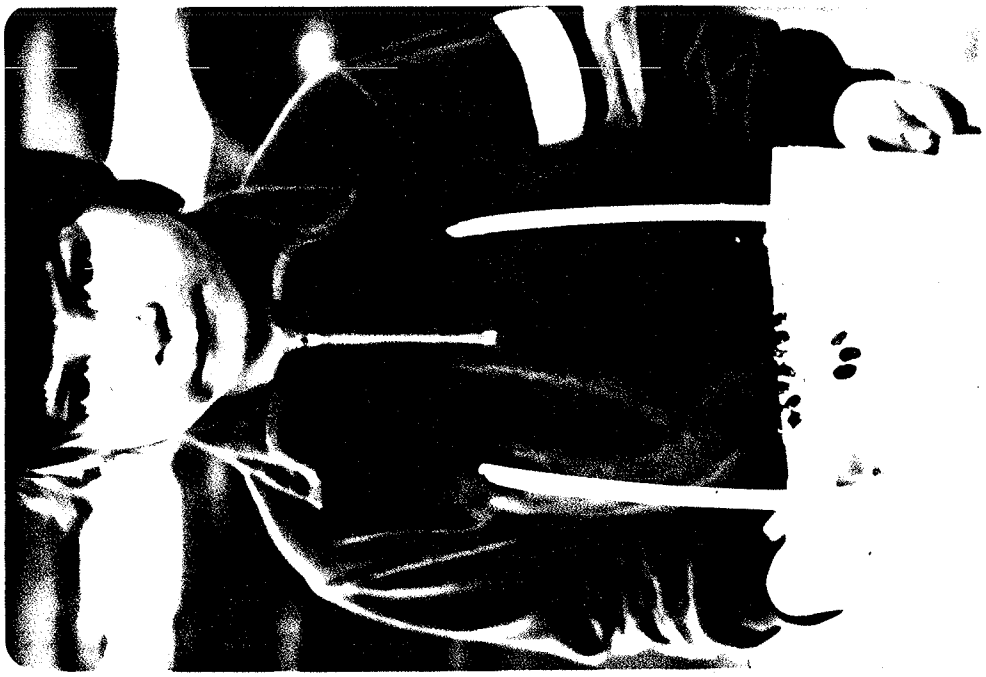

Figure 38

small block placed underneath with three dark beans on it, reinforced his symmetrical theme (see Figure 38).

In all the activities, Derrick seemed to concentrate on one or two concepts at a time and worked these out thoroughly. During the printmaking activities he chose to print with mainly blue squares and circles although many other colours and shapes were readily available to him. He also chose to wear the same blue art shirt both times. Again, many other shirts were available for his use. Perhaps Derrick felt a certain comfort in order and regularity. This definitely shows in his work. In sculpture, Derrick's primary concern appeared to be with symmetry. Everything he did was consistent with this concept.

Delanie (I), a case study. In the first printmaking activity (see Figure 39), Delanie appeared to be exploring the shapes of the printing blocks. To do this, she classified five different shapes into groups by printing them in vertical rows. Unsatisfied with the impression of the tape dispenser, she outlined the faint print with a crayon.

In printmaking II, Delanie was again working in rows (see Figure 40), this time exploring the patterns made through the repetition of two shapes. Each of her rows was different yet she lined them up so that the circles matched vertically. To do this, she had to select objects that were all the same size. This showed that she classified by size as well as by shape.

In the clay II activity Delanie became involved with symmetry (see Figures 41 and 42). Her first piece showed a closed symmetrical pattern. In her next piece she repeated this pattern and then extended it into a mandala-type design with perfect point symmetry (see

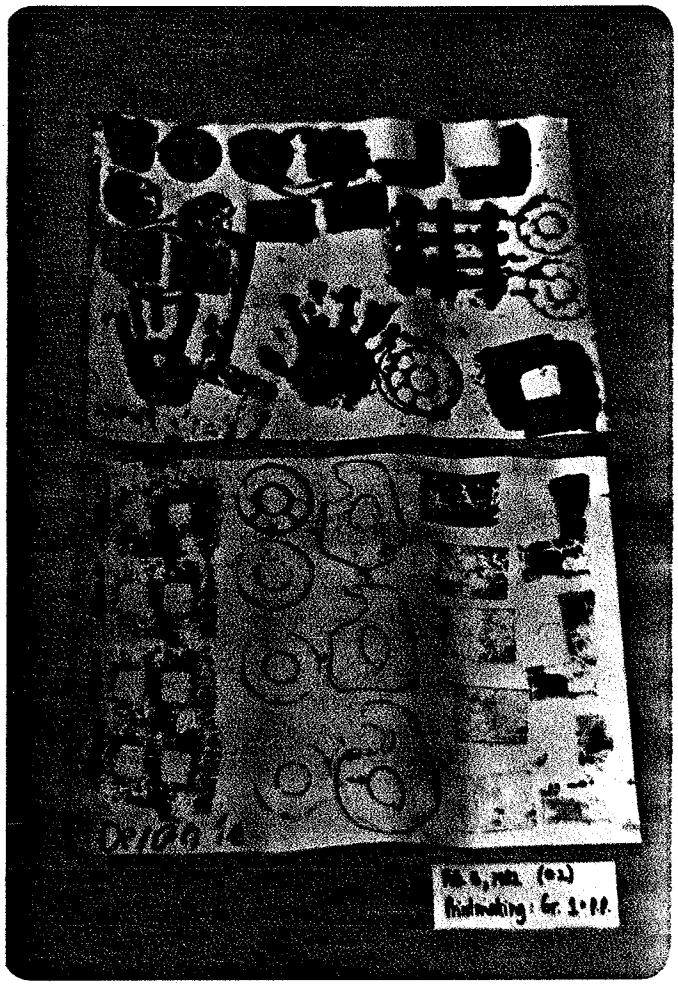

Figure 39

Figure 40

Figure 41

Figure 42

Figure 43

Figure 42).

Delanie's construction in the sculpture II activity was remarkable (see Figure 43). An elaborate structure, it contained examples of almost all the skills on the checklist. It was symmetrical front, back and side. It showed evidence of pattern making by repetition of two items, repetition of schema, and by repetition of large and small. Logical thinking was evident throughout this sculpture.

Delanie's work displayed a great deal of evidence of logical thinking and cognitive growth. She was able to explore different concepts and ideas in each activity. Unlike Phoebe, none of her work was representational. Perhaps she did not feel a need to work in this way as her drawing and schema development were already well advanced. Delanie may have felt more challenged by the more complex concepts of pattern and symmetry that she used in her work.

Case Study Conclusions. Examining the work of these three children led to some conclusions about the contributions art activities can make to a child's development of logical thought.

First of all, cognitive thought and development appeared to be an integral part of the activities. Logical concepts and ideas could be seen to evolve and develop in the children's work. This is clear in the examples of Derrick's work. In printmaking I, on February 17, Derrick showed a great interest in printing rows of squares (see Figure 30). This demonstrated use of basic classification skills. A month later, on March 18, he started a print with this concept again. Soon, however, he discovered a small and large circle schema (see Figures 33 and 34). The pairing of the circles showed basic seriation

skills. It is interesting to note that when he participated in the clay actitivity 10 days later on March 28, he further developed the circle concept, turning it into a symmetrical design (see Figure 35). On April 26 Derrick worked on a sculpture (See Figures 36, 37 and 38). This piece showed evidence of several logical concepts, classification and symmetry being the most obvious ones. Derrick's work from February 17 to April 26 showed definite cognitive growth. This researcher does not feel that this development was a mere coincidence. His efforts in the art activities over the weeks probably accounted for a great deal of his cognitive growth.

Children also worked with continuity and consistency in developing their own styles and images. This can be seen in both Phoebe's and Delanie's work. Phoebe, for example, was always concerned with making representational items whereas Delanie was usually involved with developing patterns and designs. Both girls put great detail into their art work. For example, Phoebe's printed houses all had chimneys. Her clay lady sitting on a chair had a frilly dress with puffy sleeves. Her swimming pool was full of people and her house arrangement was packed with furniture and other items. Delanie also embellished her work with detail. She usually started with a simple concept, such as the symmetrical design on her clay, and then added more and more designs that expanded upon the original concept. Derrick was also consistent in developing his own style and imagery. Like Delanie, his work was non-representational. Derrick's work showed careful organisation within one concept.

By examining individual examples of children's work, it appears that children often chose one or two simple concepts and then explored

these thoroughly in one piece. In Figure 34, Derrick concentrated on matching small to large. In Phoebe's house print (see Figure 14), she was expressing pattern and equivalent sequences. In Delanie's print (see Figure 40), pattern through repetition of two shapes was the focus. These three examples and many others show that art activities can satisfy a child's desire to focus on and experiment with specific logical concepts.

To sum up, three conclusions arise from these case studies. First, by examining Derrick's work, it is clear that children can grow and develop logically and cognitively in their art. Secondly, it is quite apparent that different children develop different styles of working. Each child intuitively chooses to work in a style best suited to his or her needs. Fortunately, art activites allow for this freedom. Last of all, it is obvious that children can use art activities to explore and examine specific logical concepts.

Weaknesses and Limitations of the Study

There were three weaknesses and limitations in this study. The first concerned the checklist and its inability to fully document all aspects of a child's behaviour and final product. The second weakness dealt with the limitations of the observations. Children were only observed during the actual art activities. Their behaviours and art products from other situations and activities were not taken into consideration. The last limitation came from the backgrounds of the children studied. Culturally, they were predominantly Native. Economically, they came from very needy homes. The group of children in the

study did not represent a true socio-economic cross-section of the general population.

The checklist had several drawbacks. For example, it was difficult to decide whether a child made random series or graphic collections. An observer could not always know whether a child had a system in mind while creating a print or a sculpture. What may have appeared to be random to an observer may, on the child's part, have been a systematic exploration of one or two qualities of the activity. According to Piagetian theory, a graphic collection is created when the child fails to consistently use a defining property or a clear rule to sort objects into different classes. If interpreted strictly, almost all child art would consist of graphic collections. However, many times children classified objects into groups and then added other objects, perhaps for aesthetic reasons. Because of these difficulties, the first two items on the checklist were inconsistently marked and therefore eventually dropped from the list.

Most classification skills were straightforward and could easily be observed. Two of the skills posed minor problems. Because enumerating and counting could be done very quietly by a child, many examples of this behaviour may have been missed. The last classification skill, ordering classes within classes, was also difficult to judge since it was impossible for an observer to be aware of all the criteria a child considered while sorting things out. For the same reason, two items on the seriation skills list were omitted. An observer had no way of consistently knowing whether a child seriated objects by trial and error or by preconception.

The last section of the checklist dealt with pattern. This section did not seem to have enough information on it to record the many interesting things the children were producing. "Repetition of schema" was added to the list and "uses symmetry across the whole page" was clarified by changing the skill to "uses point symmetry". Although the checklist was inadequate in places, it did facilitate the recording of data. Many things that could not be recorded on the checklists were fortunately captured in the many photographs taken during the various art activites.

The second weakness of the study concerned the limited nature of the observations. Children were not observed during other activities and in other situations. It was impossible to know whether logical concepts appeared in their art work before or after they appeared in other areas of their experience such as language, mathematics, or music. Because of this, sound conclusions could not be made regarding the influence of art on cognitive development in other areas.

The third limitation in this study was that the children all came from the same socio-economic background. This factor was beyond the control of the researcher and would have been a problem in almost any school chosen for a study such as this one. Culturally, 75% of the children came from Native backgrounds and the rest had a variety of ethnic origins. Culture can have a large influence on a child's attitudes and aptitudes towards areas of learning and expression. Art and pattern making are valued in Native cultures. This influence was not taken into consideration in this study. Another factor not considered was the fact that young children entering inner city schools such as the

one in this study are often academically behind their contemporaries entering suburban schools. It would be of great interest and value to carry out this study in another school with a different socio-economic profile.

The purpose of this study was to gather a body of descriptive data on the occurrence of logical concepts and skills in child art. Although the research did not uncover every aspect of the topic, it did cover enough to draw some interesting conclusions.

Chapter V

CONCLUSIONS

Three main conclusions have come from this study. The primary conclusion is that since logical thinking and cognitive growth do occur in child art, then art activities must help promote a child's logical development and cognitive growth. The second conclusion deals with the stage at which children use logical skills in their art. Logical skills are used in art activities at very early stages of the development of the skill. Art offers children a concrete testing ground to try out new cognitive concepts and ideas. The final conclusion concerns the suitability of clay as an excellent medium for young children. Clay work seems to encourage the use of logical skills and cognitive growth sooner than work in the other art media examined.

Art activities promote a child's logical development and cognitive growth. This conclusion deals with the question originally expressed at the outset of this study: is there a relationship between pattern in child art and the development of logical thought? It is concluded that children do use logical thinking and cognitive skills in their art. The practice and use of these skills in art must have a positive influence on a child's overall cognitive development.

Children were frequently observed working quietly and thoughtfully, lining things up, sorting things out, and arranging the elements of their compositions so that they were both aesthetically pleasing and logical. Children used systematic ways of their own invention to bring

order to their productions. They used skills of classification and seriation and created a large variety of simple to complex patterns. Many of the youngest children in the study expressed logical concepts in their behaviour and in their art productions.

According to Piagetian theory, children at the nursery, kindergarten, and grade one level are struggling to master basic logical skills at a concrete level. Droz and Rahmy (1976) write:

> One finds that children become capable of making simple and multiplicative seriations spontaneously at about age 7 or 8. This level of achievement is preceded, however, by more primitive behaviour patterns. Younger subjects, up to age 4 or 5, form pairs of one large and one small element, with no attempt at seriation. Later they form partial series, little series with no coordination between them. After a transitional phase, in which the child arrives at correct seriation through trial-and-error, the level of spontaneous success is finally reached. (p. 109)

It is interesting to note that in this study, many children younger than seven enjoyed using and expressing these concepts. Table 4.01 shows that 44% of the nursery youngsters could sequence three or more items in the clay activitiy. Figures 11 and 12 reinforce this. Perhaps art activities, with their rich opportunities for concrete manipulation and visual thinking, offer children early opportunities for the development of logical and cognitive skills. Piaget has pointed out that a child masters basic logical concepts visually before they can be understood mentally. Art activities such as those in Phase II of this study may well be amongst the best kinds of opportunities to encourage the early development of logical thinking.

That art can have a positive influence on a child's cognitive development is supported by Lavin and Silver (1979) in their study which

uses art activites to develop cognitive skills in handicapped children. They propose that children with language deficiencies can develop cognitive concepts through art. They do not feel that language is necessary for the development of logical thought since language follows, rather than precedes, logical thinking. Lavin and Silver designed art procedures to stimulate thinking, reasoning, and readiness for mathematics and language. Participation in these art activities greatly improved children's abilities to express various cognitive and logical concepts.

Rudolf Arnheim (1979) feels that order in child art depends on a basic understanding of the underlying structure in a child's world. This understanding may be intuitive or intellectual. In either case "genuine art work requires organisation which involves many, and perhaps all of the cognitive operations..." (p. 263). The fact that order and basic structure was evident in the child art examined in this study means that children used many cognitive operations. Arnheim's writings support the conclusion that art activities promote a child's logical development and cognitive growth.

Children use logical skills in art activities at early stages of the development of the skill. In this study, children seemed to be most interested and most inclined to use certain logical skills in art when they were challenged by the skills, when they were at the stage of trying to understand the skills, use, and master them. As children became more and more competent in the use of a certain skill, for example, arranging like objects into a row, they tended to become less and less interested in exploring it in their art work. Often, the younger

children were more interested in creating patterns and in practicing logical skills than were the older children. This became obvious when the research was carried out with the grade two group. Although they listened to the instructions and understood the objectives of the art actitivies, these older children were usually more interested in pursuing other avenues of art expression. Representation, colour blending, and planning a group mural directed their printmaking activities. In clay, the grade two children were much more interested in creating a community of clay houses than in making patterns. They appeared to be unchallenged and unmotivated by the opportunities for simple logical thinking available in the activities. They were therefore uninterested in pursuing them.

The fact that children like to work at levels that challenge them intellectually and creatively can also be seen in comparing the nursery and kindergarten scores in the clay column in Table 4.01. The nursery children scored much higher than kindergarten children in all the classification skills and in all but one of the seriation skills. They scored lower, however, in making representational items. The more children became involved in creating representational items, the less they seemed to be interested in the pattern activities. Representation and schema development probably offered a greater challenge and were of more interest to the kindergarten children while the youngsters in nursery felt sufficiently motivated to play with logical concepts in their art work. Art activities may well be a testing ground where children try out new ideas and concepts. Art is a low-risk area where children of all ages can explore and play with new concepts, cognitive and otherwise.

Then, after mastering different skills and concepts, children seem to loose interest in depicting them in their art work. They become much more concerned with exploring newer ideas.

Skills and ideas, therefore, surface in a child's art work when the ideas are new and exciting. In this study, various logical skills were apparent in the work of very young children. Art seems to be a way, for the child, of expressing and confirming the early discovery of new skills and concepts.

Clay is a medium which encourages early use of logical skills and cognitive growth. The last conclusion to this study deals with the nature of clay as an appropriate medium for intellectual and artistic expression. Children progressed sooner and used more advanced cognitive skills in clay than in the other media examined. Clay appears to be an excellent medium for the early development of cognitive and logical skills. A child's perception and understanding seems to be sharper and more accurate in clay than in other art media.

Clay is an immediate material. It responds readily to a child's manipulations. For many young children, it is one of the first art media through which they can make articulate statements and explore logical concepts. Because children experience the clay medium in both a visual and tactile sense, their perceptions of their productions in clay are probably greater than in media which are primarily visual. On Table 4.01 in the clay column, 44% of the nursery children could seriate three or more items. This was a much higher percentage than nursery children scored in other media. Seriation seemed to be easiest for the young children when they had control over the shaping of the

objects to be ordered. Their perceptions of the qualities of an object were quite accurate when they produced the object themselves. None of the nursery or kindergarten children showed evidence of being able to seriate the wooden slats in the sculpture activity. Only by grade one were children finally interested in this.

According to Piagetian theory (Droz and Rahmy, 1976), children from ages two to five usually cannot form a systematic ordering of objects although they can sometimes order a few of them. By examining the data on Table 4.01, this theory does not appear to be entirely correct. Young children can form systematic orderings. There are some possible explanations for the discrepancies between Piagetian theory and the present data. First of all, Piaget's test cases may not have been motivated to succeed at the tasks presented them. Art, on the other hand, is usually an excellent motivator. Almost all young children appear to enjoy art activities. The fact that the activities in this study were presented as art activities and not as test situations may have made an important difference. A second explanation deals with perception. Piaget's testing was carried out with objects such as sticks and dolls. A child's perception of a clay shape that he or she has created is probably much more accurate than that of an external object, such as a stick.

Arnheim and De Bono state that perception is understanding and that pattern in child art is based on the structure and pattern of a child's perception and understanding. Since many skills appear earlier in clay work than in other media, it is safe to assume that a child's perception and understanding are sharper in clay than in other media.

Clay may be the best art medium to encourage the early development of cognitive skills.

The three conclusions drawn from this study reinforce ideas promoted by prominent educators in art and in educational psychology. The conclusions also present some new ideas which can be exciting areas for further study. The first conclusion is that art does help promote the development of logical thought and cognitive growth. This is a conclusion that is supported by the writings of Eisner, Arnheim, De Bono, and others. The second conclusion concerns the stages of development at which children are most inclined to use logical concepts in art. Children use these skills when they are most challenged by them. Art may be a sort of testing ground for new ideas and concepts. This conclusion is an interesting one and offers potential for future study. The third and last conclusion deals with the value of clay work in a child's early years. Clay seems to be the best art medium for the early development of logical skills. This conclusion is partially explained and supported by theories on perception and understanding by Arnheim and De Bono. It too is an area which would be of great interest for future study.

Implications for Teachers

The conclusions of this study have implications for art specialists, classroom teachers, and educational administrators who deal with early childhood and elementary education. They must be aware of the potential that art has for the development of logical and cognitive growth. Teachers must offer children ample opportunities to become involved in art activities, both to foster artistic growth

and to encourage the development of cognitive skills. Teachers must also plan art activities which are challenging to the children. Activites can be planned and organised in such a way that they promote the development of logical thinking. Finally, teachers must be aware of the merits of the various art media. Different materials offer youngsters different opportunities for skill development and growth.

The first conclusion with implications for teachers is that art can help children develop cognitive and logical abilities. They can explore and practice many logical skills and lay a secure base for immediate and future stages in the development of logical thought. Art may not be the only medium through which children can develop these valuable skills but it may well be the most enjoyable and possibly the most effective one. Most children tackle art activities with zest and enthusiasm. They appear to derive a great deal of satisfaction and pleasure from their work and are frequently motivated to work at art activities for great lengths of time.

Teachers can take advantage of this natural enthusiasm by planning art centres or art activities which offer children opportunities for both artistic expression and cognitive growth. Lessons such as those carried out in this study are examples. Teachers should have an understanding of the development of a child's thinking and should be aware of both cognitive and artistic objectives for the art activities. Lessons can be planned and structured so that children have opportunities for growth and development in both areas.

In "Classification: Something to Think About", Isenberg and Jacobs (1981) encourage teachers to consider thinking as a basic skill

and to plan for activities which encourage its development:

> Teachers at all levels must acquire a fundamental understanding of the development of children's thinking. It is helpful to remember that thinking is a mental process that involves forming patterns; creating mental images; and drawing relationships among people, things and events. It involves the integration of such mental processes as observation, naming, classification, seriation, and problem-solving. The coordination of these mental processes is the essence of thinking. The development of thinking skills must actively involve the individual as it forms the foundation of the educational program. A major vehicle for the development of children's thinking is that of firsthand experience with classification activities. (p. 284)

These authors promote activities with a variety of concrete materials. Through hands-on experiences with the various materials, children are able to refine their thinking skills by trial and error, observation, and making inferences. Concrete materials help children think about what they are doing. Many art activities can be organised to put such ideas into action. Teachers must realise that art has great potential for the development of a child's thinking and cognitive growth.

The second conclusion also has implications for teachers. This conclusion proposes that children use cognitive skills in art when these skills are challenging to them, at early stages of the development of the skill. Teachers must be aware of this and offer children activities which challenge their thinking processes. Activities must offer children opportunities for boundary pushing. They must challenge their artistic and cognitive skills. Too often, in today's programs, art activities do not do this. Young children are frequently exposed to overly structured, poorly designed projects where they learn to follow a teacher's step-by-step instructions to produce a predetermined end

product. Teachers must realise that an end product is not nearly as important as the thought, skill development, creativity, and expression that can and should be a part of every art activity. Teachers should plan art activities which challenge youngsters with opportunities for both artistic and cognitive growth.

The third conclusion deals with the suitability of clay for the early development of skills. Teachers must be aware of various art media and should offer children materials appropriate to different educational objectives. For example, printmaking seems to be a suitable activity for the development of pattern with kindergarten and grade one children whereas clay is not appropriate. Children seem to progress earlier in clay than in other media. Clay is a good activity for the early development of classification and seriation skills in nursery children.

Teachers should not only be aware of the educational objectives and opportunities of various art activities, they should also become familiar with the correct use and maintenance of basic art materials. This means that every teacher in the elementary area should have a basic knowledge of art education theory and practice.

In short, implications for teachers are three-fold. First of all, they should realise that there is a strong relationship between art and logical and cognitive growth. Art activities should be planned with both artistic and cognitive objectives in mind. Secondly, teachers should be aware of a child's stages of development in cognition and in art. They must be able to recognise which art activities are appropriate for different levels of development. The third implication

deals with clay and the nature of different media. Teachers should have an understanding of the use and application of various basic art media.

The conclusions that have been outlined and their implications for teachers can play a significant role in establishing the value of art in education. Rudolf Arnheim (1979) writes that:

> Once it is recognized that productive thinking in any area of cognition is perceptual thinking, the central function of art in general education will become evident. The most effective training of perceptual thinking can be offered in the art studio. (p. 296)

Teachers can help children learn how to think through art. Once teachers and administrators are aware of this, relevant art activities can be planned and carried out. Art can become a cornerstone of a young child's logical and cognitive growth.

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APPENDIX A

LESSON PLANS

PHASE 1

Sculpture 1: Assemblage.

Objectives

The children shall - -

1. develop visual and tactile awareness of form and texture in three-dimensional shapes
2. develop skills in attaching materials to each other
3. acquire an understanding of simple sculptural concepts
4. select and use materials through which to explore shema development and self-expression

Focus

1. Sculpture is three dimensional, it can be seen from all sides
2. Sculptures can be made many ways. A material like clay can be modelled. Other materials can be carved. Sculptures can also be assembled from a variety of materials
3. Materials for sculptural assemblage can be examined visually from many different angles. Their surfaces can have a variety of textures. Many methods can be used to attach the materials to each other: gluing, poking, nailing, balancing, tying, taping, imbedding, etc.
4. Sculptures can express feelings and ideas

Process

Have the children - -

1. manipulate and talk about their visual and tactile perceptions of

the available materials

2. brainstorm for ways of putting the materials together. Observe as the teacher demonstrates some of the methods
3. view and discuss slides of sculptures
4. find a spot to work. Gather supplies and materials from a central area. Start assembling a sculpture
5. request help when wanted
6. discuss finished sculptures with teacher and peers
7. clean up

Materials and Equipment

small and large wood scraps, craft sticks, toothpicks, small wooden dowels

styrofoam: packing chips, flat pieces

bristol board, cardboard

white and black beans

glue, tape, wire, string, nails, scissors, hammers

paints and brushes.

Time Allotment

20 mins. - introduction and slides

40 - 60 mins. - working time

10 mins. - clean up time

Resources

slides and slide projector

Karl Appel - Man with Moving Ears, Head on a Chair, Man with a Flower, Tulip, Mouse on a Table, Flying Fish

Joan Miro - Oiseau Solaire, Oiseau Lunaire, Jeune Fille s'Evadant, La Caresse d'un Oiseau, Femme Assise et Enfant, Personnage, Project pour un Monument

Pablo Picasso - Baboon and Young

Printmaking I: Using Found Objects and Small Printing Blocks

Objectives

The children shall - -

1. develop skills in inking and printing small printmaking blocks and found objects
2. select and use colours and shapes for their own compositions
3. perceive the relationship between a block and its print

Focus

1. Printmaking is the process of transferring an image from one surface to another surface. Printmaking can make us more aware of the shapes and textures in the environment
2. Simple shapes and colours can be combined and repeated to create expressive and unique compositions

Process

Have the children - -

1. offer information about printmaking. Listen as the teacher adds to this information
2. observe the teacher demonstrate the use of the printing utensils and ink

3. help set up the printing centres
4. experiment with the process. Place their compositions in a safe place to dry.
5. discuss, with teacher and peers, the problems and successes encountered in manipulating the materials. Discuss the imagery in the compositions
6. print more compositions
7. clean up

Materials and Equipment

Found objects, printing blocks, ink and trays, rollers and brushes, paper

Time Allotment

10 mins. - introduction and discussion

40 mins. - working time

10 mins. - clean up

Clay I: Introductory Session

Objectives

The children shall - -

1. become familiar with the origins of clay
2. discover the visual and tactile qualities of clay
3. explore and develop skills in manipulating clay

Focus

1. Clay comes from the ground. It is a common and natural material. Its look, feel, and smell are earthy
2. Clay can hold water. When moist, clay is soft and can be shaped by hand. When it dries, clay hardens. Dry clay can be made permanent

through firing in a kiln

3. Many things are made with clay. Clay can be shaped and manipulated in many ways: pounding, squeezing, pinching, coiling, rolling, cutting, combining or impressing

Process

Have the children - -

1. brainstorm for things about clay. Listen as the teacher adds to the information
2. observe as teacher manipulates clay
3. explore ways of manipulating clay. Experiment with a variety of clay tools. Talk about own work
4. decide whether they would like to be shown another way of working with clay. If so, the teacher demonstrates a method not yet used (eg. coil, slab)
5. decide whether they would like items fired. If so, choose pieces and place on a drying shelf
6. clean up. Store unused clay

Materials and Equipment

Hard clay, soft clay, and slip clay for demonstration

modelling clay, clay tools

canvas or newspaper cover for tables

kiln (optional)

Time allotment

10 mins. - introduction

30 mins. - working time

5 mins. - clean up

Sculpture II: Pattern

Objectives

The children shall - -

1. observe ways of manipulating sculptural materials that express concepts of repetition, pattern, classification, seriation, and symmetry
2. have an opportunity to express these concepts in a concrete format
3. have an opportunity to make whatever they wish with the materials

Focus

1. Opportunities for classification, seriation, and pattern making are abundant when children use three dimensional materials
2. Classification is evident when children
   - sort materials into groups
   - line like objects into rows
   - pair like objects together
   - enumerate or count like objects
3. Seriation is evident when children
   - match small to large objects
   - match small to large schema
   - sequence or order three or more items
4. Pattern is evident when children
   - repeat an item in an orderly fashion
   - repeat two or more items in an alternating pattern

5. Symmetry is evident when children

   - arrange objects equally on either side of sides of a real or imaginary point

Process

Have the children - -

1. observe a teacher demonstration of how the materials can be arranged to express the logical concepts mentioned in the focus
2. use the materials to make whatever they wish. Make as many or as few sculptures as desired. Sculptures can be painted

Materials and Equipment

a large assortment of wooden blocks (obtained from a sash and door company) in five or six basic shapes, wooden slats of lengths varying from 7 to 30 centimetres, toothpicks, four inch wooden skewers, six inch wooden skewers

styrofoam strips of 2 X 30 cms.

white, beige, dark brown, and black beans

cardboard squares for bases

white glue, liquid tempera, paints, and brushes

Time Allotment

10 mins. - introduction

50 mins. - working time

10 mins. - clean up

<u>Printmaking II: Pattern</u>

Objectives

The children shall - -

1. observe the teacher demonstrate ways of using classification, seriation, and pattern in printmaking
2. identify and describe visual patterns that show these concepts
3. express their understanding of these concepts in making prints
4. refine printmaking skills

Focus

1. Classification involves the concept of a collection of things that have something in common. In printmaking this can be seen when children
   - match shapes or colours
   - arrange similar items into rows
   - arrange items into groups or classes
   - enumerate or count items
   - arrange classes within classes
2. Seriation is the ordering of a collection of objects into a sequence. Sequential order can be based on many factors: small to large (size), light to heavy (weight), bright to dull, light to dark (colour), and smooth to rough (texture). In printmaking, seriation can be seen in
   - matching small to large shapes
   - sequencing three or more like shapes from small to large
   - sequencing by trial and error
   - sequencing by precognition
   - equivalent orderings. eg: a sequence of small to large squares matched to a sequence of small to large circles
3. Patterns are created whenever units are grouped in ordered ways.

Some patterns that children make in printmaking are

- random and/or ordered repetition of a shape or colour
- repetition of two or more shapes into an open pattern.
  eg: XOYXOYXOY...
- repetition of two or more shapes into a closed, symmetrical pattern. eg: HOOXOOH
- full page symmetrical compositions. eg: mandala patterns, line symmetry

Process

Have the children - -

1. observe a demonstration of how printmaking can be used to make patterns and designs which use the concepts of classification, seriation and pattern
2. describe and/or discuss the examples. Put them away
3. print own pictues and/or designs. Make as many as they wish
4. if time allows, make a painting at the painting centre
5. clean up

Materials and Equipment

styrofoam printing blocks in five sizes of each of the following shapes: square, rectangle, triangle, and circle

printing ink and trays, paper

Time Allotment

10 mins. - introduction

30 mins. - working time

10 mins. - clean up

Clay II: Pattern

Objectives

The children shall - -

1. observe ways of manipulating and shaping clay into forms that show repetition, seriation, and pattern
2. identify and describe these logical elements in examples of clay modelling
3. have an opportunity to express their understanding of these concepts in a concrete three - dimensional format
4. refine skills in clay modelling

Focus

1. Repetition of a unit is basic to the creation of pattern. Repetition is evident in clay work when
   - basic units are created in quantity. They may or may not be arranged in a regular fashion. eg: a pile of "cookies"
   - children invent and repeat a schema in clay. eg: a symbol for an "airplane"
   - basic units are formed and then combined to create an object. eg: coil pot
2. Seriation is the ordering of a collection of objects into a sequence. It is evident in clay work in
   - matching small with large objects
   - making and lining up small to large versions of an object. eg: little clay balls, medium sized clay balls, large clay balls
3. Patterns are created when units are combined in ordered ways. Pattern can be seen in clay work in

- repetition of units of construction. eg: bricks for a toy house
- repetition of one or more shapes or units
- surface decoration on clay objects

Process

Have the children - -

1. observe a demonstration of how clay can be used to express the principles of repetition, pattern and seriation
2. describe and/or discuss the examples. Put them away
3. use clay to make anything they wish

Materials and Equipment

clay, clay tools

Time Allotment

10 mins. - introduction

45 mins. - working time

5 mins. - clean up

APPENDIX B

DATA COLLECTION DEVICES

SKILLS CHECKLIST

Activity:_____#: _____Date:_____

Observed in:

_____Behaviour

_____Final Product

CHILD'S NAME:

CHECKLIST:							
The child: - makes random series							
- makes graphic collections							
- makes representational items							
CLASSIFICATION - matches elements 1 to 1							
- orders elements into classes							
- enumerates and/or counts							
- orders classes within classes							
SERIATION - pairs small to large							
- sequences 3 or more items							
- sequences by trial and error							
- sequences by preconception							
- makes equivalent sequences							
PATTERN - uses repetition: 1 item							
- uses repetition: 2 or more items							
- uses linear symmetry							
- uses point symmetry							
- makes mandala patterns							

RECORD OF ACTIVITY

Activity: _____ # _____ Date: _____

Students, Rm# _____ Level _____

_____ _____ _____ _____

_____ _____ _____ _____

_____ _____ _____ _____

_____ _____ _____ _____

Divergence from Lesson Plan:

objectives _____

focus _____

activity _____

materials _____

working time _____

evaluation of objectives _____

Notes:	
Child's name	Observation

ANECDOTAL NOTES

Activity: _____ #: _____ Date: _____

Anecdotal Notes:

Child's name	Observation