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RELATIONSHIPS BETWEEN SELECTED DIMENSIONS OF WRITING AND DRAWING IN FIRST GRADE CHILDREN'S COMPOSITIONS

The Ohio State University

Ph.D. 1982

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RELATIONSHIPS BETWEEN SELECTED DIMENSIONS OF
WRITING AND DRAWING IN FIRST GRADE CHILDREN'S COMPOSITIONS

DISSERTATION

Presented in Partial Fulfillment of the Requirements
for the Degree Doctor of Philosophy in the
Graduate School of The Ohio State University

By
ViLora Lyn Zalusky, B.A., M.A.

* * * * *

The Ohio State University
1982

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Advisor,
Department of Humanities
Education
This work is dedicated to
my mother and father for their
constant love, support, and guidance.
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CHAPTER I

INTRODUCTION

Writing and Drawing

Any written production is comprised of actual letters and words as well as the way in which those words are combined into units to compose a message. Thus two primary elements of any written product are the actual orthographic features of the print, and the formation of the message to be communicated. Similarly, a drawing is comprised of the actual graphic features of the drawing as well as the way in which those features are combined to express and communicate. When mastering either symbolic code, young children must simultaneously cope with these forms and functions of writing or drawing.

In beginning stages of literacy, young children do not differentiate between writing and drawing in their productions. Oftentimes, drawings have within them strings of letters which do not yet exist as written text separate from the drawing (Clay, 1975, p. 49). However, it has been shown that children as young as three years of age do differentiate between writing and drawing in that they utilize arm movements for each (Harste, Burke and Woodward, 1981). Specific arm movements were not identifiable by Harste et al. as particular to writing or drawing, however, "whatever predominant movement the child has selected as representing writing, an alternative movement was selected to represent drawing" (p. 128). Between the ages of five and seven, children begin to differentiate between these two modes in their productions. For example the text occupies its own space on the page in a distinct area separate from the drawing. Also characteristic of
children at this stage is that they have mastered the concept that graphic information, both print and non-print, carries and communicates a message. Ives (1981, 1982) has shown that young children can distinguish between drawings on the basis of literal and expressive qualities, even though these qualities are not present in children's drawings until around age ten. Similarly, for writing Clay notes, "One early and easy concept is that signs carry messages. The child demonstrates an understanding of this when he produces signs you cannot interpret and expects you to read them" (Clay, 1977, p. 337). Children at this stage then, differentiate between writing and drawing, and use both of these modes symbolically. "Certainly by the time of school there is no confusion on the part of a normal child between the realms of writing and drawing, and there is considerable understanding of the nature of the graphic code" (Gardner, 1980, p. 155).

Observations of children as they write reveal that they frequently draw prior to and/or during text production (Zalusky, 1982). "In primary grades, writing is very often undertaken in conjunction with drawing (Graves, 1975; Gundlach and Moses, 1976). Indeed, Graves suggests that for some of the seven-year-olds in his study, drawing was a necessary prelude to writing (Graves, 1975, p. 236)" (Gundlach, 1981, p. 146). Further, Marie Clay observed parallels of her repetition principle occurring about the same time in children's drawings. And, patterns of sequencing and direction in drawing simple figures have been shown to be related to directionality of script production in writing (Goodnow, 1977, p. 86).
Observations such as these have led to claims that writing and drawing are functionally related in children. Vygotsky (1978) states that "make-believe play, drawing, and writing can be viewed as different moments in an essentially unified process of development of written language" (p. 116).

In fact, Vygotsky regards the child's first marks on paper developmentally as recorded gestures rather than as drawing in the true sense of the word.... These marks on the paper go through a series of evolutionary change, from undifferentiated marks through indicator signs and symbolizing marks and scribbles to the drawing of little figures and pictures to the moment when the child realizes that one can draw not only things but speech. This recognition makes possible the transformation of writing from a first-order symbolic act, to a second-order symbolic act, from the mnemotechnic stage to the stage where one can deal with disembodied signs and symbols—to the stage, that is, of symbolic maturity (Emig, 1981, p. 23).

Similarly, Robert Gundlach says, "...in the experience of children, the writing process may be related in function, at least, to other activities in which children use representational symbols, such as drawing, sculpting, drama, and other forms of symbolic play" (Gundlach, 1981, p. 146).

While hypotheses relating children's writings and drawings have been posited, the nature and possible components of such a relationship have gone unexplored. Therefore the purpose of this investigation was to statistically determine the nature of this relationship and explore its components using five rating systems developed to assess salient features of children's text and drawing productions.
Statement of the Problem

Early in life children express themselves through the symbolic modes of written language and graphic representation. Soon after the onset of these symbolic productions, children show a general understanding that both print and pictures carry a message (Clay, 1975). By three years of age, children differentiate between writing and drawing in their own production processes (Harste, Burke, and Woodward, 1981). However, children during the early school years, when creating, expressing and producing messages, seem to freely generalize across these two symbolic modes utilizing both in their production (Zaluský, 1982), suggesting that a relationship may exist between children's writing and drawing. Thus it was the purpose of this study to determine the nature and extent of relationships between writing and drawing in children's productions and to explore the strength and possible components of such an association.

Relationships were expected to exist among the following five rating scales used to assess salient features of writing and drawing components:

- **letter production**—ratings of orthographic discrimination of upper and lower case letters;
- **concept of message**—a rating of the relationship of written text to combinations of letters used to represent the message in that text; and
- **cohesive harmony index**—a measure of text coherence.
Drawing factors investigated were:

- *elaboration*—ratings of the degree of graphic explicitness used to portray subject matter; and

- *placement*—ratings of the overall organization of symbols in the composition.

**Overview of the Study**

First-grade, middle-class subjects were asked to produce a story on a topic of their choice. Blank storybooks were provided for 27 students who comprised the sample for this study and each child produced at least half of a completed storybook. These books consist of pictures and text that were completed over a two and a half month time period. Storybooks were produced in an informal classroom and children worked on them whenever and for whatever length of time was necessary to complete the task. Children were accustomed to producing their own written texts and drawings with little or no supervision.

Storybooks were subsequently rated using five scales to describe writing and drawing. To determine the nature of the association between writing and drawing, the strength of this association, and possible components of this association as defined by the rating scales scores were compared using a canonical analysis. For the canonical analysis, the five rating scales were divided into two subsets of factors—one to represent the writing scales and one to represent the drawing scales. A $3 \times 2$ symmetrical canonical was performed with neither set of factors serving as a dependent or predicted variable set. In addition, structure coefficients and redundancy measures were generated to provide estimates of the
composition of the significant canonical root. Finally, examples from
the data were provided to illustrate relationships which were found
between children's writing and drawing productions.

Significance

While symbolic functioning has been explored, (Langer, 1958, 1973;
Olson and Bialystok, 1980; Piaget and Inhelder, 1956; Smith and
Franklin, 1979; Werner and Kaplin, 1963), the specific domains of symbol
systems and the interactive nature between these symbol systems has not.
For instance, specific properties of one symbol system under certain
circumstances may be shared by another symbol system—as in the case of
writing and drawing. Ives and Rovet (1979) point out that drawing,
because it is a two-dimensional and static medium, utilizes different
communicative devices than language. Writing, usually considered in the
"same" symbol system as language, may be a case however when language
is used more like the medium of drawing than like oral language, since
in this particular instance writing is a two-dimensional medium.

Further, cross-media comparisons that specifically address pro-
properties which may be shared by writing and drawing in children are
rare, if not nonexistent. In light of observations concerning possible
links of children's drawings and writings made by researchers such as
Clay (1975), Goodnow (1977), Harste, Burke and Woodward (1981), Ives
(1981, 1982), and Zalusky (1982, in press), it is clear that research
is necessary to explore similarities and differences between these two
symbolic modes in children. The purpose of this research study, then,
was to explore relationships between writing and drawing in children's
productions and to shed light on the following questions:

(1) To what extent does children's use of written language differ from their productions in drawings?

(2) To what extent does children's use of written language overlap and share properties with their productions in drawings?

Scope and Limitations of the Study

The purpose of this study was to investigate relationships between writing and drawing in children's productions. This type of cross-modal investigation was exploratory in nature and its results were subject to the following limitations.

(1) The data collected in this study were composed of storybook productions of first-grade children. Storybooks comprise a particular genre which is usually composed of both written text and pictures. Therefore results demonstrating relationships between writing and drawing in these productions pertain only to this genre.

(2) A general concern with a study of this nature, which seeks to compare two different symbolic modes, is an "apples and oranges" issue. Direct comparisons cannot be made across the five rating scales. Each rating scale seeks to represent some particular attribute of the symbolic code with which it is associated. Therefore, attempts to interpret drawings using the writing scales, and vice versa, would be misleading.

(3) Because this study was cross-sectional and only focused on one point of children's development, relationships found between writing and drawing cannot be generalized to any other developmental period.
Because the sample used in this study was not randomly selected from a population of first grade children, it is not possible to generalize the results of this study beyond the sample.

Organization of the Study

Literature relating to research in writing and drawing is reviewed in Chapter Two. Procedures of the study are presented in Chapter Three and Chapter Four presents the results of the study. Chapter Five provides an illustration of the results using samples from the data, offers a summary of the study, interprets the results and gives implications of the study for future research.
CHAPTER II
REVIEW OF LITERATURE

Introduction

The purpose of this chapter is to provide an overview of the research literature relating to children's writing and children's drawing by addressing salient aspects of the two questions posed at the conclusion of Chapter One. These two questions concerning differences and similarities between children's graphic and written language comprise the two main sections of this chapter. By exploring the nature of differences and similarities between these two symbolic modes, the relationships found in this present study between children's writings and drawings can be partially explained.

The first section of this chapter gives definitions of symbols and symbol systems and provides an overview of the research which highlights differences between various symbol systems. Following this section, research which lends support to claims that relationships exist between these symbol systems is provided.

Differences Between Writing and Drawing

To consider differences between writing and drawing, it is important to view each as a distinct symbolic mode housed within a distinct symbol system. Gardner used the following definitions of symbol and symbol system to highlight differences between the symbol systems.
(1) For present purposes, it may suffice to speak of a symbol as an element—usually a physical mark but one which (like a word) can also be an (abstract) conception: for individuals within a given culture, symbols carry meanings of one or another sort, and can generally enter into meaningful relationships with other elements from the same class, thereby constituting a symbol system (Gardner, 1979, p. 77).

(2) ... a symbol system is a set of elements which have certain syntactic relations among themselves and which relate in specifiable ways to a field of reference. Such a system may be relatively linguistic (digital) or relatively nonlinguistic (analog), depending on the extent to which its individual elements are disjointed and the manner in which they are mapped onto a field of reference (Gardner, 1977, p. 90).

Gardner pointed out that symbol systems differ from one another by: (1) what they encode; (2) what they typically express; (3) what features they highlight; and, (4) in their notationality. Because of these qualitative differences, it cannot be assumed that information is perceived in identical ways across symbol systems, "... it may well be that each symbol system has its properties and limitations which preclude preservation of identity of meaning across an 'intersymbolic' translation" (Gardner, 1977, p. 79). Although symbol systems are intertranslatable, they are still nonequivalent (Olson, 1973). However, the specific domains of symbol systems and the interactive nature between symbol systems has yet to be adequately explored.

Others (Ives and Gardner, 1979; Ives and Rovet, 1979) have argued that each medium of communication contains unique characteristics inherent to that medium, used to convey specific information.
For instance, research in linguistics has documented many inherent properties of language and has shown how these properties shape linguistic communication (Halliday, 1976; Olson, 1977). Likewise, Golomb (1973) demonstrated this point by comparing children's drawings with their clay modeling tasks.

Golomb noted that many researchers have provided descriptive evidence of certain schematic features which seem to occur universally in children's drawings during the early stages of development (for instance: Gardner, 1980; Kellogg, 1970, 1979; Lowenfeld, 1947; and Schaefer-Simmel, 1948). Further, psychologists have attempted to characterize these schematic features and identify developmental norms. Perhaps the most widely known of these attempts is the Draw-a-Man Test devised by Florence Goodenough (1926) and its popularized revision, Draw-a-Person Test (Harris, 1963). "The published correlations between the Goodenough Draw-a-Man Test and other intelligence tests have ranged from the low twenties to the seventies" (Golomb, 1973, p. 200). The assumption underlying the Goodenough test is that children draw what they know. This assumption is premised on an associationist theory which posits a correspondence between children's thought, language and drawings (Golomb, 1973).

Golomb (1973) points out that a similar position is taken by Piaget. "According to Piaget the child draws what he knows rather than what he sees, and is not aware of this distinction. The child sees only what he knows and what he anticipates, so that
his vision is distorted by his ideas" (p. 201). Like Goodenough, 
Piaget is concerned with children's drawings as replications of 
some internalized schemata or representation of knowledge. To 
the extent that features or some parts of a drawing of a person 
is left out, an indication or measure of children's deficiencies 
are obtained since these drawings are viewed relative to later 
developments occurring in drawing. Summarizing this perspective, 
Golomb states that, "... the early drawings seem like faulty 
imitations, lacking essential attributes of the object, and 
appear deficient in the spatial arrangements of the parts. The 
imperfect drawings are related to the child's immature reasoning 
processes" (p. 202).

Differing radically from this perspective is the theory of 
Rudolf Arnheim. Emphasizing the importance of visual perception, 
Arnheim (1974) points out that children may not be able to re-
produce technically what they visually perceive. This could 
account for why children do not conform to realistic appearances 
relating to spatial conventions in their early drawings. In 
part, children do draw generalities and nonprojective shapes 
because of what they see. However, Arnheim claims that it is 
unquestionable that children see more than they draw. "At an age 
when they easily tell one person from another and notice the 
smallest change in a familiar object, their pictures are still 
quite undifferentiated" (p. 168). The differences lie with 
children's experiences of the nature and function of pictorial
representation. Children are seen as inexperienced artists who must explore the nature of graphic media until forms which stand for or represent objects can be invented. Simplicity and movement, only as necessary from the general to the specific, are key principles from which children operate. Thus according to Arnheim's law of differentiation, "... any shape will remain as undifferentiated as the draftsman's conception of his goal object permits." And secondly that "... until a visual feature becomes differentiated, the total range of its possibilities will be represented by the structurally simplest among them" (p. 181). Therefore, on this basis, Arnheim rejects the idea that the tadpole figure drawn by children is an erroneous version of a representation of the human figure (see note 1). Because the circle is a simple and undifferentiated form, says Arnheim, it can stand alone as the total human figure. Thus children do represent what they see in a form that is consistent with their "search for equivalence of form in a given medium" (Golomb, 1973, p. 202).

In general, then, there are two opposing theories—the conceptual and the perceptual. Golomb (1973) nicely summarizes their distinctions in the following statement: "... the 'conceptual' hypothesis, considers young children's drawings as expressions of preconceptual reasoning. ... the 'perceptual' hypothesis, states that a child's representation does not directly, or exclusively, reflect his conceptual development" (p. 204). Using these two theories as research hypotheses, Golomb devised eleven different
tasks for 105 children between the ages of three and seven years, based on children's representations of the human figure, to test empirically these two divergent positions. What is unique about Golomb's work is that in addition to administering the Draw-a-Person Test, she had children dictate components of figure drawings to experimenters and experimenters dictate human figure components for children to draw as well. Also, children were tested with the Manikin-Puzzle task and represented a person in other media forms. Golomb postulated that if the conceptual hypothesis was tenable, children's representations of the human figure would be invariant across the eleven tasks. On the other hand, if the perceptualist perspective were plausible, there would be significant variation between and among the tasks. The results of Golomb's study clearly show significant differences between the tasks.

The results of this study argue against the conceptual theory of children's drawings and support Arnheim's theory that representation varies as a function of the medium, instructions, practice, the provision of parts, and the child's developmental level" (p. 199).

If the perceptual hypothesis is tenable, as Golomb's study has demonstrated, then representation varies across function and task. However, a relationship between modes of representation can be expected if the tasks are interrelated, as in the case of writing a story and drawing a picture to accompany it. It has been shown that children often draw as a prelude to or in conjunction with writing (Graves, 1975; Zalusky, in press). This observation suggests a relationship between writing and drawing as a function of task. Similar to Golomb's
findings that children's representation varies as a function of task, Halliday and others have demonstrated differences between oral language and written language.

According to Halliday (1973) the difference between oral and written language lies in the functional aspects of the way in which language is used. Halliday's functional theory of language is premised on the social use of language.

The essential feature of a functional theory is not that it enables us to enumerate and classify the functions of speech acts, but that it provides a basis for explaining the nature of the language system, since the system itself reflects the functions that it has evolved to serve (p. 66).

Halliday argues that spoken language essentially has an interpersonal dimension whereas written language serves primarily an ideational function (King and Rentel, 1979, p. 248). With the interpersonal function, the speaker uses "language as the means of his own intrusion into the speech event: the expression of his comments, his attitudes and evaluations, and also of the relationship that he sets up between himself and the listener--in particular, the communication role that he adopts" (p. 106). The ideational function, on the other hand, is expressed by two sub-functions. The first, is the experiential, in which the writer (or speaker) expresses his own experiences, reactions, conceptions and perceptions of the real world including "his linguistic acts of speaking and understanding" (p. 106). Secondly, and not entirely unrelated to the experiential, is the logical sub-function which Halliday claims is the "expression of certain fundamental logical relations such as are encoded in language in the form of
co-ordination, apposition, modification and the like" (p. 106).

Related to these main functions of interpersonal and ideational is a third—textual. The textual function is the realization of both the interpersonal and ideational—the creation of text, which according to Halliday, is a "function internal to language" and its use.

Halliday's functional theory of language, as well as work by Chafe (1970) which emphasized the semantic aspects of language, rather than the syntactic features of language (represented by Noam Chomsky's work), has influenced studies of writing because this emphasis has allowed researchers to go beyond a sentence level analysis to the analysis of text. Text, says Halliday, is "... an operational unit of language, as a sentence is a syntactic unit; it may be spoken or written, long or short...." (p. 107). Halliday substantiated this view that the text is the appropriate level of analysis because text "... is a functional-semantic concept and is not definable by size ... it is concerned just as much with the internal organization of the sentence, with its meaning as a message both in itself and in relation to the context" (p. 107). This kind of analysis is important for two additional reasons. Text analysis allows for investigation into the speaker or writer's communicative intention as well as the opportunity to delve into the issue of how what people say or write is reminiscent of or related to what they know (King, 1978).
Olson (1977) further distinguished between spoken and written language by differentiating between utterance and text. These differences lie in the logical relations of meaning, truth and function. Meaning is realized in utterance through stated knowledge or common sense on the part of the listener, whereas meaning in text is derived from the use of premises and logic from which implications arise. Truth in utterance, according to Olson, relates to truth as wisdom, while truth in text is conceived through the correlation between statement and observation. In addition, utterance and text differ on the basis of function. Using Halliday’s notion of the primacy of the interpersonal nature of oral speech, Olson illustrated this functional distinction from text in the sense that "if a sentence is inappropriate to a particular listener, the utterance is a failure." To further distinguish this difference in function, Olson continued, "In written text, the logical or ideational functions become primary, presumably because of the indirect relation between writer and reader" (p. 278). Olson also claimed that these functional distinctions might be what is responsible for the higher degree of explicitness and conventionalization that is observed in writing. Similarly, King (1978) maintained that writing, as opposed to speech, includes some active involvement, reflections, and a willingness to be accountable for one's own statements.

These distinctions between oral language and written language highlight differences which exist between modes within a single
symbol system. Writing is, after all, simply one mode of representation under the larger symbol system of language (King, 1978).

Olson provided implications of these differences:

The bias of written language toward providing definitions, making all assumptions and premises explicit, and observing the formal rules of logic produces an instrument of considerable power for building an abstract and coherent theory of reality. . . . Oral language with its depth of resources and its multitude of paths to the same goal, while an instrument of limited power for explaining abstract ideas, is a universal mean of sharing our understanding of concrete situations and practical actions (Olson, 1977, p. 278)

The research cited in this section has demonstrated that differences exist between and within symbolic systems. Still there are grounds for arguing that strong relationships exist between the various symbol systems and that these relationships may be qualitatively and quantitatively different. In other words, specific properties of one symbol system, under certain circumstances, may be shared by another symbol system.

**Similarities Between Writing and Drawing**

Many researchers view the writing process as related in function to other similar activities involving the use of representational symbols such as oral speech, reading, drawing, and various forms of symbolic play (Gundlach, 1981; Vygotsky, 1978). To compare writing to other representational activities, it is important to review an area of writing research referred to as discourse analysis. Discourse studies look at texts of either developing or experienced writers in an attempt to assess the processes which
are reflected in text productions (Kanter, 1981). Kanter pointed out seven major areas that have been explored by discourse studies: (1) the relationship of oral speech to writing; (2) the relationship of reading to writing; (3) the syntactic complexity and maturity of the production; (4) the role and use of cohesive devices in writing; (5) error patterns demonstrated; (6) rhetorical strategies; and (7) studies of related cognitive processes. The relationship of oral to written language, the use of cohesion, the relationship of reading to writing, as well as how each of these relate to children's drawings will be reviewed in this section.

Britton (1970) and Moffett (1968) have emphasized the role of sustained speech as a first step in writing development. Moffett claimed that a shift occurs when children demonstrate the ability to take over a conversation and maintain the topic in question, independent of the kinds of interaction and feedback that are commonly available to people in face to face conversation, and that this constitutes a prelude to writing. This shift indicates that children are abstracting and beginning to represent the varying levels of discourse structures (King and Rentel, 1979). However, as King and Rentel have pointed out, what is not clear is how this shift occurs, or what constitutes the relative components of this shift.

Also addressing this link between oral and written language, James Britton has shown how young children adopt the spectator and participant roles in their use of language and has linked this
use of roles to the writing process in older children. Britton, et al. (1975) examined over two thousand scripts from students, aged 11 through 18, based on two sets of categories. The first category, function, was determined by the purpose the piece of writing served. Audience, the second category, was a determination of to whom the writing was addressed. Britton and associates found that students tended to move from writing that is self-directed or expressive to either transactional writing or poetic writing. Transactional writing is writing to "get things done," according to Britton. For example, informative, instructional or persuasive writing. In the transactional function the writer assumes the role of a participant, whereas in the poetic function, some patterned verbalization that represents the writer's feelings and ideas, the writer assumes the spectator role.

Britton (1979) showed how young children also adopt the spectator and participant roles in their use of oral language. To show this, Britton distinguished between two modes of oral language: talk as play and talk as communication. He stated that utterances of both kinds are found at all stages of development. In symbolic play, for instance, children assumed a spectator role and their speech is talk as play--speech as an end in itself. However, when communication is necessary, children become active participants in "getting things done." Then, when children begin to write, they write in this playful role producing most often stories and storybooks where writing is seen as an end in itself.
Children begin this way because communicative requests can still be easily satisfied by oral language and there is no necessity to write them down. Britton's ideas of symbolic play, and its relationship to spectator and participant roles in language provides a hypothetical function for sustained speech as an initial step in the writing process (Britton, 1970; King and Rentel, 1979; Moffett, 1968).

In addition to these demonstrated links between speech and written language, drawing, speech and writing are also related. Goodnow (1978) examined aspects of change in children's drawings when they were asked to represent action. She found that children merely add on features to their standard form drawing of a human (for instance, extending the arm to indicate picking up a ball), earlier in development but actually alter the form itself to indicate the requested action later in development. These results, Goodnow claimed, lend support to the theory that drawing is a rule-governed activity and that skill acquisition in drawing may be similar to other rule-governed activities, namely language acquisition. Goodnow argued that drawing should not be seen as an "esoteric activity, but as an accessible, visible expression of thought" (1978, p. 64).

Drawing on information processing theory, Goodnow (1977) examined sequence and direction in a child's drawings as a "guide to the development of his strategy or skill" (p. 12). She argued that a drawing may be seen as a set of parts of units combined to
create a whole or a pattern. Further, she claimed, that an understanding of children's strategies for producing this drawing or pattern could be obtained by focusing on their chaining sequences and describing the changes or alternatives children employ. Similarly David Olson (1979) has examined graphic constraints in children's acquisition of diagonality in terms of a sequencing of steps to achieve an end result, and alternates presented and choices made at each step.

Examining sequences, Goodnow differentiated between one pattern and another by the number of units contained in the pattern, types of units contained and the presence of boundaries or space between the units (Goodnow, 1977, p. 11). Crucial to sequencing is the way that one part or unit constrains later elements or units of the drawing. What is observed is: (1) actual constraints that children set for themselves and (2) how they attempt to manipulate and get out of these "binds." These observations show drawing as a problem-solving activity that relates one element of a drawing to each successive element in terms of its boundary, space, orientation and sequence.

Using Piaget's theory that children actively construct and engage in their own learning, Goodnow argues that children's drawings indicate that they abstract and extend rules and principles from this rule-governed activity. Drawings, states Goodnow, are "equivalent"—they stand for or may be called the same as something else. Observing development in children is, in essence,
observing the development of new equivalents. If "equivalents" can be said to be the various symbol systems, Olson (1973) makes a similar claim when he states that symbol systems function not only as a means of communicating but also as a means of exploring the world and the actual symbol system itself (p. 38).

Paralleling Goodnow's research in drawing is Marie Clay's work in developmental writing. She studied a variety of children's writings in order to gain insight into how they mastered arbitrary customs of written English—for example, left to right sequencing, letter formations, spacing and punctuation conventions. Clay refers to these conventions as concepts of print. Children learn these concepts when becoming fluent readers and writers (Clay, 1975, 1979). Clay identified thirteen concepts and principles which allow for assessment of early writing and reading behaviors based on observations of children's increasing awareness of print concepts.

An important aspect of Clay's research has been an emphasis on what concepts of print children have already acquired before they come to school through their interactions with everyday occurrences of print, including being read to and viewing television, as well as their own drawings and scribblings. These productive interactions with their environment demonstrate what concepts children have mastered, even prior to school instruction (Clay, 1975, 1977, 1978).
Clay's findings are similar to Goodnow's views of children's use of sequence when drawing. Clay has demonstrated that writing can be thought of as a rule-governed activity utilizing representational symbols which children begin to master well before they are of school age. Both Clay and Goodnow, then, have shown that young children are influenced by and manipulate sequence and space when producing either a text or a drawing. For instance, beginning writers often inappropriately divide words at the end of a line to preserve established margins on a page rather than repeat the whole word to preserve word boundaries (Clay, 1975). Similarly, in drawing, children tend to preserve the negative space in their drawing and will not place one element of their drawing on top of or close to another element (Goodnow, 1977). Hence, use of space in children's writings and drawings is an aspect of their productions which should be investigated and compared.

Arnheim (1974) claimed that manipulation of space in creating a focal point in a drawing gives the drawing a symmetrical or asymmetrical appearance. And, that this balanced or unbalanced appearance creates what Arnheim called "tension." Relating Arnheim's notions to children's drawings, Garfunkel (1980) found significant grade trends in children's use of spatial balance, again suggesting that children's manipulation of space in drawing is important to investigate.

To examine children's use of space in drawings, in the present study, Garfunkel's rating scale, based on Arnheim's theory, was
employed. Additionally, to explore children's use of space in their writings, the King et al. (1981) concept of message rating scale, derived from Clay's concepts of print categories, was revised and adopted for this investigation. The concept of message rating, utilized in the current study, was found to be correlated with the placement rating (Garfunkel's rating scale) and the elaboration ratings, which assessed the degree of explicitness employed by children in their drawings. To appreciate the implications of these relationships, it is important to consider relationships between reading and developmental writing, as well as children's use of cohesive devices in their writings.

Clay (1975) stated that an inverse relationship exists between writing and reading. Language, she says, is hierarchical in nature. Sentences can be broken down into phrases, phrases into words, words to letters, and letters to sounds. As children learn to read they work down through this hierarchy in what she terms an analytical process. Conversely, as they learn to write, they work up through this hierarchy in a synthetic process (Clay, 1975, 1979).

Read's (1981) work contrasts sharply with Clay's claims that reading and writing are inversely related. He challenges assumptions similar to Clay's that describe reading and writing using and encoding-decoding metaphor. Read claims that the schematic conception which relates a set of literacy skills to either producing print, in the case of writing, or interpreting print,
in reading, is inappropriate for young children. "They are far less interested in the product than we are, and more involved in the process of writing something down" (p. 108). Further he states, "the writing of young children who can read seems to show that for them, the two processes are fundamentally different" (p. 108).

To substantiate these claims, Read documented ways in which children shift from invented, non-standard spelling to standard spelling, showing "the inconsistency in some children who read printed words in standard spelling with ease but invent spellings ingeniously when they write the same words" (Frederiksen and Dominic, 1981, p. 7). Read does not deny that a reader is inevitably in the position of attempting to reconstruct another person's written ideas and that in adults the reverse of this process is true for writing. However, this does not hold true for writing, as children approach it. "In writing as young children do it, no one else is necessarily involved" (Read, 1981, p. 112). The significance of this, as Read says, is that,

The partial independence of these skills surely suggests a renewed importance for research on the development of writing considered as a distinct skill rather than as an extension of reading. It suggests, moreover, the importance of research on the early stages of writing development, in which we can see the origins of at least the surface skills more distinctly.

Thus Read's work suggests that a broader perspective is necessary in researching developmental writing than has previously been held. One alternative to this narrow perspective as described by Read, would be to view writing, reading and oral language as different
symbolic modes within a symbol system, and to investigate relations within this system and between other symbolic systems highlighting similarities and differences.

Pettegrew (1981) investigated whether or not pre-literate and literate first grade children differed in their text forming strategies in storytelling and dictation tasks using a cohesion analysis. Zalusky (in press), as a follow-up to Pettegrew's study using the same sample, assessed the degree of explicitness found in the children's drawings and compared this to Pettegrew's results.

To understand the results of these two studies, as well as the cohesive harmony analysis employed in the present research study, it is important to review the theory of cohesion as defined by Halliday and Hasan (1976).

From Halliday's functional theory of language, more specifically the conception of text, grew operational definitions of the key concepts of texture, ties and cohesion. "Texture represents the property of text by which the interpretation of one element in a text may be made through reference to another. Tie, on the other hand, denotes a single instance of relation within a text. . ." (King and Rentel, 1979, p. 11). Cohesion, then, "is a semantic relation between an element in the text and some other element that is crucial to the interpretation of it" (Halliday and Hasan, 1976, p. 8). These semantic relations, to which Halliday and Hasan refer, are the five categories of cohesion: (1) reference; (2) substitution; (3) ellipsis; (4) conjunction; and (5) lexical cohesion.
Reference is "the specific nature of the information to be signalled for retrieval. . . . the information to be retrieved is the referential meaning, the identity of the particular thing or class of things that is being referred to: . . ." (Halliday and Hasan, 1976, p. 31). In general, there are three types of reference found in English: personal reference, demonstratives and comparatives (King and Rentel, 1981). Reference within a text can occur in two directions--forward or cataphoric; and backwards or anaphoric. For example:

My brother and I went out to fish. We fished at the lake for hours.

"We" is an anaphoric reference because it refers or points back to "my brother and I" for an explanation of "we." "Out," however, points ahead to "at the lake" illustrating a cataphoric reference. Notice that these two types of referencing occur within the text--endophoric. But often in speech and occasionally in writing, reference is made to some thing or element whose explanation is only retrievable vis-a-vis some outside (outside the text, that is) context. For example:

We don't do that in here!

To a reader or listener, the exact meanings of "we," "that," and "here" are unclear. However, if this statement were made by a teacher, inside a classroom while observing two students fighting, the meaning of "we," "that" and "here" would be very clear. Reference items then, that are only retrievable outside the text are called exophoric.
In substitution, one word or phrase is used to stand for another word, phrase or clause which has been removed from the text. Notice the use of "one" in the following example.

Michael bought an ice cream cone.
I bought one too.

Similar in nature to substitution is ellipsis. With ellipsis, however, the reader or listener must recall previous sections of the text to interpret the complete omission of some later element.

Barbara and Jerry were going to go swimming.
They asked Jody if he would like to go.
Jody said, "yes."

The extended meaning of "yes" is in a previous section of the text—yes, Jody would like to go swimming.

Conjunction differs from the other types of cohesive devices in that it does not refer to some item within the text. Rather conjunctions semantically links one element of a text to what has come before it. In general, these links are expressed in an additive, adversative, causal or temporal relationship. Note the use of "and" as an additive, "so" used as a causal, "but" as an adversative, and "then" used to signify a temporal relationship in the following account.

One day I was walking down the street and saw a man selling balloons for only one dollar. So, I just had to buy one. But, then, I saw another man selling balloons for only a quarter. So, I bought one from this man too.

Lexical cohesion refers to the patterning of words through the use of same (reiteration) or similar words associated with the
original word (collocation).

On Sundays my family goes to the beach. Everyone brings sand buckets, sun umbrellas and lounge chairs. We love to sit close to the water and let the waves roll up on us as the tide comes in. We all love the beach!

In this example, the two occurrences of "beach" illustrate reiteration while such items as "sand buckets, sun umbrellas, and lounge chairs" and "water, waves, and tide" are all semantically related to each other. Another important distinction of lexical cohesion is that, unlike reference, substitution, ellipsis and conjunction which create texture grammatically between sentences, the use of lexical devices are related through semantic fields as well as through varied forms of repetition, both of which contribute to cohesion between and within sentences (King and Rentel, 1981).

Using a cohesion analysis, Pettigrew (1981) found that when children were grouped into beginning, transitional and fluent reading categories, use of restricted exphoric reference and lexical cohesion significantly discriminated among the three groups. Pettigrew suggested that a shift occurred--as children become literate they used more explicit language. And, "... this shift marks the growing ability to more appropriately used language in indirect and abstract contexts of situation" (p. 106).

Zalusky (in press) found that children who used restricted exphorics in Pettigrew's language tasks also tended to obtain lower ratings on an elaboration scale used to assess the degree of explicitness employed in children's drawings. Conversely, children who
did not use restricted exophorics tended to score higher on the elaboration rating scale. Zalusky's elaboration ratings were influenced by Kellogg's (1970) analysis of children's drawings who found that children became increasingly more explicit and used more complex shapes as they got older. Kellogg identified twenty basic scribbles which were organized into "placement patterns" on paper. Kellogg stated that these scribbles constitute the child's first stage in art and are the "building blocks of art" (p. 15). From scribbles, children moved into simple or diagram shapes linking pairs of these shapes together producing "combines" which lead to the combination of three or more shapes called "aggregates." This progression, says Kellogg, demonstrates that each stage is reminiscent of and incorporates the previous stage. Thus based on Kellogg's observations, Zalusky claimed that her findings suggested a relationship between children's ability to use language explicitly and their ability to communicate through elaboration in drawing.

Hayes and Flower (1980) used a procedure called protocol analysis to identify both the organization and sequence of the writing process. A protocol is "a description of the activities, ordered in time, which a subject engages in while performing a task" (Hayes and Flower, 1980, p. 4). To study writing, Hayes and Flower asked subjects to think aloud about everything that occurred to them while writing, no matter how unimportant it might have appeared.

Based on their protocol analyses, Hayes and Flower (1980) proposed that the "writer's world" is comprised of three elements:
(1) the task environment: (2) the writer's long term memory; and

(3) the writing process. The first two, task and long term memory, are the context in which the third, the writing process, operates.

The writing process is divided into the processes of planning, translating and reviewing. Planning is further divided into the sub-processes of generating, organizing and goal-setting. The function of the planning process is to utilize information in long term memory and from the task environment and "... to use it to set goals and to establish a writing plan to guide the production of a text that will meet those goals" (p. 12). The translating process, acting under the guidance of the writing plan, produces language that corresponds to the information in long term memory. Reviewing is subdivided into reading and editing, and has the function of improving the quality of the text that the translating process produces (p. 12).

This emergence model, based on their analysis of verbal protocols, is not a stage model, but a model of competent writers. Using this model, Flower and Hayes (1980) attempted to account for the dynamics of the writing process. "As a dynamic process, writing is the act of dealing with an excessive number of simultaneous demands or constraints" (p. 33). These constraints take the form of: (1) integrating knowledge; (2) inclusive linguistic conventions of written texts; and (3) encompassing constraints is that constraints are often built into goals by writers which as a result actively shape the writer's process of achieving the goal.

Finally, Flower and Hayes proposed a taxonomy of writing plans
consisting of: rhetorical plans, content plans, and composing plans. "Out hypothesis is that writers draw on three major kinds of plans which are hierarchically related to one another" (Flower and Hayes, 1980, p. 44). Rhetorical plans specify a speech act that involves the writer, reader and purpose. Content plans specify the information that the writer is seeking to convey. Composing plans specify strategies for generating knowledge and producing a text.

King, Rentel, Pappas, Pettegrew and Zutell (1981) illustrated the shift in linguistic cohesive devices that occurs when children attend to content planning as specified by Flower and Hayes. King et al. found, in a cohesion analysis of written texts of kindergarten and first grade children produced over one and a half school years, that lexical cohesion accounted for the largest proportion of change over time in use of cohesive devices. In addition they found an increase in the children's use of conjunction with a decrease evidenced in use of exophoric reference. In their conclusion, they provided an overall account of the use of cohesive devices in young school-age children:

Clearly, children have acquired a wide range of cohesive options and a reasonably well organized set of systematic options for utilizing those strategies in the formation of cohesive fictional narratives. By the end of grade two, their cohesive ties are routinely endophoric. They employ substitution and ellipsis sparingly. Conversely, they are hesitant in their use of lexical cohesion, conjunction, and reference. Restricted exophoric reference has all but faded completed from their texts. In short, so far as cohesion is concerned, their transition from oral to written texts, while not complete, is well under way by the end of second grade in the sample of children investigated in this study (p. 73).
Thus King et al. (1981) and Pettegrew (1981) have demonstrated the shift that occurs in children's use of cohesive devices when they attend to content planning. Further, the relationship found between use of cohesive restricted exophics in story dictation tasks and elaboration in drawing (Zalusky, in press) is evidence that content planning in children's writings is related to their use of elaboration and explicitness in drawing. Therefore a viable avenue for future research in children's drawings would be the development of categories in drawing analogous to cohesion categories in language. However, such an endeavor is outside the scope of the present study.

This review of research has demonstrated that tasks are perceptually salient to children, a finding that argues for a hypothetical relationship between drawing and writing when the two are employed to compliment and support each other in classroom writing activities (Golomb, 1973). Second, that children apparently organize their composing resources to support the production of a message rather than to achieve specific, formal linguistic or iconic ends (Clay, 1975; Gardner, 1980). These claims argue that a concept of message undergirds both writing and drawing (Clay, 1975; King et al., 1981)—operationalized in this study as concept of message scale and elaboration and placement scale. Third, children initially appear to rely on a highly constrained set of graphic rules as basic drawing strategies (Ives and Houseworth, 1980). Starting with basic geometric schemes, children appear to elaborate these schemes in drawing (Kellogg, 1979). Similarly in writing, letter production appears first in children's
writing as relatively undifferentiated between upper and lower case letters and as having functional equivalence. These seemingly global forms are later differentiated by function into their appropriate upper and lower case roles. The expectation is that these similarities may form the basis for a relationship between elaboration in drawing and letter production in writing. As noted earlier, this relationship has been hypothesized on the basis of observed similarities between language and drawing which may be reflective of some "common underlying principles of the semiotic function" (see Pufall, 1979 in Ives and Houseworth, 1980, p. 593). Fourth, initially children can be expected to produce compositions that reflect personal, more situationally constrained texts whose function is to express self and identity (Britton, 1975, 1979; Halliday, 1973). Identity relations comprise a basic component of the cohesive harmony index and indeed may be a fundamental component of the message children seek to communicate at the onset of learning to write. This expectation should be reflected in a relationship between concept of message and cohesive harmony index. These dimensions of writing and drawing will be investigated in a canonical correlation analyses to ascertain the strength and relative components of these hypothesized relationships between the writing and drawing factors.

In addition to investigating these aspects of children's writings and drawings, it is critical that these factors be examined in relation to each other at a time when children can differentiate between these two modes. Children must be capable of producing
texts that are distinct from their drawings. As Clay (1975) has shown, prior to beginning school years, children's attempts to write often take place in the larger context of a drawing. At this point in development, it is difficult to distinguish between scribbles (Kellogg, 1979) and scribble writing or mock writing (Clay, 1975). During the beginning school years, however, children are aware of these differences between writing and drawing (Clay, 1975) and produce written texts distinct from their drawings. In addition, at this stage, children are still limited by their not fully developed use of symbol systems, such as language and pictures (Gardner, 1980) and may be utilizing acquired abilities in one symbol system to facilitate production in another (Zalusky, in press). Hence it is important to investigate related aspects of writing and drawing in children during the early school years.

Chapter three presents the procedures employed to investigate relationships between children's writings and drawings at the beginning of first grade.
CHAPTER III

PROCEDURES OF THE STUDY

The purpose of this study was twofold: 1) to investigate relationships that exist between drawing and writing in 7 year-old children's productions, and 2) to explore the nature of these relationships. Using a cross-sectional approach, children who were still in the process of acquiring literacy and drawing competencies were selected to serve as subjects in this study. Storybooks, produced by these subjects, which consisted of written text and drawings, were rated and analyzed. A canonical correlation analysis was performed to investigate the strength and possible components of associations between dimensions of children's writing and drawing.

The first section outlines the plan, design of the study and the subject sample. The next section discusses the procedures involved in data collection. And the last sections detail the scoring procedures for the writing and drawing samples and briefly overviews the analysis involved.

Overview

Children in the first grade were chosen as a subject pool for this study, first, because they could produce sufficient written text distinct from their drawings for analysis, and second because instructional effects could be minimized with data collected at the beginning of grade one.

Secondly, four rank order scales were developed or adapted--two for drawing and two for writing--to serve as indices for the
writing and drawing variables. In addition a discourse analysis was performed on the written texts to assess coherence. Thus five codings were performed on the data, three for writing and two for drawing.

Subjects for this study were drawn from the middle-class first grade population of a suburban school in Columbus, Ohio. The particular elementary school from which these first grade subjects were chosen was participating in a larger 20-month longitudinal study investigating the development of writing in children (See King, Rentel, Pappas, Pettegrew and Zuttell, 1981). Data used in the current study were collected in context of this longitudinal study.

The 27 students that comprised the sample for this study were all students in the same first grade class of a suburban elementary school. This elementary school was an alternative school which implemented an informal approach to education. In general, instruction was on an individual or small group basis. Curriculum usually consisted of a thematic integration of all subject areas with a heavy emphasis placed on literature, reading and writing using a language experience reading methodology. In this setting, writing was carried out on a day-to-day basis with little instructional intervention. In addition, drawing, as well, occurred on a continuing basis in this classroom as a valid mode of expression rather than merely as a "frills" activity.

Data were collected on the entire class of 14 female students and 13 male students. Three subjects were eliminated from the sample due to special psychological testing (1 female subject), special
reading testing (1 male subject), and incomplete data (1 male subject). The remaining 13 females and 11 males (with mean age of 80.22 months) comprised the sample for this study. Detailed information concerning sex breakdown and chronological age can be found in Appendix A.

Socio-economic status, for the subject sample, was determined by King and Rentel's (1981) modification of the Warner, Meeker and Ellis (1949) Index of Status Characteristics. This instrument rates parental occupation, source of income, house type and dwelling area. Only middle-class subjects as identified by the modified Index of Status Characteristics were selected to control for socio-economic factors.

Data Collection Procedures

Data were collected during the first part of the 1979-80 academic school year (late September through November). The task, for the children, was to create a storybook consisting of text on a topic or topics of their choice. Blank storybooks (8 1/2 by 7 inches in size with 32 pages each) were provided for the children but length was not limited since they were told that they could have more than one storybook if they desired. Several children produced more than one storybook and a couple of children made additions to their storybooks by constructing their own books out of construction paper or unlined paper. Length of time taken to complete the storybook was uncontrolled and students worked on their storybooks whenever and for whatever length of time they felt was necessary in order to complete the task. Students continued to work on one or more storybooks.
throughout the school year. However for the purposes of this study a two and a half month time period was sampled because all subjects produced at least a half of completed storybook during this time frame.

To standardize teacher-pupil interactions, assistance to the children by the teacher and/or two research assistants was provided only if requested by the subjects. In addition, a variety of drawing, writing, painting and textured materials was always available to the children for use in their storybooks. Use of these materials however was completely on the child's own initiative and not suggested by either the teacher or the research assistants. Thus neither use of materials, assistance, nor completion was encouraged or discouraged. One teacher and two research assistants were available if any child requested help. Children were told that research assistants were helping teachers and saw this task as part of their classroom experiences. Also since children were totally in control of text length, time duration, topic, and other aspects of production, the data are most likely representative of the children's intentions.

Preparing and Rating the Writing Samples

The following three rating systems were employed for the written texts: 1) concept of message; 2) letter production; and 3) a cohesive harmony index. The data were coded in their original form without any transcription whatsoever for the first two rating systems. However to obtain cohesive harmony indices the data were first transcribed from the storybooks to text which consisted only of the
children's written text with all invented spellings converted to standard spelling. Capitalization of proper nouns and the first-person singular pronoun was the only form of punctuation utilized in these transcripts. In cases where spellings were unintelligible, which occurred very rarely, an ellipsis bounded by parenthesis was used (see Figure 1). After the storybook productions were transcribed, they were parsed into "T-units" and typed.

The T-unit was the basis upon which the cohesive harmony analysis was performed because as King, et al. (1981) have stated, "The T-unit has been used in many studies of child language development—in both speech and writing—because of its efficacy and reliability" (p. 27-28). A T-unit is defined as "a clause complex consisting of one independent or main clause with any dependent or subordinate clauses attached to or embedded in it" (Hunt, 1964 in Pettegrew, 1981, p. 66).

In addition to segmenting the text into T-units, text boundaries were marked, and brackets were placed in cases where there was more than one distinct story or an indication of obvious copied text (such as one child who copied a section from a reference book), or title and chapter headings were used, since they could not be included in the analysis. Figure 1 provides a list of the notational system utilized and a sample of a parsed text appears in Appendix B.
Figure 1. Notational System for Written Text Transcriptions and T-Unit Parsing

Concept of Message

According to Marie Clay (1975, 1977) children, sometime between the ages of three and five, begin to produce marks on paper and notice that print conveys a message. Clay refers to this as the concept of sign. "The child demonstrates an understanding of this when he produces signs you cannot interpret and expects you to read them" (Clay, 1977, p. 337). Next children try to produce messages through this new found written code (message concept). But while attempting to communicate through written symbols, children must also deal with other principles, such as left-to-right direction, word boundaries,
spacing, punctuation marks and the spelling system. To assess children's global awareness of the sign concept as well as several other related principles the concept of message rating scale was devised.

This rating scale was adapted from the Concept of Message Categories utilized by King, et al. (1981) in their study. As King, et al. point out, the categories differentiate between 1) those children who have little or no understanding of the relationship between messages that are expressed in the written language, including those combinations of letters necessary for that expression; versus 2) those children who have a holistic understanding of those relationships; 3) those who have the ability to represent copied or invented patterns; and 4) those children who are able to produce complete, varied and original messages. Figure 2 is a description of the concept of message scale used in this study.
<table>
<thead>
<tr>
<th>Rating</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Letter strings only; no letter-sound match ups.</td>
</tr>
<tr>
<td>2</td>
<td>Letter strings based on letter-sound relationships; word boundaries usually unclear.</td>
</tr>
<tr>
<td>3</td>
<td>Simple patterns, labels or clauses utilized in a repeated fashion; word boundaries observed; high frequency words are spelled correctly (e.g., (I like my mother, I like my father, I like my dog).</td>
</tr>
<tr>
<td>4</td>
<td>Varied phrases and/or sentences—each phrase or sentence being different from the previous. Writing conventions usually include correct use of capitalization and punctuation. Correct use of punctuation is not of critical importance in this category however some use of punctuation generally occurs. Spelling in general is quite accurate.</td>
</tr>
<tr>
<td>5</td>
<td>Fluent writing—includes a wide range of writing as well as storybook conventions: punctuation, capitalization, chapter headings, numerical indicators for different chapter, use of &quot;the end.&quot; As in category 4 spelling is generally quite accurate.</td>
</tr>
</tbody>
</table>

**Figure 2. Concept of Message Scale**

**Letter Production**

Within the production of written text, children must deal with global aspects of composition, as represented in the concept of message categories, as well as master such specifics as the production of upper and lower case letters. Children, as beginning writers, appear to use upper and lower case letters in a variety of ways. Based on Marie Clay's notions of concepts of print and the various categories devised to represent conventions of print in King, et al. (1981), a letter production rating scale was developed to assess ways in which children differentiated between upper and lower case letters.
This rating scale assumed three interrelated concepts involved in letter production. The first was that upper-case letters differ from lower-case letters in size. Secondly, upper-case letters and corresponding lower case letters are functionally equivalent. And third, even though \( r \) equals \( R \), there are conventions in writing which dictate when preference is given for one "\( r \)" over the other "\( R \)." Figure 3 describes the letter production ratings that categorizes children on the basis of concepts of letter production as evidenced in their text productions.

<table>
<thead>
<tr>
<th>Ratings</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>All letters, upper and lower case, are the same size and may be located in any letter position. Simultaneous occurrences of a letter as upper and lower case may occur, but no size distinction is made.</td>
</tr>
<tr>
<td>2</td>
<td>Size discrimination for distinction of upper and lower case letters is discernable. However, there are very few occurrences of letters produced as upper and lower case within the same text. Upper and lower case letters may occur in any letter position.</td>
</tr>
<tr>
<td>3</td>
<td>As in the previous category, distinction is made between upper and lower case letters in size with letters occurring in any position within a word. However, there are frequent occurrences of upper and lower cases for the same letter.</td>
</tr>
<tr>
<td>4</td>
<td>Size distinction is apparent. Upper case letters occur predominantly at the beginnings of sentences or individual words.</td>
</tr>
</tbody>
</table>

Figure 3. Letter Production Scale
Cohesive Harmony Index

Cohesive harmony (Hasan, 1981) is a "count" of certain properties or aspects of a text associated with a judgment of coherence of that text. The cohesive harmony index, then, is an index derived from this "count" as a result of a series of analyses performed on a written text. A comprehensive explanation of cohesive harmony is not possible in the context of this discussion however, to provide for an adequate interpretation of the results of this study, a general overview of the theory and a brief description of the coding procedure follow. (For a detailed description of cohesive harmony the reader is referred to Hasan, 1981 and Pappas, 1981).

Cohesive harmony is a direct extension of Halliday and Hasan's (1976) theory of cohesion and the role of cohesive devices (reference substitution, ellipsis, lexical cohesion, and conjunction) in discourse as discussed in Chapter Two. Recall that an important component to Halliday and Hasan's theory is the concept of a tie. A tie is simply a relation between two members (Hasan, 1981). Hasan offers this figure to illustrate a tie:

\[
\begin{array}{c}
A \\
\end{array} \leftrightarrow \begin{array}{c}
B \\
\end{array}
\]

This figure demonstrates that within any one tie there are at least three elements: the two members of the tie (represented by A and B), and the relation or link that connects them (represented by the double-ended arrow). "The nature of this link is semantic: the two terms of any tie are tied together through some meaning relation (Hasan, in press, p. 3). These links form chains which are classified into
one of two types: identity chains and similarity chains.

Chains, according to Hasan (p. 11), can be seen as structures, and, "if so, a normal text contains a multiplicity of such structures, which together combine to produce the unity of the text." A chain is formed "by a set of items each of which is related to the others by ... semantic relation" (p. 13). There are three types of semantic relations: co-referentiality, co-classification, and co-extension. Each of these is based on the cohesive devices of reference and subject ellipsis, substitution and ellipsis and lexical cohesion respectively. Whereas identity chains are characterized by semantic relations of co-referentiality, similarity chains are comprised of semantic relations which involve co-classification or co-extension.

So far then, there are ties, which simply put, form chains. Chains are formed by the semantic relations of co-referentiality, co-classification and co-extension. These semantic relations define whether a chain is one of identity or similarity. For example, "The relation between the members of an identity chain is that of co-reference; every member of the chain refers to the same thing, event, or whatever, ..." (p. 13). By contrast, Hasan states that

the members of a similarity chain are related to each other either by the relation of co-classification or that of co-extension. Each such chain is made up of items which refer to non-identical members of the same class of things, events, etc., or to members of non-identical but related classes of things, events, etc. (p. 14).
Figure 4 is a schematic diagram that illustrates these relationships of ties to chains, and chains to meaning relations. Further, as can be seen in the figure, meaning relations are defined by the types and roles of cohesive devices. Notice that of the five cohesive devices, conjunction has been excluded and the remaining
Figure 4. Schematic Diagram of Meaning Relations Comprised by Chains, Types of Relations, and Cohesive Devices
four have been employed in this analysis. Because reference, ellipsis, substitution and reiteration as a lexical device have been previously discussed, only the remaining lexical relations of synonymy, hyponomy, meronymy and antonymy will be briefly described. These descriptions are provided in Figure 5.

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hyponymy</td>
<td>An inclusion relation: the meaning of one member of the pair subsumes that of the other. Class X subsumes subclass X₁.</td>
<td>Beast – Eat. Subclass cat (X₁) is subsumed by the class of beast (X).</td>
</tr>
<tr>
<td>Synonymy</td>
<td>The ideational meaning of the two lexical items is identical. In other words, they mean the &quot;same.&quot;</td>
<td>Woman – Lady. Both can be used to mean the same &quot;thing.&quot;</td>
</tr>
<tr>
<td>Meronymy</td>
<td>A part-whole relation between two members of a tie.</td>
<td>Words – French. Words are part of the language of French.</td>
</tr>
<tr>
<td>Antonymy</td>
<td>Two lexical items that are opposite in meaning to each other.</td>
<td>Atheism – Believer. Lexical items that show &quot;oppositeness&quot; of meaning.</td>
</tr>
</tbody>
</table>

NOTE: Descriptions and examples are adapted from Hasan (1981).

Figure 5. Descriptions and Examples of the Four Sense Relations of Hyponymy, Synonymy, Meronymy and Antonymy

According to the theoretical background just outlined, procedures for obtaining a cohesive harmony index are derived. Consider the following text produced by a subject which has already been parsed into T-units.
1 this is a house
2 in the house there is a hill
3 children are on the hill
4 a Easter bunny is coming to this house
5 and maybe he will come to your house

(3.1)
According to Pappas, et al. (in preparation) and Hasan (in press), which were the procedures followed for coding the data in this study, the first step in obtaining the cohesive harmony index is to perform a lexical rendering of the text. In this process all implicit devices (reference, ellipsis and substitution) are rendered explicit and verb forms are transformed into their respective verb stems. Hence the following:

\[ \text{be (exist)} \]
1 this is a house
2 in the house there is a hill
3 children are on the hill
4 a Easter bunny is coming to this house
5 and maybe he will come to your house

(3.2)
In the next phase, ties are identified and meaning relations (co-referentiality, co-classification and co-extension) are determined. Then, members or tokens of these meaning relations are placed in either identity chains or similarity chains, as shown below.
Notice that all tokens entered into chains are parts of ties which are linked by meaning relations. Summing the tokens (13, in this case), the number of relevant tokens is obtained. This "count" of relevant tokens is the numerator in the ratio used to compute the cohesive harmony index.

In the second step of this analysis, "role relations (the noun-verb relations at the clause level)" are identified (Pappas, et al., in preparation, p. 2). These role relations are determined according to work done by Halliday (1968), Chafe (1970), and others, on aspects of case grammar. Examples of role relations are: sayer and the process of saying, doer, doing and affected by doing; attribute and attribuand; location and located; number and enumerated; action and manner of action (Hasan, 1981, p. 19). Examples from text (3.2) include:
be (exist) - house
be (exist) - hill
children - be (exist)
Easter bunny - come - house

(3.4)

After the role relations have been established, chain interactions are identified. "The minimum requirement for chain interaction can be phrased as follows: for two chains X and Y to interact, at least two members of X should stand in the same relation to two members of Y" (Hasan, in press, p. 19). From text (3.2) the following is the only chain interaction as determined from the original text (3.1).

Easter bunny - come - house
Easter bunny - come - house

(3.5)

Thus only 6 of the possible 13 relevant tokens have met the requirements of chain interaction. These 6 tokens, a subset of the set of relevant tokens, are known as central tokens. Finally, the cohesive harmony index is computed--the ratio of central tokens to relevant tokens. In the case of script (3.1), a score of 0.4615 was computed.

Rating the Drawing Samples

The scales were constructed to rate the drawing productions--an elaboration scale and a placement scale. With each scale a rating was given to drawings which were produced in the storybooks over the two-and-a-half-month, specified, time frame. Thus, two separate, overall ratings were given to each child's collection of drawings which reflected the mode of the two rating scores. It was
necessary to use the mode of the rating scores because within the
drawing collections some children produced drawings which could have
been coded at more than one rating level. The following discussion
provides an explanation of these two rating scales.

Elaboration

The elaboration scale deals with the degree of complexity or
detail of the subject matter or content of the drawing. Extending
observations made by others (Gardner, 1980; Goodnow, 1977; Kellogg,
1970, 1979; Lindstrom, 1957) categorical descriptions were constructed
to differentiate between 1) children who represent figures as simple
figures with no detail; versus 2) children who begin to elaborate
on the chosen subject; versus 3) those who completely embellish their
drawing. Both Gardner (1980) and Kellogg (1970, 1979) have shown
that children progress from producing simple geometric shapes, to
combining those shapes to produce simple schemes, to developing
more advanced and embellished schemes. This progression continues
until somewhere between eight or nine years of age when children
reach the "age of realism" when, because of a variety of maturational,
sociological and school environmental factors, their drawings appear
much more realistic in quality and "less creative" (Gardner, 1980).

The assumption underlying the elaboration scale presupposes not
that more detail is better, but that children, prior to this "age
of realism," use detail as a means of elaborating on the presenta-
tional symbolism (Langer, 1978), rather than the expressive qualities
of line, shape, and texture which occur in productions at later
stages in development (Carothers and Gardner, 1979; Ives, 1981, 1982).

In other words, the more detail given by young children in their drawings, the more detailed the information they have communicated in their productions. Figure 6 provides the categorical descriptions, including a simplified example, of the rating scale for elaboration.

<table>
<thead>
<tr>
<th>Rating</th>
<th>Example</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><img src="image1.png" alt="Example 1" /></td>
<td>Human figures represented as stick-like figures with little facial detail or expression demonstrated. Buildings shown as simple structures with lines used to indicate doors and windows. Often the same pictures appear in isolation page after page with little variation.</td>
</tr>
<tr>
<td>2</td>
<td><img src="image2.png" alt="Example 2" /></td>
<td>Human figures having distinguishable body torsos. Evidence of hands, feet, and facial expression. The use of props, such as hats and glasses allow the viewer to begin to distinguish one human character from another. Decorated torsos indicate clothing however identifiable clothing pieces are hard to distinguish. Buildings shown as simple structures—only now chimneys, window panes and door knobs are included.</td>
</tr>
<tr>
<td>3</td>
<td><img src="image3.png" alt="Example 3" /></td>
<td>Subjects appearing in the context of a total picture with human figures evidencing hair, fingers, feet, shoes, eyelashes and eyebrows. Articles of clothing are differentiated. Sex and age differences are clear.</td>
</tr>
</tbody>
</table>
Buildings show details such as window decorations, scenes inside the house, roof textures, or smoke emitting from chimneys. Comparison and contrastive drawings appear frequently in the category.

Subject matter is very detailed. Human figures are elaborately adorned with hats, head pieces, jewelry and different kinds of clothing. Extreme attention to detail is obvious.

Buildings and structures are very detailed as evidenced by the boy who drew an aerial view of a football stadium including the different decks for seating, team locker rooms, team benches, flags and yard line markers.

Figure 6. Elaboration Scale

<table>
<thead>
<tr>
<th>Rating</th>
<th>Example</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td><img src="image1" alt="Example image" /></td>
<td>Buildings show details such as window decorations, scenes inside the house, roof textures, or smoke emitting from chimneys. Comparison and contrastive drawings appear frequently in the category.</td>
</tr>
<tr>
<td>4</td>
<td><img src="image2" alt="Example image" /></td>
<td>Subject matter is very detailed. Human figures are elaborately adorned with hats, head pieces, jewelry and different kinds of clothing. Extreme attention to detail is obvious.</td>
</tr>
</tbody>
</table>

Placement

In a recent study of the development of compositional balance, Garfunkel (1980) applied Arnheim's notions of balance to the analysis of children's drawings (kindergarten through fifth grades). Garfunkel found significant grade trends among children in their use of compositional balance. She suggested that this trend is indicative of "... a growing awareness of the relation of parts to each other and to the whole gestalt of the drawing" (p. 7). Arnheim's (1974) discussion of the components of balance in drawings, Garfunkel's findings on the development of compositional balance in children, as well as Kellogg's (1979) observations of placement patterns in children's drawings, were the basis for this placement scale. Garfunkel's scale was adapted for this study and is shown in Figure 7.
Rating | Description
--- | ---
1 | Drawing has no use of ground. Figures are scattered on page and appear to float.
2 | The edges of the paper itself supply the ground for the figures. However figures tend to "hug" to the bottom corners of the page.
3 | Complete and absolute symmetrical balance is achieved through placement of figures on the horizontal and vertical axes. In general, there is an indication of ground in the drawing.
4 | As before, symmetry is achieved. But additional figures occurring on both sides of the vertical or horizontal axes are placed in unbalanced positions. This beginning use of asymmetry, according to Garfunkel, creates "tension" in drawing.

Figure 7. Placement Scale

Analysis of Data

Subjects were scored according to the procedures previously discussed for the three writing factors and the two drawing factors by this investigator. One additional rater was trained in each of the five coding procedures and ten written texts or ten sets of drawing samples were rated to obtain reliability measures. In addition reliability measures were obtained for the T-unit parsing procedure. Inter-rater reliabilities were computed as simple Pearson product-moment coefficients and are displayed in Figure 8.
Subsequent to coding the data, the five factors were classified into two data sets--one for writing and one for drawing. A 3 x 2 symmetrical canonical correlation analysis was performed to investigate the strength and relative components of relationships between the writing and drawing factors. Canonical correlation differs from simple correlational techniques in that linear combinations are derived, at a specified level of significance, in a way as to maximize the relationship between the two sets (Cooley and Johnes, 1971). As opposed to factor analytic procedures, these linear combinations are composed of unrotated factors (Cohen and Cohen, 1975). Canonical roots, canonical weights and structure coefficients were generated to aid in the interpretation of this multivariate procedure. Results of this procedure are outlined and explained in Chapter Four.
RESULTS OF THE STUDY

Results

Canonical correlation analysis was the statistical procedure chosen for this study to investigate relationships between writing and drawing productions in children. Originally developed by Hotelling (1935, 1936 in Cohen and Cohen, 1975), canonical correlation is a multivariate technique whose objective is to "find a linear composite of the Y variables and a (different) linear composite of the X variables so that when this pair of derived variables (i.e., pair of linear composites) is correlated, the resulting two-variable correlation is the highest attainable" (Green, 1978, p. 261). For this study 3 x 2 symmetrical canonical correlation analysis was performed using the five factors of concept of message, letter production, cohesive harmony index, elaboration and placement as described in Chapter Three. As previously discussed, the five factors were organized into two sub-sets of factors with the first three factors comprising the writing set or left set, and the last two factors comprising the drawing set or right set.

Displayed in Table 1 are the means and standard deviations for each of the five factors. Note that comparisons across means would lead to erroneous interpretations since, as can be recalled, ranges differ across the rating scales. However, the means provide an interesting description of a "typical" member of this sample. This
hypothetical subject produces simple textual patterns in a repeated fashion, discriminates between upper and lower case letters and tends to use both cases in any letter position, and produces a relatively coherent written text. In drawing, the beginnings of detail are evidenced in representations of human figures, buildings and other objects and placement of subject matter on the page is nearly symmetrical. It is also interesting to note that the overall means obtained for the cohesive harmony index and for the elaboration ratings parallel findings made by Rentel and King (in progress) and Garfunkel (1980) respectively.

**TABLE 1**

**MEANS AND STANDARD DEVIATIONS FOR CONCEPT OF MESSAGE, LETTER PRODUCTION, COHESIVE HARMONY, ELABORATION AND PLACEMENT**

<table>
<thead>
<tr>
<th></th>
<th>Means (N=24)</th>
<th>SD (N=24)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Message</td>
<td>2.83</td>
<td>0.75</td>
</tr>
<tr>
<td>Letter</td>
<td>2.46</td>
<td>0.87</td>
</tr>
<tr>
<td>Cohesive Harmony</td>
<td>0.69</td>
<td>0.21</td>
</tr>
<tr>
<td>Elaboration</td>
<td>2.21</td>
<td>1.15</td>
</tr>
<tr>
<td>Placement</td>
<td>2.71</td>
<td>0.89</td>
</tr>
</tbody>
</table>
Subsequent to generating descriptive statistics, the first step in canonical correlation analysis was to create an inner-correlation matrix which related all of the variables involved in the analysis and provided a basis for successive steps in this analysis. Table 2 shows the results of this procedure. Again, direct and conclusive interpretation of this matrix could be misleading because of the possibility of multicollinearity existing in the multivariate normal distribution which described the Nth-dimensional universe defined by this analysis. However, interpreting the correlation coefficients in a relative fashion, revealed substantial associations between concept of message and letter production, concept of message and elaboration, and letter production and elaboration. In addition, moderate associations were obtained between concept of message and cohesive harmony, concept of message and placement, cohesive harmony and elaboration, and elaboration and placement.

Based on the results displayed in Table 2, a pair of linear composites were generated, so that they were maximally correlated (Green, 1978, p. 261). Having done this, it was possible to generate a second pair of linear composites which was uncorrelated with the first pair. This pair of linear composites is referred to as a pair of canonical variates. Ultimately it is possible to generate as many pairs of canonical variates as the number of factors in the smallest set. Each successive pair of canonical variates obtained, however, has a necessarily smaller canonical correlation than the preceding pair. Therefore, for interpretive purposes, those variates with
TABLE 2
INTERCORRELATIONS AMONG WRITING AND DRAWING FACTORS
OF CONCEPT OF MESSAGE, LETTER PRODUCTION,
COHESIVE HARMONY, ELABORATION AND PLACEMENT

<table>
<thead>
<tr>
<th></th>
<th>Message</th>
<th>Letter</th>
<th>Cohesive Harmony</th>
<th>Elaboration</th>
<th>Placement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Message</td>
<td>1.000</td>
<td>0.506</td>
<td>0.359</td>
<td>0.622</td>
<td>0.493</td>
</tr>
<tr>
<td>Letter</td>
<td>0.506</td>
<td>1.000</td>
<td>0.151</td>
<td>0.614</td>
<td>0.282</td>
</tr>
<tr>
<td>Cohesive Harmony</td>
<td>0.359</td>
<td>0.151</td>
<td>1.000</td>
<td>0.336</td>
<td>0.025</td>
</tr>
<tr>
<td>Elaboration</td>
<td>0.622</td>
<td>0.614</td>
<td>0.336</td>
<td>1.000</td>
<td>0.344</td>
</tr>
<tr>
<td>Placement</td>
<td>0.493</td>
<td>0.282</td>
<td>0.025</td>
<td>0.344</td>
<td>1.000</td>
</tr>
</tbody>
</table>
nonsignificant or small canonical correlations are discarded and only those pairs which exhibit significance are retained (Cohen and Cohen, 1975). In this analysis, two pairs of canonical variates, with their respective tests of significance, have been generated and are shown in Table 3.

The canonical correlation is a symmetric measure of association. Its square, the eigenvalue, is a measure of shared variance between the two batteries of variables (Green, 1978). As stated, both roots produced are independent and Wilk's lambda was used as the test for any residual association. Chi-square was the statistical test for the significance of the canonical correlation.

Table 3 shows that the first pair of canonical variates is significant \( R_c = 0.7499, X^2 (6) = 18.80, p \leq 0.005 \) and that a little more than half (56%) of the variance was shared equally by both sets.

In Tables 4 and 5, the composition of the corresponding canonical variates that produced the significant canonical correlations is presented. The canonical weights, displayed in Table 4, were multiplied, using matrix algebra, by their corresponding correlations, from Table 2, to obtain the structure coefficients presented in Table 5. The size of these coefficients is indicative of the relative contribution made by the original variables in the subset which formed the variates. In the left set, concept of message has the heaviest weight, although letter production also made a moderate contribution, with cohesive harmony contributing relatively little to the overall canonical correlation. In the
TABLE 3

SUMMARY OF CANONICAL ANALYSIS

BETWEEN WRITING AND DRAWING FACTORS

<table>
<thead>
<tr>
<th>Root</th>
<th>Canonical R</th>
<th>Eigenvalue</th>
<th>Wilk's Lambda</th>
<th>Chi-Square</th>
<th>d.f.</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.7499</td>
<td>0.5624</td>
<td>0.3906</td>
<td>18.80</td>
<td>6</td>
<td>.005</td>
</tr>
<tr>
<td>2</td>
<td>0.3276</td>
<td>0.1073</td>
<td>0.8927</td>
<td>2.27</td>
<td>2</td>
<td>.321</td>
</tr>
</tbody>
</table>
### TABLE 4

**CANONICAL WEIGHTS OF LEFT AND RIGHT SET VARIABLES**

**ASSOCIATED WITH THE SIGNIFICANT CANONICAL VARIATES (ROOT #1)**

<table>
<thead>
<tr>
<th>Original Variable</th>
<th>Left Set Canonical Weight</th>
<th>Right Set Canonical Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Message</td>
<td>0.6313</td>
<td>Elaboration</td>
</tr>
<tr>
<td>Letter</td>
<td>0.4796</td>
<td>Placement</td>
</tr>
<tr>
<td>Cohesive Harmony</td>
<td>0.0937</td>
<td></td>
</tr>
</tbody>
</table>

### TABLE 5

**STRUCTURE COEFFICIENTS OF LEFT AND RIGHT SET VARIABLES**

**ASSOCIATED WITH THE SIGNIFICANT CANONICAL VARIATES (ROOT #1)**

<table>
<thead>
<tr>
<th>Original Variable</th>
<th>Left Set Structure Coefficient</th>
<th>Right Set Structure Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Message</td>
<td>0.908</td>
<td>Elaboration</td>
</tr>
<tr>
<td>Letter</td>
<td>0.813</td>
<td>Placement</td>
</tr>
<tr>
<td>Cohesive Harmony</td>
<td>0.393</td>
<td></td>
</tr>
</tbody>
</table>
right set, elaboration made a high contribution to the formation of
the set, while placement made a low contribution.

Thus far, all results discussed concern the shared or symmetrical
variance between the two batteries of variables. Recently, however,
Stewart and Love (1968) have proposed a measure that they call an
Index of Redundancy which is a nonsymmetric measure of accounted-for
variance (Green, 1978). Their index expresses how much variance in
one set of variables is accounted for by the variance in the other
set. "We think that in some ways it is a more interesting number
than $R_c$ [canonical correlation], since it expresses the amount of
actual overlap between the two batteries that is packaged in the first
canonical relationship as seen from the side of $Z_1$, as added to an
already available $Z_2$ (Cooley and Lohnes, 1971, p. 170).

TABLE 6
REDUNDANCY MEASURES AND VARIANCE EXTRACTED FOR
BOTH PAIRS OF CANONICAL VARIATES (ROOTS 1 AND 2)

<table>
<thead>
<tr>
<th>Variance Extracted</th>
<th>Redundancy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Left Set</strong></td>
<td></td>
</tr>
<tr>
<td>Root 1</td>
<td>0.547</td>
</tr>
<tr>
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</tr>
<tr>
<td><strong>Right Set</strong></td>
<td></td>
</tr>
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<td>0.638</td>
</tr>
<tr>
<td>Root 2</td>
<td>0.362</td>
</tr>
<tr>
<td>Totals:</td>
<td>1.000</td>
</tr>
</tbody>
</table>
Table 6 displays this redundancy measure for both roots and also shows exactly how much variance has been extracted by this measure. Green (1978) notes that it is possible to have a high degree of shared association between the two sets of variables and yet find that the left set (say) accounts for very little of the variance in the right set. In this case the redundancy measure for the left set would be low. On the other hand, the redundancy measure for the right set could be quite high if it, in turn, accounted for an appreciable proportion of the variance in the left set. "Accordingly, high redundancy requires both high (shared variance) and high variance accounted-for by the battery's canonical variate" (Green, 1968, p. 275).

From the results displayed in Table 6, it appears that the left set (writing battery) accounted for less than 31% of the variance in the right set (drawing battery), while the right set accounted for slightly more (36%) of variance in the left set. In addition, the amount of extracted variance associated with each of these measures is more than half—55% extracted from the right set by the left set and 64% extracted from the left set by the right set.

Discussion

Based on the results of this study, it appears that the hypothesis that writing and drawing are related in children's productions is tenable. This is suggested by a strong and significant canonical correlation obtained between the two variable sets.
rating both writing and drawing factors, as well as an eigenvalue which indicated that a little more than half of the variance is equally shared between the two variable sets. Furthermore, the redundancy index showed that each variable set explains more than half of the variance in its corresponding set.

These results indicate that a strong relationship exists between writing and drawing. And, within the confines of this study, the rating scales of concept of message, letter production and elaboration are the components that appear to have made the greatest contributions to this correlation, although according to these results, it was considerably weaker than the other three factors.

Interestingly, cohesive harmony did not appear to have contributed, in any significant way, to the overall canonical correlation. In fact, a prior study using on the first four factors and excluding the cohesive harmony rating obtained a canonical correlation of nearly the same magnitude (Zalusky, 1982). It seems then, that cohesive harmony accounted for very little of the writing-drawing relationship. One possible explanation for this lack of accountability is illustrated by preliminary findings of Rentel, King, Pettigrew and Pappas (1982) who found that coherence, as measured by the cohesive harmony index, increased significantly in second grade but does not vary as a function of grade, at least through grade four. It appears that once children begin producing whole texts, as opposed to letter-strings and segmented messages, coherences increases significantly within or between children. For the present study,
because most children did produce whole texts, the Rentel et al. finding would indicate that sufficient variability was not present in the coherence ratings to achieve any significant contribution to the overall canonical correlation.

In conclusion, the results from this study do not provide a basis for conclusive interpretations; however, the results do indicate that relationships exist between children's drawings and their written texts. Correlations suggest that children who produce complete, varied and original messages and use capital letters primarily in sentence or word beginnings in their writing, also include greater detail in their drawings. These results indicate that writing and drawing may share a common cognitive base. To illustrate these results, three examples from the data have been selected for discussion and are presented in the next chapter.
CHAPTER V

A CLOSER LOOK, SUMMARY AND IMPLICATIONS

To illustrate the relationships between writing and drawing implicated by the results of this study, pages from three storybook productions have been selected for a closer look. Comparisons have been made between the drawings and written texts produced by Michael, Barbie and Linda, who represent varying levels of awareness on concepts rated in this investigation. Following these comparisons is a summary of the research study and implications of the study for future research.

Example One: Michael

Throughout his storybook, Michael concentrated on Halloween creatures or symbols — like pumpkins, or creatures or symbols from outer space. Among the Halloween subjects Michael chose were pumpkins, devils and ghosts, as well as monsters, mummies and Count Dracula. Interspersed in his parade of scary ghosts and goblins are Martians and flying saucers. Michael introduced his characters with a "this is . . ." phrase (see Figure 9). However, notice how, in Figures 10 and 11, Michael, without varying the "this is . . ." phrase in his written text, still offers his reader new information. In Figure 10 Michael tells his reader that the object he has visually represented is a saucer — "This is ASOSR." Then, in Figure 11, even though all his written text
"This is the devil"
Figure 10
"This is a saucer"
Figure 11

"This is a Martian"
states is "ThisAmrHN" (This is a Martian), he communicates the information that the Martian is connected to the flying saucer in some way, by including the saucer in the drawing with the Martian, and by placing them next to each other on the page. What the exact relationship is between the two objects is unclear, but a probable guess would be one of possessor-possessed.

In later efforts, Michael offers more information about the characters he has introduced through both writing and drawing. Notice in Figures 12 and 13 his comments that "DAVLSLEVUNDGRah" (devils live underground) and "MUMERSRKArRE" (mummies are scary). Notice also Michael's use of the heavy lines drawn above the devil and below the mummy. It is possible that this is the beginnings of an indication of ground-sky in his drawings and is used rather creatively here to show above versus below ground. Also evident in figures 12 and 13 is that Michael has clearly achieved a sense of letter-sound relationships in his writing. His word boundaries are not yet observed, but the vertical line drawn between the letters in Figure 14 demonstrates that he is well on his way when he asks "ORA/MRHN" (or a Martian).

Throughout these drawings, Michael shows beginning uses of elaboration. For instance, in Figure 9, he has chosen to give the devil horns and a pitchfork, which he reiterates in his drawing in figure 12. Both of these devils have been drawn with block-like body parts, as opposed to the stick figure variation used to represent the mummy in Figure 13. This is a nice attempt on Michael's part to distinguish these monsters within his mode of presentation.
Figure 12

"Devils live underground"
Figure 13

"Mummies are scary"
Figure 14
"Or a Martian"
Michael received ratings that were well below the sample means on all rating scales. He displays many characteristics of a beginning writer -- unclear word boundaries, spacing concerns, lack of differentiation of upper and lower case letters, and invented spellings. As well, his drawings show very elementary uses in detail of subject matter and figures in his drawings appear with float-like qualities on the page. Even though Michael is at the beginning stages of writing and drawing, he can effectively use reiteration between his text and drawing to establish identity relations in his productions (Rentel, et al., 1982).

Example Two: Barbie

Barbie's storybook is very interesting in that she has, in several cases, offered information and then extended and elaborated on that initial offer through both drawing and writing. Figures 15, 16, and 17 came in immediate succession in her book. She has combined the "this is ..." and the "I like ..." pattern to achieve an elaborative effect in her writing. Notice in Figure 15 she introduces the subject -- a flower. In Figure 16 she tells us and shows us that she likes flowers by writing it and putting herself in the context of the picture near the flowers. Then to perhaps elaborate on the aesthetic qualities of the flowers she portrays them, in Figure 17, against a blue sky so perhaps the reader can enjoy them also.

Several pages later, Barbie does a very interesting comparison and contrastive study (see Figures 18, 19, and 20). She introduces the reader to a house both in writing and in drawing in Figure 18. Then
This is a flower

Figure 15
"This is a flower"
I LIKE FLOWERS

Figure 16

"I like flowers"
Figure 17

"This is a blue sky with flowers"
through a series of two more (Figures 19 and 20), "this is ..." phrases, tells her reader that her house is with her mom and the other one is her dad's. Notice the striking differences conveyed between the house through these drawings. The text alone could not have produced this contrastive effect. Barbie appears skilled at presenting differences and making contrastive statements with her drawing. In addition there seems to be an indication of a similar stage in writing development.

Throughout her storybook, Barbie basically used "This is ..." and "I like ..." phrases in a repetitive manner in creating the written text. However, the text in Figures 15-17 and Figures 18-20 demonstrate that Barbie is beginning to produce varied and original sentences to convey messages. In contrast to Michael, Barbie appears to have already mastered word boundaries, spacing concepts, and is using upper case letter primarily at sentence or word beginnings. In addition, Barbie's drawings demonstrate greater use of detail, a definite and clear use of ground-sky with representations placed at the bottom of the page, appropriately just above the ground line. Further her placement of figures on the page is basically symmetrical (as in Figure 15), although her drawings also show indications of asymmetry as evidenced by the placement of "mom" in Figure 19 and the tree and sun in Figure 20. Barbie, like Michael, has unambiguously established identity relations relating text to drawing. In addition, she has added beginnings of a similarity-like chaining between the drawings and the text in creating contrastive statements. Overall, on both writing and drawing scales, Barbie's ratings were at or slightly above the sample means.
"This is a house"
Figure 19

"This is a house with my mom"
Figure 20

"This is my dad's house"
Example Three: Linda

In the context of Linda's storybook she has a brief story about Miss Martian. Figures 21-23 are excerpts from this story. Figure 21 is a portrait of Miss Martian with the jagged lines representing the electric shock waves that vibrate through her body to keep her "safe." Notice how Linda has utilized disproportioned human features -- four eyes, four arms, wide mouth, to make her Miss Martian distinctively "Martian." Her obvious use of elaboration in this drawing -- Miss Martian's crown, earrings, necklace and hairdo is illustrative of a child that would receive a high rating on elaboration. In addition, the amount of detail in Figures 22 and 23 further illustrates this point. Notice for instance the shock waves vibrating between the antennae protruding from the planet in Figure 22 and the mathematical equations on "Maploty's" school arithmetic assignment in Figure 23.

Linda's text, in Figure 21, shows use of original text composed of complete sentences and upper case letters occurring at word or sentence beginnings, although in Linda's case this occurrence is slightly less prominent than in Barbie's written text. Again Linda's text is illustrative of the highest rating on the concept of message scale and ratings above the sample means on the letter production scale and coherence rating. It is also interesting to note Linda's labeling of Miss Martian in Figure 21. This labeling occurs outside the context of the written text itself and is similar to that of a caption in an illustrated text. Further her indication of "continue on Page 28-29" in Figure 23, adds to the "storybook-like" flavor of her production.
This is Miss Martian.

She has an electric shock going through her body. She keeps herself safe by it.

Figure 21

"This is Miss Martian"
This is her planet.

Figure 22

"This is her planet"
Figure 23

Continued on Page 28-29

"Her name is Naploty"
With Linda, as with Barbie and Michael, the production is effective as a form of symbolic expression and communication. All three subjects are convincing authors and have unambiguously established identity relations through writing and drawing. A major task confronting beginning writers is that of establishing identity relations in narratives (Rentel et al., 1982). Thus the storybook samples have demonstrated that relationships exist between writing and drawing in children's productions and have illustrated possible components of these relationships.

Summary

It was the purpose of this study to investigate and explore relationships between writing and drawing productions in children. The data for this study consisted of storybook productions, composed of written texts and drawings, produced by twenty-four first grade subjects, who comprised the sample for this study, and was collected during a two-and-a-half month time frame at the beginning of the academic year. Storybook length, completion time, topic, and use of materials in the production of the storybooks was uncontrolled, therefore the storybooks are most likely representative of the children's intentions.

These data were rated according to five rating schemes: (1) concept of message; (2) letter production (3) cohesive harmony; (4) elaboration; and (5) placement. These five schemes were divided into two subsets -- one to represent writing factors and the other to represent drawing factors. Using these subsets as factor sets, a
canonical correlation analyses was performed to investigate the strength of an association between children's writing and drawing productions and to explore possible components of this association.

Results revealed that a strong correlation exists between the two batteries of variables and that over one-half of the variance was shared equally by the two sets. As well, redundancy measures indicated that a moderate amount of variance was accounted for by each set of factors as viewed from its corresponding set. The factors of concept of message, letter production, elaboration, and to a lesser extent, placement, appear to have been the components which contributed the most to the significant canonical correlation. In addition to these statistical findings, samples from three storybook productions were discussed to further highlight and illustrate found relationships.

Implications For Future Research

This study and the examples of children's work posit several provocative hypotheses concerning the relationships between symbol systems. It is not only important for researchers to address themselves to questions concerning the domains of these symbol systems, but to address questions of underlying symbolic processes as well. As Gardner (1979) pointed out, research into symbol domains and development of the symbolic processes may be the next step for developmental psychology after Piaget.
The significant findings of this study have implications for future research. More and detailed analyses need to be conducted on different modes of children's production. Just as Clay (1975) has observed links between early writing skills and those skills required in the acquisition of reading, so may writing and drawing be related. Specifically comparisons between children's stages of writing development as contrasted with their level of drawing development need further investigation. Research on the associations between writing and drawing will ultimately shed light on relationships between drawing and general literacy factors as well as the underlying cognitive structures which are employed in the general use of language — oral, written and aesthetic, and their resulting powers of communication.

In addition, future research inquiries should include comparisons of other symbol system such as: musical notation, mathematical symbols and movement. Such investigations would augment studies, such as the current one, and help to provide a foundation for linking together all symbol systems through common cognitive roots. Specific domains of the symbol systems, shared domains, of various symbol systems, and facilitative effects of competence in one symbol system to the acquisition of competence in another, are all research inquiries that are both provocative and necessary.

In conclusion, investigating relationships between writing and drawing in children's productions is valuable. Even though the results from this study are not conclusive, they do provide evidence of
relationships between two forms of symbolic modes, an exploration of the possible components of these relationships, as well as suggesting a framework for future similar inquiries into children's cross-modal productions.
NOTES

Note 1: A tadpole figure is an early representation of the human figure of a circle enclosing eyes, nose and mouth with arms and legs attached to it—the figure appears truncated.
APPENDIX A

MEANS AND STANDARD DEVIATIONS FOR CHRONOLOGICAL AGE BY SEX OF SAMPLE
MEANS AND STANDARD DEVIATIONS
FOR CHRONOLOGICAL AGE BY SEX
OF SAMPLE

<table>
<thead>
<tr>
<th>Males</th>
<th>Age in Months</th>
<th>Females</th>
<th>Age in Months</th>
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<tr>
<td>$X_{11}$</td>
<td>85</td>
<td>$X_{11}$</td>
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Group Mean: 79.82  Group Mean: 80.62
SD: 2.89       SD: 2.57

Overall Mean: 80.25
SD: 2.69
APPENDIX B

SAMPLE PARSED SCRIPT
SAMPLE PARSED SCRIPT

Subject Number: 07

1. this is me driving a truck
2. this is me playing on a sunny day
3. this is a sunny day
4. this is a rainy day [the end]
LIST OF REFERENCES


Cocking, R. and Copple, C. Change through exposure to others: A study of children's verbalizations as they draw, unpublished manuscript.


DeFord, Diane. *Young children and their writing.* *Theory Into Practice,* 1980, 19, 137-162.


Graves, Donald. Research update: We won't let them write. Language Arts, 1978, 55, 635-640.


Rentel, V. M., King, M. L., Pettegrew, B., and Pappas, C. A longitudinal study of coherence in children's written texts. The Ohio State University, Columbus, Ohio, 1982.


