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PREVIEW

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**Distinguishing differences between writing samples of
unconsolidated concrete, consolidated concrete, unconsolidated
formal, and consolidated formal operational students, grades
5-11: The comparative validity of three writing assessments**

Friesen, Patricia A., Ph.D.

The University of Nebraska - Lincoln, 1990

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PREVIEW

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**DISTINGUISHING DIFFERENCES BETWEEN WRITING SAMPLES OF
UNCONSOLIDATED CONCRETE, CONSOLIDATED CONCRETE,
UNCONSOLIDATED FORMAL, AND CONSOLIDATED FORMAL
OPERATIONAL STUDENTS, GRADES 5 - 11:
THE COMPARATIVE VALIDITY OF THREE WRITING ASSESSMENTS**

**by
Patricia A. Friesen**

A DISSERTATION

**Presented to the Faculty of
The Graduate College in the University of Nebraska
In Partial Fulfillment of Requirements
For the Degree of Doctor of Philosophy**

Major: Interdepartmental Area of Psychological & Cultural Studies

Under the Supervision of Professors Toni E. Santmire and Paul A. Olson

Lincoln, Nebraska

June, 1990

DISSERTATION TITLE

Distinguishing Differences Between Writing Samples of Unconsolidated
Concrete, Consolidated Concrete, Unconsolidated Formal and Consolidated
Formal Operational Students, Grades 5 - 11: The Comparative Validity
of Three Writing Assessments

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DISTINGUISHING DIFFERENCES BETWEEN WRITING SAMPLES OF
UNCONSOLIDATED CONCRETE, CONSOLIDATED CONCRETE,
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OPERATIONAL STUDENTS, GRADES 5 - 11: THE COMPARATIVE
VALIDITY OF THREE WRITING ASSESSMENTS

Patricia A. Friesen, Ph.D.
University of Nebraska, 1990

Advisers: Toni E. Santmire and Paul A. Olson

This study compares the validity of three techniques of assessing writing to identify developmental differences between the written texts of students at four distinct levels of cognitive development. Each writing assessment records changes at a different structural level of text: the syntactic independent clause or t-unit (Hunt, 1976), combinations of t-units within the total text (Scinto, 1982; 1984; 1986), and the whole text (Santmire, 1984a; 1985). Students at four grade levels (5, 7, 9, and 11) wrote three essays (self-descriptive, narrative, and expository) and completed Gray's (1976) How Is Your Logic? (HIYL) test. Based on the consistency of their HIYL responses, sixteen subjects were selected (four subjects at each of four cognitive stages).

Analysis of their expository texts reveals that average t-unit length increases until consolidated formal operations and then decreases; the same pattern is observed for the average number of dependent clauses per t-unit (Scinto's condensation index). Texts become increasingly integrated across t-units until consolidated formal operations, when single arcs

reappear (Scinto's integration index). Scinto's cohesion indices of coherence and compactness, however, do not detect significant developmental differences between any groups. Ratings on Santmire's Writing Scale distinguish unconsolidated or consolidated stage status, but do not distinguish concrete or formal operations.

Further analysis demonstrates that the underlying logical structure of each expository text is synchronous with the logic of that writer's HIYL responses. This synchrony supports the Piagetian theoretical concept of the structured whole (*structure d'ensemble*). Such synchrony in logic across content domains has important implications for scoring and interpreting performance on Piagetian paper and pencil tests. Although the logical analysis consistently detected differences between each of the four groups, and a common logical structure within each group, none of the three writing assessment measures detected changes which parallel cognitive development through all stages. This has important implications for the results reported in previous writing research.

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This project would not have been completed without the support and encouragement of my committee, family, and friends. I thank them all.

In particular, I am fortunate to have a flexible, patient, and supportive committee. The logical text analysis reported in Chapter Five is what I hoped to find in the research literature from the beginning of my studies. My committee urged me to go beyond the established writing assessments which I was examining, which deserves special note, for uncovering the logic in these texts required time and solitude.

For the past eleven years, Dr. Toni Santmire continued to provide contexts in which I could study the complex issues of human development. Her patient encouragement and thorough understanding of Piagetian and other developmental theories were invaluable. Dr. Paul Olson always acknowledged the importance, yet also the difficulty, of studying the relationship(s) between language and thought, particularly from a structuralist perspective. He wisely urged me to keep my *N* small enough that each individual text could be thoughtfully examined. Dr. Roger Bruning, understanding how any assessment measure influences the nature of one's observations and data, suggested that I compare Scinto's techniques with Halliday & Hassan's cohesion research, enabling me to differentiate and interpret the effects of those four Scinto indices. Dr. Royce Ronning has continued to gently remind me that other variables, specifically content knowledge or experience, still wait to be incorporated into my data analysis. Dr. Robert Egbert was always interested in the educational implications of developmental issues, the very context out of which my studies originated.

A special thanks are due the public school staff and students who willingly worked with me, particularly the teachers, Barb Euler, Lance Hall, Marceil Hinshaw, Bob Rogge, and Janice Strange.

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P. A. F.

PREVIEW

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Chapter 1

INTRODUCTION

"Implicit in any pattern of discourse are the mental processes that the writer had to perform to arrive at that pattern of discourse. One of the tasks of the rhetorician is to relate the structure of thought to the structure of discourse" (D'Angelo, 1975, p. 16). Inhelder & Piaget (1955/1958; 1959/1964) document how the structure of thought changes throughout childhood and adolescence. However, few researchers assess developmental cognitive status when studying how writing develops. Three studies (Lawson & Shepherd, 1979; Santmire, 1984; Scinto, 1982) were located which report initial evidence of changes in a written text's structure corresponding to certain developmental cognitive changes. Each study assesses writing at a different structural level: within the syntactic structure of a t-unit, across t-units, and considering the total text as a structure. The problem addressed in this study is whether the textual changes identified by these three writing assessments are valid indicators of developmental changes in cognition from the early stage of unconsolidated concrete operations through consolidated formal operational thought.

What Is A Structure?

What characterizes a structure or organizational pattern? Structures are not observable; they are abstracted forms of forms. A structure is characterized by the rules that regulate the use of its elements, not by its specific elements since an element can be used in more than one structural system (Piaget, 1968/1970).

Structuralism, discovering and documenting a structure or system of structures, has influenced many disciplines. The Bourbaki report parent structures in mathematics; von Bertalanffy details information systems. Levi-Strauss conducts structural-functionalist analyses in anthropology, as do Parsons and Durkheim in sociology. Propp exposes the elements and systematic combination patterns of the folktale; transformational grammars specify deep structures and their transformational rules which account for language at the sentence level.

Jean Piaget documents the development of qualitatively different logical relationships inherent in child and adolescent knowledge that explain a child's characteristic problem-solving behavior at various ages. Using mathematical symbolic notation, and his knowledge of structural relationships already discovered in mathematics, Piaget explains how the different logical structures implicitly limit and direct what the individual notices, understands and can explain.

The typical Piagetian research design poses a problem to children, asking them to solve it through prediction and subsequent concrete manipulations. Interviewing each child individually, the researcher observes his or her actions, pursuing verbal reasoning as much as possible, and assesses the child's degree of resistance to counter-suggestions. For any given interview, the focal problem is "What is the child's concept of this specific content-problem?" Across all students in a study the focal problem then becomes, "What are the general logical structures which can account for these various conceptions of the same problem?" The general logical structures which Piaget described from this data are the well-known concrete and formal operational thought structures.

Piagetian studies are usually cross-sectional, not longitudinal, and they rarely assess a given individual on multiple tasks. These studies report the range of chronological ages within which a given logical structure is observed and sample responses illustrating the structurally different conceptions of a given problem also report the responding child's age.

Piaget and his associates have accumulated a vast research literature on developmental differences in children's concepts of mass, weight, volume, time, space, number, geometry, proportion, causality, and probability (Inhelder & Piaget, 1955/1958; 1959/1964; Piaget, 1941/1965; 1927/1971; 1927/1972; 1971/1974b). Unfortunately, Piaget has published much less about spoken or written language. Piaget studied the relationships between language and thought in such books as The Language and Thought of the Child (1923/1974), Play, Dreams and Imitation (1945/1962), The Moral Judgment of the Child (1932/1962b) and Judgment and Reasoning in the Child (1928) before he published his work on the structural (logical) characteristics of thought with Barbel Inhelder. He did not return to study any language content in his later research, although his ideas on the relationship between language and thought are included in the discussions of several later books: thought is basic, but there is no doubt that language is necessary (though not sufficient) to fully develop logical structures (1963/1969; 1974/1978; 1974/1980b; Piaget & Inhelder, 1966/1971). A section on "Linguistic and Logical Structures" in his book, Structuralism (1968/1970), concludes "If we can say today that it is as much as demonstrated that language is not the source of logic, that Chomsky is right in grounding language in reason, it must nevertheless

also be said that the detailed study of their interaction has only begun" (p. 96).

Identifying Text Structures

The structure or organizational plan of a text is, in some way, an important factor in the reader's reaction to a text. A global rating of the organization or structure of a text is a frequent scoring criterion in holistic writing assessment scales (Bamberg, 1984; Burry & Quellmalz, 1983; Cooper & Odell, 1977; Diederich, 1974; Mellon, 1969; Nagy, Evans & Robinson, 1988; O'Hare, 1973). Purves (1984) asked raters from different cultural backgrounds to rank a common set of essays on scales designated by twenty-five different adjectives. The factor which accounted for 76% of the variance in their ratings was organization or structure, subsuming the adjectives *tightly organized*, *connected*, *focused*, *consistent*, and *concise*. Nagy, Evans, and Robinson (1988) report that organization and sequence, and sentence structure are the two factors accounting for the difference between high- and low-quality holistic ratings of tenth grade essays.

But holistic quality ratings are also reported to be unreliable. In an early ETS study (Diederich, 1974) three hundred essays were rated by fifty-two readers on a nine-point holistic scale. All three hundred essays received at least five different scores. In the Nagy, Evans, & Robinson study, even though the primary traits *organization and sequence* and *sentence structure* best accounted for the difference between high- and low-quality ratings, 80% of each high- or low-quality group of texts overlapped into the range of the other group. And when an independent assessment of quality of argument (framework scoring) was compared with the holistic

scores of each judge for organization ($N = 40$), correlations ranged from 0.08 to 0.72.

Holistic scoring methods assume that quality resides in the composition (Purves, 1984). The research on variations between raters suggests the problem is more complex: characteristics of the reader are part of what determines a holistic rating of writing quality. Cronnell (1980) reports differences between classroom teachers and Regional Lab scorers: classroom teachers rate student writing consistently higher on content, and consistently lower on form and format. Cross (1985) reports classroom teachers rated essays for the National Teacher Exam lower than teacher educators. Smith (1969) reports inconsistencies between ratings by acclaimed high school composition teachers and five other groups: prospective teachers, elementary teachers, junior high English teachers, high school English teachers and nonteachers. Presumably, when raters have dissimilar backgrounds, their different attitudes and values affect their essay evaluations.

Inter-rater reliabilities are greatly improved in large-scale writing assessments by establishing scoring leaders who select writing samples as models of different rankings and then socialize the rest of the raters to apply the same criterion (Myers, 1980). However, without access to the model essays used as anchors, it is difficult to compare holistic rankings from one corpus of texts with another set's rankings. What is needed is an independent description of discourse structures that can specify a given assessment rating.

Linguistic Correlates of Developmental Change

Two studies conduct Piagetian assessments and relate that data to linguistic structures observed in those students' writing (Lawson & Shepherd, 1979; Scinto, 1982; 1984; 1986). These linguistic structures were initially identified independently from developmental characteristics.

The t-unit is an independent clause with all attached dependent clauses. Lawson & Shepherd (1979) hypothesized that longer t-units would reflect more complex thought at the within-sentence level. They assessed the Piagetian stage of ninth grade students with a group paper and pencil test and then analyzed the relationship of each student's test score with their average t-unit length in an assigned composition. The results were mixed: significant positive correlations for males but not for females.

Scinto (1982) derived a technique to graph the relationships between t-units within an entire text from work published by the Prague Linguistic Circle (Danes, 1974; Vachek, 1966). Scinto reasoned that one could truly study structural discourse relationships only when connections across t-units within the whole text were considered. He developed four indices which report various ratios between the number of cohesive connections within the text, the total number of t-units in the text, the number of dependent clauses in the text, and modules of t-units within the text (text modules). His hypothesis that more complex cognitive structures would produce more complex cohesive connections within texts, as indicated by his four indices, was supported in an initial study of consolidated concrete and early formal operational British students, ages 8 - 14.

Santmire (1984a) developed her Writing Assessment Scale by constructing hypotheses about the nature of writing based on her

knowledge of Piagetian research on cognitive development. Her scale accounts for changes in both content focus and organizational patterns within the structure of the total text. She reports a significant positive correlation between her Writing Assessment Scale scores of eighth graders' written samples and an independent assessment of their social development using a written paragraph completion instrument (Hunt, Butler, Noy, & Rosser, 1978).

The Purpose of This Study

The purpose of this study is to compare the validity of three techniques of assessing writing to identify developmental differences between the written texts of four distinct cognitive groups. Each writing assessment records changes at a different structural level of text: the syntactic independent clause or t-unit (Hunt, 1965), combinations of t-units within the total text (Scinto, 1982; 1984; 1986), and the whole text (Santmire, 1984). Written samples were collected in three modes of discourse: descriptive, narrative, and expository. A group paper and pencil test (Gray, 1976) was the criterion measure of cognitive development.

Data analysis proceeded in two phases. The first phase analyzed the quantitative scores from the three writing assessments to answer these questions:

1. What are the changes in writing recorded by each of the writing assessment techniques?
2. How do the changes noted in one technique relate to changes documented by the others?
3. How do the changes documented by each writing assessment relate to a student's stage of cognitive development?

4. Does the writer in transition to concrete or formal operations produce more disorganized, incoherent writing than students who are at stage?

The second phase was a text analysis of the logical-structural characteristics of each expository writing sample, patterned after protocol reports in Piagetian studies of cognitive structures. The results are interpreted in light of expected relationships from Piagetian theory, and previously reported results from other studies which ignored developmental status but reported age data.

Any measurement technique is designed to codify or represent some phenomenon being studied. To identify developmental structures and establish the fact that developmental change has occurred is difficult given current measurement techniques (Glass, 1984; Santmire, 1984). Developmental change is structural rather than incremental; any given assessment may record a change that constitutes one stage, but no others. Periods of transition from one stage to another are characterized by fluctuations in behavior which are statistically unreliable, but developmentally meaningful. On the other hand, statistically significant correlations may reflect continuous incremental change which is not developmental. Statistically nonsignificant results may be masking a nonlinear, yet developmentally meaningful, relationship. Likewise, to observe no occurrences of a behavior being studied can be developmentally meaningful, yet statistically problematic. Ultimately, Piagetian studies of developmental change and stability are validated by their structural-logical analyses (Gruber & Voneche, 1977).

This study is designed to validate the ability of three writing assessment procedures, currently available, to detect developmental change in student writing. The sample size of this study is small ($N = 16$), reducing the power of the statistical analyses. A larger N would have increased statistical power, but would also have required a large additional investment of researcher time to generate the data, particularly for the Scinto indices and the Piagetian individual text analyses. Eliminating either the Scinto or Piagetian text analyses would have saved time, but those two assessment techniques seemed the most promising structural tools to investigate. Consequently, this study focuses on a small number of texts written by subjects representing a wide range of cognitive developmental operational stages. Assessing these texts with multiple techniques maximizes the likelihood of detecting at which stage, if any, those behaviors are developmentally characteristic. Studying a small number of texts in depth sacrifices some statistical power in order to be able to also conduct a structural logical analysis. This logical analysis can verify the construct validity of using a paper and pencil test score as the criterion of developmental status on a writing task, as well as generate initial data about other, developmentally meaningful, writing behaviors.

Chapter 2

REVIEW OF THE LITERATURE

The Nature of Thought

From a developmental constructivist perspective, all thought is a function of representations of past, present, and future (anticipated) interactions between an individual and the environment. The structure of thought is derived from the human organism's adaptation to the environment; a process of continuous assimilation and accommodation. Assimilation, taking in information, comprehends or gives meaning to an activity or experience by recognizing it as a part of a structure or concept. Accommodation adds that experience to the structure, either expanding and differentiating or consolidating the structure (Piaget, 1936/1952).

Development is characterized by a continuous process of assimilation and accommodation. What characterizes transitions between one logical structure and another are incomplete compensations or perturbations which the underlying structure(s) senses but cannot integrate. Perturbations are anything that proves an obstacle to reaching some goal. Cognitive disequilibrium occurs throughout the development of thought whenever the individual is aware of the inadequacies or contradictions inherent in using only one system by itself, yet is unable to coordinate two acquired systems into a new structure.

The primary aspect of any structure are positive judgments that state what is: those aspects of experience that are represented from preoperational thought on throughout the life cycle. Negations must be constructed and when positive judgments and negations are coordinated