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Field Dependence/Independence and its Relationship to Schema Utilization during Discourse Processing

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FIELD DEPENDENCE/INDEPENDENCE AND ITS
RELATIONSHIP TO SCHEMA UTILIZATION
DURING DISCOURSE PROCESSING

THESIS

Submitted to the Graduate Committee of the
Department of Curriculum and Instruction

Faculty of Education

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in Partial Fulfillment of the
Requirements for the Degree of
Master of Science in Education

by

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Abstract

This study investigated the relationship between field dependence/independence and the ability to utilize prior knowledge during discourse processing.

A sample population of thirty-one eighth grade students were given the Group Embedded Figures Test, a measure of field dependence/independence, and one of two narrative passages designed to measure the degree to which an individual utilizes prior knowledge.

The scores of these two measures were analyzed to determine if there was a significant difference between the field dependents and the field independents in their performance on the constrained and unconstrained passages, measuring schema utilization.

A significant difference was found in the mean score of the two groups on the constrained passage, no difference was found in their performance on the unconstrained passage.

This analysis leads to the conclusion that in this testing population of eighth graders, the field independent students were better able to utilize their prior knowledge to comprehend a written passage than the field dependent students.

Table of Contents

Chapter I	Page
Statement of the Problem	1
Purpose	1
Questions to Be Answered	1
Need for the Study	1
Definitions of Terms	4
Limitations of the Study	5
Summary	5
Chapter II	
Review of the Literature	6
Purpose	6
Cognitive Style	6
Field Dependent/Independent Styles	7
Field Dependence/Independence and Reading	10
Schema Theory	14
Schema Theory and Reading Comprehension	16
Schema Utilization and Individual Differences	20
Chapter III	
Design of the Study	23
Purpose	23
Hypotheses	23
Methodology	23
Statistical Analysis	27
Summary	28

Table of Contents (Con't)

	Page
Chapter IV	
Statistical Analysis	29
Hypotheses	29
Principal Findings	29
Additional Findings	32
Summary	32
Chapter V	
Conclusions and Implications	34
Conclusions	34
Implications for Further Research	35
Expansion and Refinements	37
Implications for Classroom Practice	37
Summary	38
References	39
Appendices	
A. Sample Test Questions of <u>GEFT</u>	46
B. Constrained and Unconstrained Narratives	47

Chapter I

Statement of the Problem

Purpose

The purpose of this study was to determine the relationship between field dependence/independence and schema utilization during discourse processing.

Questions to be Answered

The study attempted to answer the following questions.

Is there a significant relationship between the ability to process an unconstrained narrative passage and the degree of field dependence/independence?

Is there a significant relationship between the ability to process a constrained narrative passage and the degree of field dependence/independence?

Need for the Study

Current research in the area of cognitive science and specifically reading comprehension has focused to a large extent on the constructive nature of reading. This constructive nature is a "...process of active interaction between information explicit in the text and information contained in pre-existing knowledge structures or schemata" (Spiro & Tirre, 1980, p. 204). In other words,

the meaning of the text is constructed by combining information from various sources, and it is the act of combining information to produce the text's understood meaning that is referred to as a construction (Spiro, 1980).

Many researchers (Anderson, Reynolds, Schallert, & Goetz, 1976, Rumelhart, 1977, Spiro, 1980) have theorized that a central role in constructing meaning from a text belongs to pre-existing knowledge or schemata. But to simply say that prior knowledge is important to reading comprehension is not adequate. It becomes necessary to know how prior knowledge is used. Schema utilization is the term given to this process.

In a paper presented in 1980, R.J. Spiro states that individuals with comparable reading skills do not necessarily process text in the same way. Some readers tend to rely heavily on the text itself, while others process text based primarily on what they already know. Most efficient readers use both methods to process a text (Bobrow & Norman, 1975). However, a problem arises when an over reliance on one mode occurs. Spiro (1980) suggests that this maladaptive behavior of over reliance could be accounted for by differences in cognitive style, specifically the field dependence/independence dimension. He continues, "Despite the fact that the constructive processes have been the subject of continuous investigation for over ten years now, there has been next to no consideration of individual differences in that vein..." (Spiro, 1980, p. 16).

The relationship of field dependence/independence to reading comprehension is a subject that has been thoroughly investigated. However the results of these investigations have been inconclusive. A strong positive correlation has been found between field independence and reading ability by

some researchers (Baber, 1976, Cohn, 1968, Gluck, 1972, McDaniel, 1973, Stuart, 1967, Watson, 1969). Other researchers have found no significant relationship between field dependence/independence and reading ability (Buriel, 1978, Daku, 1978, Martin, 1979).

This disparity suggests that researchers are perhaps not taking into account specific aspects of cognitive style that coordinate with specific aspects of reading behavior. However, a study of Spiro and Tirre (1980) did investigate the relationship between the cognitive style of field dependence/independence and the reading behavior involving schema utilization. They hypothesized a relationship between these two variables would be significant because of similar processing requirements. The ability to disembed a figure from a field, or field independent, is analogous to the process of applying schemata to a text because both processes require "...operating with two structures ... where one of the structures must be fit from memory onto the structure of the physically present text" (Spiro & Tirre, 1980, p. 6). A principal finding of the study was that field independent individuals of college age are more likely to use their prior knowledge to facilitate comprehension of a written passage.

The intent of the present investigation was to determine if this same relationship between field independence and schema utilization would be demonstrated in a testing population of eighth grade students. This study is a partial replication of the previously mentioned study by Spiro and Tirre (1980).

Definitions

Key terms used in the study are defined as follows.

Individual differences. Variation and preference of an individual in perceiving, remembering, and thinking.

Cognitive style. The characteristic, self consistent modes of functioning which individuals show in their perceptual and intellectual activities.

Embedded figure. A simple figure within a larger complex figure, so organized as to obscure the sought after simple figure.

Field independent. Ability to break up an organized visual field in order to keep part of it separate from that field.

Field dependent. Perception strongly dominated by the overall organization of the surrounding field, parts of the field are experienced as fused.

Schema, schemata. Prior knowledge; the building blocks of cognition which determine how we perceive, remember, understand, learn and solve problems.

Schema utilization. The ability to process information based on prior knowledge.

Discourse processing. Comprehending written text.

Unconstrained narrative passage. A passage which contains a certain body of information which lacks special significance due to the context. For example a supermarket context is less constrained than a restaurant context because it is not as important to identify specific actions in order to understand the passage.

Constrained passage. A passage which contains special significance due to the context.

Limitations of the Study

Written recall was the only measure of reading comprehension used in this study. Measures such as the cloze, written questions, oral questions, and oral recall were not considered.

Another limitation was the small number of students in the testing population. Due to illness, the original number of forty subjects was reduced to thirty-one.

Summary

Since the amount of research dealing with the relationship between field dependence/independence and schema utilization is limited, there was a need for further study. Evidence of previous researchers suggests that the field dependence/independence dimension of cognitive style may have a bearing on the way in which prior knowledge is utilized, which is critical to an understanding of reading comprehension. This study investigated this relationship between field dependence/independence and schema utilization with a testing population of eighth grade students.

Chapter II

Review of the Literature

Purpose

This study investigated the relationship between the field dependent/independent dimension of cognitive style and the utilization of prior knowledge during discourse processing.

Related literature reviewed in this chapter includes a discussion of cognitive style, field dependent and field independent styles, field dependence/independence and its relationship to reading ability, schema theory, schema theory and its relationship to reading comprehension, and field dependence/independence and its relationship to schema utilization.

Cognitive Style

Identification of individual differences in children based upon cognitive style has been an important element of recent research in many disciplines (Blanton & Bullock, 1973, Daku, 1978, Smith, K. M., 1973). Although application of the findings naturally differs among the disciplines, there is general agreement on the definition of cognitive style. It refers to the variation and preference of an individual in perceiving, remembering and thinking. It is a mode of functioning which individuals exhibit in their perceptual and intellectual activities which is characteristic and self-consistent (Witkin, Oltman, Raskin & Karp, 1971).

Witkin, Moore, Goodenough and Cox (1977) have applied four characteristics to the concept of cognitive style. The first characteristic defines it as concerned with form rather than content of cognitive activity. Differences in

the process of perceiving, thinking, problem solving, learning, relating to others, etc. are a primary importance. Second, cognitive styles are "pervasive dimensions." They become diffused throughout every part of the human psyche, allowing the mind to be treated as a holistic entity. Third, cognitive styles are stable over time, although this does not preclude that they are unchangeable. The fourth characteristic is that cognitive styles are bipolar. This distinguishes it from ability dimensions like intelligence, where having more of an ability is better than having less. Each pole of a cognitive style has to be judged in relation to specified circumstances.

Kogan (1971) has enumerated nine separate cognitive dimensions, many of which are inter-related. However, the present study is concerned only with the field dependent/independent dimension.

Field Dependent/Independent Styles

Field dependence/independence is a dimension of cognitive style which describes an individual's ability to perceptually disembed a simple figure from a complex one. This ability to disembed or to "keep things separate in experience" perceptually also manifests itself in other areas of psychological activity. Researchers have shown that the way in which an individual perceives particular stimuli may indicate certain personality traits and modes of cognitive functioning. Tests such as the Rorschach are based on this premise and it is the same rationale on which tests for field dependence/independence are based. The ability to overcome embedded contexts in perceptual functioning is related to other areas of cognitive functioning (Witkin et al., 1971).

Individuals who are adept at locating an embedded figure are considered more field independent. Those who have difficulty locating an embedded figure are considered more field dependent. Perhaps a more useful way to distinguish these two styles is to describe how they are characteristically exhibited. However, it is important to consider these behaviors in terms of a continuum rather than an all-or-nothing framework.

Field independent persons tend to be more analytical, articulated and interact more actively with things within their environment (Daku, 1978). They tend to be inattentive to social cues and more impersonal in orientation. They are individualistic, competitive and sensitive to intrinsic motivational factors, directive in interpersonal relationships and attentive to significant details (Dixon, 1981). Research suggests that students with a more field independent style learn better with an inductive approach (Kogan, 1971, Smith, 1973). Field independent people are high in cognitive restructuring skills as well as in personal autonomy and low in social sensitivity and social skills (Witkin et al., 1977).

Individuals considered to be field dependent tend to be more global in their interaction with the environment. Dixon (1981) states that field dependent persons are attentive to social cues such as body language, facial expression, and eye contact. They are people oriented and are influenced by the ideas of others. They tend to be cooperative and sensitive to external positive and negative reinforcement, accepting of environmental organization and more likely to comprehend the "big picture." Field dependent individuals tend to be more social in nature and might benefit most from a teacher-directed approach to instruction (Kogan, 1971, Smith, 1973). In contrast to field independents, field

dependents are high in social sensitivity and social skills and low in restructuring skills and personal autonomy (Witkin et al., 1977).

Boys and men tend to be more field independent than girls and women. Present evidence indicates that sex differences may not be present before the age of eight or in geriatric groups. Developmental curves covering the eight to twenty-four year period show a marked and continuous increase in field independence. After the age of fifteen the developmental curves level off and approach a plateau in the period of young adulthood. In geriatric groups there is a return to field dependence.

Field independent performance is conceived as reflecting more developed cognitive functioning, however this does not imply that persons who are field independent are superior in general intelligence. When Embedded Figures Test scores were correlated with sub-scores of the WISC, significance was reached only with the analytic portions, represented by Block Design, Object Assembly and Picture Completion (Goodenough & Karp, 1961). Neither does field independence imply better adjustment or mental health, although there is some evidence of a higher prevalence of psychopathology at both extremes of the field dependence/independence continuum (Witkin et al., 1971).

Several investigators have sought to determine the sources of differences among people in the development of field independence. Early experiences in the family are a possible source for these differences. Field independent children have interacted with their parents in ways that fostered separate and autonomous functioning (Barclay & Cusumano, 1976, Berry, 1966, Dawson, 1967, cited in Witkin et al., 1971). It has been found that the extent of opportunity for and encouragement of separation, particularly from the mother, appears to

foster a more field independent individual. Other possible reasons for field independence are the manner of dealing with the child's expression of impulse and characteristics of the parents themselves which influence their role in the separation process and in the regulation of impulse (Dershowitz, 1966).

In summary, the field dependence/independence dimension of cognitive style refers to the ability of an individual to differentiate a targeted object from a surrounding field. The degree to which an individual is able to perform on a test of field dependence/independence is generally related to the "... extent to which information and impressions are discrete, structured and assimilated" (Daku, 1978, p. 22).

Field Dependence/Independence and Reading

Since the ability to read adequately is an important determinant of school achievement, it follows that any variables which affect this ability should be of concern to the educator. The relationship of cognitive style to school achievement is one that has been examined by several disciplines, causing some to question the appropriate use of the curriculum. "If a particular cognitive style impedes the school success of a student, then perhaps it is not the student's style which is wrong but instead the curriculum with which he has to cope" (Daku, 1978, p. 28). Reading plays a critical role in the successful implementation of many curriculums, therefore an investigation of the relationship between cognitive style and reading ability could provide insights into guaranteeing successful curriculums for all students.

Findings vary as to the relationship between reading and field dependence/independence, although much of the research indicates that a significant positive relationship exists.

Watson (1969) investigated the relationship between reading and field dependence/independence with a testing population of seventy-five first, second and third grade boys. She correlated performance on the Children's Embedded Figures Test with the reading portion of the Stanford Achievement Test and the Draw-A-Person Test and found that field independent boys in grades one through three are better readers than field dependent boys of the same age.

Baber (1977) used two different grade levels, first and fourth, to determine the relationship between field dependence/independence and silent reading comprehension. Significant positive correlations were reached at both grade levels between the two variables.

Santostefano, Rutledge, and Randall (1965) determined the cognitive style of forty-seven boys classified as either remedial readers or good readers. The results of testing this eight to thirteen year age group led the authors to conclude that to read effectively individuals must "... call on a particular constellation of cognitive mechanisms or principles which actively select, organize assimilate, and process shapes and forms which ultimately are learned as symbols representing sounds and objects" (Santostefano et al., 1965, p. 61). If these cognitive mechanisms are unavailable, a reading disability may result.

McDaniel (1973) was interested in building testing instruments which would be useful in identifying and describing the characteristics of perceptually handicapped children. He found that motion picture tests of perceptual ability correlated significantly with reading scores as measured by the Iowa Test of Basic Skills. McDaniel concluded that "the ability to recognize visual patterns accurately among distracting elements may be among the more important perceptual processes related to severe reading disabilities" (p. 758).

The research of Stuart (1967) indicated that a strong positive relationship exists between field independence and reading achievement in seventh and eighth graders. He suggested that the identification of cognitive style before beginning reading instruction would be beneficial.

Cohn (1968) tested fifty-nine boys and sixty-three girls in order to determine the relationship between field dependence/independence and reading comprehension. This group of sixth graders were tested with the Embedded Figures Test, and Lorge Thorndike Intelligence Test and the Sangren-Woody Reading Test. A significant positive relationship was demonstrated between the Embedded Figures Test and four reading subtests: Details, Main Ideas, Sequence, and Total Reading Score. Cohn summarizes his findings by stating that:

Field independence was positively and significantly correlated with those aspects of comprehension that require reorganization of a field to solve a problem, apparently when the solution had to be found through new cognitive activity rather than through reliance upon experience and external authority (p. 476)

Peterson and Magaro (1969) examined the relationships between performance on the Embedded Figures Test, and Wide Range Achievement Test, and a reading related figure ordering task. The sample population was twenty high school students and although no significant correlations were found among the three measures, it was noted that all statistical outcomes were in the predicted direction.

Although the review of the literature seemed to support the hypothesis that field independence is positively correlated with reading achievement, there were three studies that did not support this theory.

In a cross cultural study, Buriel (1978) found that students who were tested on the Metropolitan Achievement Test and performed well on the reading section of that test were not necessarily field independent. The results of the testing showed no main effect due to field dependence/independence.

Daku (1978) found no significant relationship between reading achievement and field dependence/independence in a testing population of sixth graders. He felt that the discrepancy between his findings and the findings of others is that previous studies failed to control for IQ which he considered a confounding variable. Significant levels of correlation between field dependence/independence and reading achievement would have been reached if the author had not controlled for IQ. This led him to conclude that "Field dependent students tend to score low on IQ tests and tend to score low on reading vocabulary and comprehension tests" (p. 43). On the basis of his data Daku found that IQ was a better predictor of reading success than the Group Embedded Figures Test.

Martin (1979) investigated the relationship between scores on the Hidden Figures Test and reading achievement. His testing population was one hundred and twenty-three college students. He found no significant relationship between the variables.

The research strongly indicates that at all age levels the cognitive style of an individual can influence reading achievement. Field dependence/independence is an area of cognitive science which has provided valuable information for those interested in understanding possible reasons for school failure, in general, and reading disabilities, in particular. The tremendous variability in a way in which students process information, perceive instructional tasks and cope with analytical and nonanalytical materials warrants further investigation.

Schema Theory

Moderate educational theorists generally attribute the idea of schema to Bartlett (1932). He theorized that knowledge is incorporated in abstract structures that have certain properties. He used the term schema to denote these structures, borrowing the phrase from the work of Piaget (1928).

Not much interest was aroused by Bartlett's work at the time, but it was revived during the last two decades by researchers who did much of their work at the Center for Information Processing in San Diego, California.

More recent theorists such as Rumelhart and Ortony define schema as a "... cognitive template against which new inputs can be matched and in terms of which they can be comprehended" (Rumelhart & Ortony, 1977, p. 23).

Purves (1979) defines schema as a mental outline, an expectation or a prediction used to understand something.

Smith (1975) prefers the term cognitive structure to schema. His definition includes a system of categories which enables the user to organize information in terms of similarity and dissimilarity. A second aspect of Smith's definition is that schemata have rules or specifications of "distinct features" for allocating objects or events to particular categories. The last characteristic is a network of inter-relations among the categories themselves.

The characteristics of schemata which enable the information processing to take place are most precisely set out by Rumelhart and Ortony (1977). The first of these characteristics is that schema have variables with which we associate persons, objects, and sub-events. An example of this would be the schema for GIVE. This schema could include three variables, the giver, the gift, and the recipient. The values for these variables differ depending on

contextual or situational factors, however the internal relationship within the GIVE schema remains the same. Regardless of the environment, the giver will give the gift to the recipient.

The second characteristic is that schemata can embed one within another. For example, the FACE schema contains within it a network of subschema representing eyes, nose, mouth, etc. These in turn would have subschema. The eye would have a subschema for iris, pupil, eyelash, etc. Sheridan (1978) notes that the position of embedded schemata in a hierarchy is related to its index of importance. She writes that "Schema are more likely to contain concepts for restructuring or retrieving important rather than unimportant information" (p. 17).

The third characteristic is that schemata represent knowledge at all levels of abstraction, ranging from basic perceptual elements to higher level conceptualizations such as action sequence or story plots.

The fourth characteristic of schemata is that they present knowledge rather than definitions. Concepts are retrieved not by remembering the total of all its basic components but rather by relating the new information or stimulus to those aspects of the event already stored in the memory. Schemata relate new knowledge to that which is already known.

The fifth characteristic is that schemata are dynamic in nature. They are actively seeking, selecting, acquiring, organizing, storing, and at appropriate times, retrieving and utilizing information about the world.

The sixth and final characteristic of schemata is that they function as recognition devices. They process and evaluate input to determine "goodness of fit." This function is analogous to hypothesis testing.

Schema theory attempts to explain the process of the representation of knowledge and how the representation facilitates the use of knowledge in particular ways (Rumelhart, 1980). It attempts to provide a theory of learning that will help solve problems not only in the domain of education but in psychology as well.

Schema Theory and Reading Comprehension

Schema theory offers a theoretical base to explain factors that influence a reading comprehension. It offers the explanation that the process of understanding discourse is a matter of "... finding a configuration of schemata that offers an adequate account of the passage in question" (Rumelhart, 1980, p. 47). Comprehension is the use of prior knowledge to create new knowledge.

Durkin (1981) writes that "A major tenet of schema theory is that comprehension is as dependent on what is in a reader's head as it is on what is printed" (p. 25). This tenet is supported by the work of Anderson, Reynolds, Schallert and Goetz (1976). They asked two groups of college students to read one of two passages. The two student groups consisted of male weight lifters and female music majors. Both of the passages were constructed to be ambiguous; one could be perceived as describing either a prison or a wrestling match and the other could be understood to be about either an evening of playing cards or a rehearsal session of a woodwind ensemble. The results of several different types of comprehension testing indicated that there was a significant relationship between the subject's backgrounds and their interpretation of the selections. The authors determined these results to indicate that a high level background schemata provided the interpretation framework for comprehending discourse.

Understanding a text is considerably more than just understanding the words and sentences. Tierney and Spiro (1979) stress two key points about reading comprehension:

1. A text is never fully explicit nor is reading comprehension exclusively textual.
2. A number of factors influence both the extent to which an author's ideas are represented explicitly in text and the extent to which a reader's understanding will vary from both the author's intended message and the explicit textual information. (p. 133)

Adams and Bruce discuss this interaction between the message, the reader and the author in a paper written in 1982. Effective linguistic messages which ensure comprehension involve correctly predicting the kinds of related knowledge the intended readers already have, producing expressions that will activate appropriate subsets of that knowledge, and presenting those expressions in a manner that will encourage the readers to interrelate the activated knowledge into a structure that will closely capture the intended meaning. The authors illustrate this relationship by comparing the differing responses of adults and a child to the fable *The Rabbits and the Frogs*. They suggest that the difference between the two interpretations of the fable can be attributed to "... a difference in the knowledge or application of a single facet of the background information presumed by the author" (p. 5).

An investigation by Pace (1979) resulted in similar conclusions about the importance of relevant background knowledge to the task of comprehension. This study examined the relationship of background knowledge and oral comprehension. A testing population of kindergarteners through sixth graders listened to four stories at increasing levels of unfamiliarity. They were subsequently asked questions about the stories. The results of the questioning

indicated that children at all grade levels had nearly perfect comprehension for the highly familiar stories, while none demonstrated comprehension of the unfamiliar stories although the sixth graders performed significantly better than the younger children on the unfamiliar stories. The author interpreted these results to indicate that prior knowledge provides the framework for comprehension.

Stevens (1980) conducted a study investigating this relationship between prior knowledge and comprehension with a testing population of ninth graders. The author identified high and low knowledge topics for each subject. Students were then given paragraphs to read which corresponded to each student's high and low knowledge topics. The author concluded that prior knowledge significantly aided comprehension of that topic. She states that "... prior knowledge of a topic is crucial to the superior comprehension on material concerning the topic" (p. 327).

In a follow-up study, Stevens (1982) examined whether direct teaching of background knowledge concerning a topic will have beneficial results in students' ability to comprehend passages concerning that topic. The design of the study was structured such that one group of high school boys received instruction concerning the background of the target passage, while the other group received non-relevant instruction concerning another topic. Both groups read the targeted passage and answered comprehension questions regarding the passage. Stevens determined that the group who received prior relevant instruction performed significantly better than the control group in the ability to answer the comprehension questions correctly. She concluded that a reading teacher's role might additionally be viewed as a teacher of relevant information.

Pearson, Hansen and Gordon (1979) investigated the relationship of background information to the reading comprehension of "natural" texts. Second grade students were first tested on their background knowledge of spiders and subsequently given a passage to read on the same subject. The authors reported that those who had a "schema for spiders" prior to reading the passage performed significantly better on both explicit and implicit comprehension questions.

Schemata provide the device by which the reader allocates attention. This led theorists to hypothesize that significant textual elements may be recalled better because they are learned better. Anderson (1977) theorized that two possibilities could account for this. The first is that schemata trigger extra attention to be devoted to important elements in the text while less important items must be skimmed. The second possible reason for the better learning of significant elements is that schemata provide "ideational scaffolding" for selected categories of text information. Anderson explains this idea as follows,

A schema will contain slots for important information, but may contain no slots or only optional slots for unimportant information. Information gets encoded precisely because there is a niche for it in the structure. (p. 14)

Anderson, Spiro, and Anderson (1977) researched these two possibilities, attention directing and slot-filling, with a testing population of college students. The testing instruments used were two narrative passages which closely paralleled each other in terms of types of items mentioned and the order in which they were presented. The difference between the two was that one of the passages described dining in a fancy restaurant while the other described shopping for food in a supermarket. Students were asked to read one of the two passages and after being given the WRAT, they were asked to

reproduce the entire passage, in the correct order, without leaving out anything. The results indicated a significant difference in the recall of the restaurant group as compared with the supermarket group. The authors attribute this difference in the two groups to "... differences in the high-level schemata evoked by the restaurant and supermarket narratives" (p. 438). Students were able to reconstruct the restaurant passage better because information presented in that narrative was more significant in the context of a restaurant than it was in the supermarket context.

In summation, the research involving the relationship between the ability to use prior knowledge and reading comprehension indicates a positive correlation. The function of schemata as recognition devices is particularly pertinent to the present study. Research has shown that schemata serve to activate attention as well as provide "ideational scaffolding."

Schema Utilization and Individual Differences

The issue of schema utilization is a complex one. To say that prior knowledge is important is not adequate. It becomes necessary to know how prior knowledge is used (Langer, 1982), and how it is used may not be the same for all individuals. Even when the reading skills of two individuals are comparable, they most probably will differ in the way they allocate their processing resources (Spiro, 1980). Some readers tend to rely heavily on the explicit text, while others rely on what they already know. Good readers tend to utilize both tactics, but all individuals use their processing resources somewhat differently. Why this is true was the concern of Spiro and Tirre (1980). They hypothesized that cognitive processing styles may dictate some individuals discourse processing style. Spiro and Tirre asked one hundred and

twelve college students to read either a narrative about a trip to the supermarket or a parallel narrative about a dining experience. The subjects were then given the Embedded Figures Test and a vocabulary test, after which they were asked to recall the passage they had read. Those students who had low EFT scores also scored significantly lower on the recall of the restaurant passage. This led the authors to conclude that college students scoring lower on an embedded figures test used their prior knowledge less in the performance of a discourse processing task.

A pilot study by Spiro, Tirre, Freebody, and DeLoach (1979) found that three etiological factors, decoding skill, cognitive style, and general schema availability, were somewhat predictive of discourse processing style in fifth and sixth grade students. The authors conclude the discussion of their results with the following statement:

All of the preceding discussion must be considered conservatively. More work needs to be done to demonstrate the reliability, validity, and range of application of these findings across types of tasks and texts. Their potential practical importance, however, should make the study of individual differences from a constructive viewpoint a major priority in reading research. (p. 12)

Summary

The majority of the literature concerning field dependence/independence and reading ability indicated a positive relationship between the two variables. This relationship exists of all developmental levels, from elementary to college age. The conflicting research, consisting of three studies, included the same developmental levels, however, no significant correlations were found between field independence and reading ability. The reasons for this disparity could be differences in testing populations of research methodology.

Related literature dealing with the use of prior knowledge and reading comprehension indicated a significant positive relationship between these two variables. This relationship was found in both written and oral presentations.

Spiro and others hypothesized that these two strands of research could be related. His investigations determined that for some individuals cognitive style may indicate discourse processing style.

Chapter III

Design of the Study

Purpose

This study examined the relationship between field dependence/independence and the use of prior knowledge during discourse processing.

Hypotheses

1. There is no significant difference in the mean score of field independents and the mean score of field dependents on the recall of a constrained passage measuring schema utilization.
2. There is no significant difference in the mean score of field independents and the mean score of field dependents on the recall of an unconstrained passage schema utilization.

Methodology

Subjects

This study consisted of thirty-one eighth grade students attending a semi-rural junior-senior high school in western New York State. They ranged in age from twelve to fourteen years. The sample consisted of thirteen females and eighteen males; all were of average intelligence, as indicated by scores on the WISC. These students were also reading at or above an eighth grade level as determined by scores from the Metropolitan Reading Achievement Test of May 1983. Additionally, the instructor of this testing population, a social studies teacher, confirmed that they all were presently reading at an eighth grade level.

Eighth grade students were chosen for this study because it was the intention of this investigator to determine if the results of the present study would be similar to those of Spiro and Tirre (1980). The Spiro and Tirre study indicated that there was a significant relationship between field independence and schema utilization among college-age students. The eighth grade age group was also determined to be appropriate based on the evidence that there is a "... marked, continuous increase in field independence between eight and about fifteen years..." (Witkin, Goodenough & Karp, 1967). It seemed likely that there would be a representative range of field dependent and field independent scores in this age group.

Instruments

The instrument used to determine field dependence/independence was the Group Embedded Figure Test (GEFT), Consulting Psychologists Press, Inc., 1971. The GEFT requires the detection of a memorized target shape in a complex line and shade configuration. It is a timed test, one which requires the subject to find and outline the simple target shape when viewed in an embedded context. Subjects are allowed to look at the simple form as often as necessary. Simultaneous presentation of the simple form and the embedded context is impossible as the simple forms are located on the back cover of the test booklet. There are seven practice problems and eighteen other problems. Scores are determined only from the eighteen problems. This score is based on the number correct out of a possible eighteen. All answers are scored as either correct or incorrect, no partial credit is given. Omitted problems are scored as incorrect.

It is suggested in the test manual for the GEFT that time limits may have to be adjusted for younger populations, that is, populations younger than the norming population of college students. For the purposes of this study, the time limits were extended from five to seven minutes for each nine-problem section.

The GEFT has a reliability estimate of .82 for both males and females, as computed by the Spearman-Brown formula. The validity coefficients for the GEFT are .82 and .63 for males and females respectively when compared with the Embedded Figures Test, an individually administered test of field dependence/independence.

Use of the GEFT for this study was appropriate because it requires subjects to superimpose a structure from memory onto a stimulus structure. This parallels schema-based processing which involves subjects bringing a schema from memory to fit into the structure of the physically present text. A sample problem from the GEFT is contained in Appendix A.

Two narrative passages were used to determine the extent of schema utilization. These passages were adopted from passages used in a study by Anderson, Spiro and Anderson, 1977, which determined that significant information is learned better than insignificant information. These passages were rewritten by this investigator in an appropriate form for younger readers. The readability of the passages as determined by the Fry Readability Graph was between seventh and eighth grade.

One of the passages involved a trip to the supermarket. This was considered the unconstrained passage because the information presented lacked special significance within the framework of a supermarket schema.

A second passage involving a trip to a restaurant was constructed to closely parallel the supermarket narrative. This was considered to be the constrained passage because the information presented was significant in the context of a restaurant. For example, in a restaurant it matters who ordered the roast beef since that person will be eating it. The context places constraints on the interpretations that could be possible. However, in a supermarket it matters less who puts the roast beef into the cart, since the meat will probably be shared at a later meal.

Each of the two passages contained exactly the same stimulus items presented in the same order. There were seventeen significant items or actions in both of the passages. Scores were determined by the total number of significant items recalled. Narrative passages are contained in Appendix B.

Procedure

The students participated in the procedure during regular class time in groups of twenty-two and nine. The GEFT was administered by the investigator to the students. Students were not familiar with the investigator.

All the students were provided with test booklets and pencils with erasers. The instructions were read aloud as the students read along, silently. Students were then asked to perform the sample problems and to raise their hands if they had any questions. In both groups there were initially several questions about the correct procedure. They were then requested to do the seven problems in a time limit of five minutes. The investigator circulated the room and gave additional explanations to those who seemed to be having difficulties. Students were then informed to begin the first of two sections, which were to be timed. They were instructed to work as accurately and quickly as possible in the seven minutes allowed for each of the two sections.

The scores from the GEFT were analyzed and the population was divided into two groups, either field independent or field dependent. One-half of the field independent group was assigned the unconstrained passage, while the other half was assigned the constrained passage. The same procedure was followed for the field dependent group. Assignments were random.

Reading and recall of the passages took place on the next school day. Students were instructed to read their assigned passage and were informed that they would later be asked about what they had read.

After all the students had read their passage, a brief explanation of the GEFT was given. Characteristic attributes were explained. Students were able to identify their own cognitive style because their narratives were initialled either FI or FD according to their performance on the GEFT. This discussion took approximately ten minutes and served the function of delaying the recall of the passage.

The students were then asked to turn their narrative over and to recall in writing as much as possible of the passages. They were informed that the format of the recall was not important, but to try to include as much detail as possible. They were informed that the investigator had determined seventeen significant items or actions and to use that figure in judging the completeness of their recall.

Statistical Analysis

A two-way analysis of variance was used to determine if there was an interaction effect among the variables of field dependence/independence and constrained/unconstrained passage.

Summary

Based on a study by Anderson et al. (1977), a method for determining schema utilization was developed by the investigator. Scores from this test were correlated with scores from the GEFT. These correlations provided information on the relationship between field dependence/independence and the ability of eighth graders to use prior knowledge while processing discourse.

Chapter IV

Statistical Analysis

Purpose

The relationship between field dependence/independence and the use of prior knowledge, i.e. schema utilization, was investigated in this study. This chapter contains the analysis of the data, the findings, and the interpretations.

Hypotheses

1. There is no significant difference in the mean score of field independents and the mean score of field dependents on the recall of a constrained passage measuring schema utilization.
2. There is no significant difference in the mean score of field independents and the mean score of field dependents on the recall of an unconstrained passage measuring schema utilization.

Principal Findings

A two-way analysis of variance was performed in order to determine if there was an interaction effect among the variables. The results of the analysis determining the interaction are located in Table I.

Table 1
Two-Way Analysis of Variance of the Differences
in Schema Utilization Due to Cognitive Style

Source		df	SS	MS	F-Ratio
Cognitive Style	(A)	1	17.29	17.29	1.82
Schema Utilization	(B)	1	7.00	7.00	0.74
Cognitive Style & Schema Utilization	(AXB)	1	41.29	41.29	4.34
Error		24	288.86	9.51	
Total		27	293.86		

Critical F = 5.72 alpha = .05

In order for an interaction to have taken place, the F-ratio must be greater than the critical F of 5.72. These results were not obtained, indicating that no interaction existed among the variables.

A two sample t-test was computed in order to determine if there was a significant difference between the field dependents and the field independents on the mean score of the constrained and unconstrained passages. The scores of the two groups on the constrained and unconstrained passages are contained in Table 2. Additionally, the mean, the standard deviation, the critical t-value, the degrees of freedom, and the probability level are included in the table.

Table 2
Differences in the Mean Scores of Constrained and
Unconstrained Passages Due to Cognitive Style

Field Dependent		Field Independent	
A	B	C	D
constrained	unconstrained	constrained	unconstrained
5	2	16	5
11	9	15	9
8	10	7	7
9	9	10	12
9	10	11	6
1	13	11	7
9	9	10	10
Note. Maximum score = 17			
Mean 7.43	8.86	11.43	8.00
S.D. 3.36	3.34	3.31	2.45
	AxC		BxD
t-value	2.31		-0.55
df	11.90		11.00
p	0.041		0.59

The probability level must be less than .05 in order for a significant difference to exist. On the constrained passage the probability level was 0.041. Therefore, the data rejected hypothesis one which stated that there is no significant difference in the mean scores of field independents and the mean score of field dependents on the recall of a constrained passage measuring schema utilization. This indicates that the field independent students

performed significantly better than the field dependent on the constrained passage which demanded greater use of prior knowledge in order to comprehend the passage.

The probability level was -0.55 on the unconstrained passage. Therefore, the data failed to reject hypothesis two which stated that there is no significant difference in the mean score of field independents and the mean score of field dependents on the recall of an unconstrained passage measuring schema utilization. This indicates that there was no significant difference in the performance of the field independents and the field dependents on the unconstrained passage which was designed to be less demanding on the use of prior knowledge for comprehension.

Additional Findings

While not a major investigation of the present study, performance on the test of field independence based on sex, was of note. Four of the thirteen females in the testing population received scores of twelve or better on the test of field independence, while eleven of the eighteen males received scores of fourteen or better. This indicates that in this testing population only thirty percent of the females were field independent, while sixty-one percent of the males were field independent. This agrees with the findings of Witkin et al. (1971) that men and boys tend to be more field independent than girls and women.

Summary

A two-way analysis of variance determined that there was no interaction effect among the variables of field dependence/independence and constrained/unconstrained passage.

A two sample t-test indicated that there was a significant difference between the mean score of the field independents and the mean score of the field dependents on the recall performance of the constrained passage. No such significance was found for performance of the unconstrained passage.

Chapter V

Conclusions and Implications

Purpose

This study investigated the relationship between the cognitive style of field dependence/independence and the ability of eighth graders to utilize prior knowledge during a discourse processing task.

Conclusions

The results of the analysis of variance indicated that there was no interaction effect among the variables of field dependence/independence and the constrained/unconstrained passages.

The results of the t-test demonstrated that the mean raw score for the constrained passage was significantly higher for field independents than for field dependents. These results indicated that for this testing population, the field independent students utilized their high level schema for dining in a restaurant better than field dependent students.

Field dependent individuals recalled the unconstrained passage as well as or better than the field independent subjects; the mean raw scores, out of a possible seventeen, were 8.86 and 8.00 respectively. This is important to note because it indicates that field dependents' general recall was equal to or better than their field independent counterparts, therefore the better performance of the field independents on the constrained passage was not due to the superior recall ability of that group. However, the field dependents performance on the constrained passage did not improve significantly from their performance on the unconstrained passage, which would indicate that they are not relying on their prior knowledge to process the constrained passage.

This does not preclude that the field dependent students in this study can not or do not use prior knowledge for all processing tasks. It seems unlikely that they would score at or above the eighth grade level on a test of reading achievement and not have used some knowledge-based processing strategies. Spiro and Tirre (1980) have a possible explanation for this when they note that "... the use of prior knowledge to help one remember better is somewhat optional; one can use knowledge to enrich understanding without necessarily gaining mnemonic benefits" (p. 11). It may be that they are better at using the text's inherent structure to improve recall.

Implications for Further Research

Since the results of this study indicate that field dependent individuals are less likely to utilize prior knowledge while processing discourse, research needs to be conducted to determine possible factors to account for this. The relationship demonstrated in this study between field independence and use of prior knowledge for discourse processing does not indicate a causal relationship and further research should focus on additional factors which influence the processing task.

Because the tendency to rely on data-based rather than knowledge-based processing indicates a possible over-reliance on the text itself, an analysis of the subscores might explain where a breakdown of processing occurs for field dependents who are experiencing reading comprehension problems. A test of reading comprehension such as the TORC which emphasizes the relational aspects of reading comprehension, could be of value in diagnosing problem areas.

Another area for further research could be to determine whether field independent individuals may also have difficulty in reading comprehension because of over-reliance on knowledge based processing and not paying an adequate amount of attention to the text. This point is mentioned because on an examination of individual scores, it was noted that not all field independents performed well on the constrained passage. This indicates that there are great differences in individual processing styles and that one type of cognitive style does not necessarily preclude effective discourse processing.

Given the evidence provided by Kogan (1971) and Smith (1973) that field dependent individuals learn better with a teacher directed approach, an investigation examining the effects of instructional approach to schema utilization with both field dependent and field independent individuals could prove beneficial.

A study could be undertaken to investigate alternative instruments to measure schema utilization. The method used in this study has limitations because recall of the passage does not necessarily indicate how individuals are processing but rather how much.

As discussed in a paper by Smith (1979), open responses such as the recall method used in this study, provide the purest form of reader response. An alternative form of recall is the probed question. Use of the probed question could result in a more complete picture of what is comprehended, at the risk of activating recall by the question itself. She notes that if the mode of recall is uncomfortable for an individual, such as speaking into a tape recorder or writing, a probed recall may reveal more information.

Expansion and Refinements of the Present Study

Since several of the students commented to the investigator that they would prefer to retell the passages orally, use of an additional mode of retelling, such as tape recording or questioning, could be considered. A preference in mode of presentation could be a confounding variable, and as such, should be a consideration in following research.

The procedure of recall instruction should include a sentence such as, "Retell the passage as though you were telling this story to a person who had not read it." This could improve both the quantity and quality of the recall.

Implications for Classroom Practice

The analysis of the data indicates that field dependent youth tend to rely on data-based processing as a primary strategy for comprehending written discourse. Over-reliance on one tactic can result in serious maladaptive patterns. Instruction should attempt to make the student aware of the importance of using prior knowledge to understand written discourse in conjunction with other strategies.

Early identification of cognitive style could result in a better match of individual preference to teaching style. Since field independents tend to learn better with an inductive approach to teaching, it could prove counterproductive to insist on a teacher directed approach to instruction. This is not to say that instruction should only take place between teachers and students with compatible styles, rather it should be a consideration when instruction seems ineffective or when motivational problems arise.

Making students aware of their cognitive style could prove beneficial and enriching for them. Social and emotional adjustments may progress more smoothly with additional self-knowledge. The self-awareness of the relationship of cognitive style to discourse processing style could enable a less skilled reader to try to monitor his processing style thereby improving his comprehension.

Summary

This study demonstrated that field independent eighth graders perform significantly better than field dependent eighth graders on a constrained passage measuring schema utilization. There was no significant difference between the two groups on recall of the unconstrained passage. These results indicated that in this testing population field independent students were more likely to utilize prior knowledge while processing written discourse than field dependent students.

Due to the limited number of subjects in this study, the results should not be generalized to other populations without further research.

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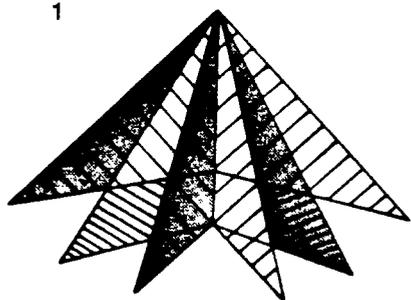
APPENDICES

Appendix A

Sample test question from the GEFT

Note: Simple figure and complex figure are not presented simultaneously.

1

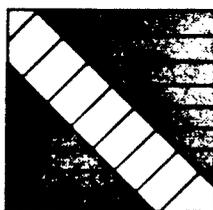


Find Simple Form "F"

F

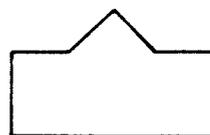


2



Find Simple Form "G"

G



Appendix B

The Birthday Dinner (Unconstrained)

Beth had lots of interests, but the thing she enjoyed doing the most was eating. When her mother asked if she would like to celebrate her twelfth birthday by arranging her own birthday dinner, she thought it was a great idea. She called her friend JoAnne to see if she'd like to help out and they soon put together a list of the things they would need and the people they would invite.

On the afternoon of Beth's birthday her mother dropped JoAnne and her off at the Super Duper. They grabbed a cart and started down the aisles. The first thing they came to, by coincidence, were the party favors. They hadn't included any on their list but JoAnne insisted on getting candles. "Just in case the lights go out," she joked. Moving on down the aisle, they came to the beverage department, where Beth lifted six or seven bottles of Coke into the cart. Next came the crackers, and JoAnne was sent on a detour to get the cheese to go with them. They met back at the meat department.

The meat manager must have thought they looked confused because he came from behind the glassed-in room where he worked to help out. When Beth told him why they were there, he suggested making either steak or chicken. Steak sounded good to them both and the meat manager said he would cut them several nice ones if they didn't mind waiting. They told him they had a little more shopping to do and would be back in a while. They decided to pick up some frozen french fries to have with the steak. Beth asked JoAnne if she thought a salad was a good idea. JoAnne answered, "Who'd eat it?"

The steaks were all ready for them by the time they got back to the meat department and Beth threw them into the basket. "Now we just need the cake,"

said JoAnne. "I thought we decided a cake was silly," answered Beth. JoAnne just smiled and pushed the cart towards the bakery department. Beth had a feeling something was up and when she saw her mother at the bakery counter, her suspicions were confirmed. "Surprise," she cheered and from behind the counter came the baker carrying a huge cake with twelve candles on it. Everyone, including the other people shopping in the store, started to sing "Happy Birthday" to her and Beth felt like hiding somewhere, fast. But after they stopped, she had to admit she really was surprised.

They finished up shopping for the last few things on the list and Beth's mother paid the cashier. Walking out to the parking lot, Beth thought about the dinner tonight and hoped it would be as much fun eating the food as it had been shopping for it.

Appendix B

The Birthday Dinner (Constrained)

Jim had lots of interests, but the thing he enjoyed doing the most was eating. When his mother asked if he would like to celebrate his twelfth birthday at the Ganson Inn, he could hardly believe his ears. His father had made reservations for four, so he could invite a friend if he wanted. Jim knew right away who to ask. Mike lived two doors down the street and it seemed as if they had always known each other. It was only fair that Mike should join them for this special event.

When they arrived at the Inn the hostess showed them to their table in the corner. She lit the candles on the table, then asked if anyone wanted a cocktail. Jim started to laugh but a glance from his mother made it quite clear that it really wasn't funny. "Cokes for the boys, and we'll have a bottle of red wine," replied Jim's father. The waiter brought the menus and bread and butter while they waited for their drinks. There were crackers and cheese on the table to snack on while making their dinner choices.

Everything on the menu sounded so good that it was difficult for Jim to make up his mind. He finally narrowed his choices to either sirloin steak or baked chicken. When Mike ordered the chicken, Jim decided to go for the steak, after all, it was his birthday he figured. He asked the waiter to have the steak cooked well done and said he'd have french fries with it. "Would you like a salad?," asked the waiter. "Why spoil a good meal?," he thought to himself, but answered, "No thanks, could I have another order of french fries?."

When dinner finally came, it was certainly worth waiting for. Jim savored every last bite. Mike agreed that it was one of the best meals he had over

eaten. The waiter cleared away their plates and asked if anyone would care for dessert. Jim knew he'd wish he had said yes tomorrow, but the thought of eating even a crumb of cheesecake was painful right at that moment. His parents ordered coffee and when Jim saw his mother smile mysteriously at his father, he knew something was up. Suddenly all the lights in the restaurant were dimmed and the waiter walked over to their table with a cake glowing with candles. Everyone in the restaurant was singing "Happy Birthday" and Jim was so embarrassed that he wanted to crawl under the table. He had to admit though, he hadn't expected anything quite like that.

After finishing the cake, Jim's father asked for the check and after paying the cashier, they walked to the parking lot. In thinking over the evening, Jim decided that this wouldn't be a bad way to spend some of his future birthdays.