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AUTHOR	Keiser, Ruth H.
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ABSTRACT

The relationships between reading scores of seventh-grade readers and their scores on the Zaslow Concept Formation Test were studied. The Gates-MacGinitie Reading Test and Tests of General Ability scores were obtained from school records on 118 students of which 32 were considered high-scoring readers (upper 27 percent) and 32 low-scoring readers (lower 27 percent). The Zaslow Concept Formation Test was administered to all 64 subjects individually over a 4-day period. The results indicated the following: (1) There was no difference between the upper and lower groups in their ability to understand the continuum on Phase A of the Zaslow test; there was some difference between the two groups when comprehension of the continuum was related to task structure. (2) There was a significant positive relationship between reading achievement and error scores as well as between IQ and error scores on the Zaslow test. (3) There was no measurable relationship between reading achievement scores and width and consistency of concepts. The author concluded that the findings essentially corroborate other concept-formation studies in that there are some relationships between abilities to read and conceptualize in children about 12 years of age. Tables and a bibliography are given. (Author/DE)

SOME RELATIONSHIPS BETWEEN CONCEPT

FORMATION AND READING ACHIEVEMENT

A THESIS

SUBMITTED TO THE FACULTY

OF THE GRADUATE SCHOOL OF EDUCATION

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APPROVED: Martin Kling
Lee Mountain
Jane Raph

DEAN: ____________________

ABSTRACT

Purpose: To investigate some relationships between reading scores, upper 27% and lower 27%, of seventh-grade readers, and their scores on the Zaslow Concept Formation Test.

Procedure:

1. Gates-MacGinitie Reading Test and TOGA scores were obtained from school records. The reading achievement scores were ranked for 118 seventh-grade pupils, with 27% of the highest and 27% of the lowest scores selected as the sample to be tested on the Zaslow Concept Formation Test. This gave 64 subjects: 32 high-scoring readers and 32 low-scoring readers.
2. The Zaslow Concept Formation Test was administered to all 64 subjects individually over a four-day period.
3. To test the null hypothesis, the mean for both groups was found for their error scores, the width of their concepts, and consistency. The number of subjects falling above and below the mean was determined and used to calculate tetrachoric correlation coefficients.
4. A tetrachoric correlation coefficient was also calculated for Upper 27% and Lower 27% who did and did not achieve Concept Level I on Phases A, B-1, and B-2 of the test.

Summary:

1. There was no difference between the Upper 27% and the Lower 27% of the seventh-grade readers in their ability to understand the continuum on Phase A of the Zaslow Test. There was some difference between the two groups when comprehension of the continuum was related to task structure.
2. There was a significant positive relationship between reading achievement and error scores on the Zaslow Test, as well as between IQ and error scores on this test.
3. There was no measurable relationship between reading achievement scores and width and consistency of concepts as measured by the Zaslow Concept Formation Test.

Conclusion:

Essentially, these findings corroborate those of other concept formation studies that there are some relationships between abilities to read and conceptualize in children about 12.

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CHAPTER I

THE PROBLEM

Background of the Problem

This study rests on a tripod of earlier research on concept formation by Kress, Piaget, and Zaslow.

According to Kress (1955), reading is primarily a thinking process. In describing Kress's position, Russell (1968) noted:

> Although the relationship between concept discovery and the reading process is not clear, Kress . . . has shown that there are differences between good and poor readers, who have been matched on general intelligence, in the ability to discover concepts in some of the well-known, clinical-type nonverbal sorting tests. The retarded readers preferred concrete to functional or abstract methods and scored low on versatility and flexibility of concept formation. . . . Questions about concept formation . . . must be studied in relation to the whole curriculum, including reading [pp. 20, 21].

Piaget (1967) emphasizes that children's concepts develop from a sensori-motor level to a concrete perceptual level and finally to an abstract conceptual level. At the age of about 11 or 12 years, or about sixth or seventh grade, logical forms of categorization, essentially mature forms of thought, are said to emerge.

Zaslow (1957) studied concept formation by using a sorting test to:

1) discriminate the conceptual thinking of 12-year-olds from the younger pre-puberty normals;
2) show that mental defectives and brain-damaged adults show impairment in serial ordering; and
3) yield three conceptual levels; the abstract, intermediate, and primitive, similar to the Hanfmann-Kasanin sorting test; and when determined by qualitative criteria, yield an objective score that reflects the conceptual level of the performer [pp. 114-117].

Statement of the Problem

The purpose of this study was to investigate some relationships between reading scores, upper 27% and lower 27%, of seventh-grade readers, and their scores on the Zaslow Concept Formation Test.

Hypotheses

The hypotheses of this study were that there would be significant positive correlations between the reading achievement scores of seventh graders and

1. the level of their ability to form concepts;
2. the quantitative scores on their concept formation tests, or accuracy of concept formation;
3. the width and consistency of their concepts.

Importance of the Problem

Educational research has not yet succeeded in finding the educator's dream: a model of the reading process, comparable with the econometric model (Business in Brief, No. 93, 1970, p. 4), which consists of a series of mathematical equations for measuring the basic structural relationships among economic variables. In the same vein, educators would wish to make an exact model of the basic structural relationships among the variable components of reading ability.

There have been more than 10,000 studies on reading, its determinants and correlates, yet it is far from being completely understood as a predictable psychological process (Elkind, 1969a, p. 20). In working toward a better understanding of the process, Singer (1970) proposed a conceptual response model as one subsystem of reading (p. 151). Within the framework of such a model, an adequate understanding of the conceptual gradient, or conceptual level, in children under standard conditions would have many implications for the development of adequate curricula for different school grades (Zaslow, 1957, p. 44).

The present study would measure the conceptual level of seventh graders in relation to reading achievement.

Definitions

1. Concept formation: there is no simple consensus of meaning (Sax, 1969, p. 196). Concept formation has, in the past, been defined according to the experimenter's approach. Werner (1948) defined it as "categorical

behavior," perhaps the shortest definition in psycholgical history. However, for this study, the definition most applicable is given by Zaslow:

> A concept may be considered as a basic characteristic, according to which items are grouped. The basic characteristic, when it is presented in the sharpest and most definite form, may be considered as the nucleus of the concept. . . [1957, pp. 86, 87].

2. Upper 27% (U 27%) are the scores of the readers who placed in the upper 27% in House 7-C of the Princeton Regional Middle School on the comprehension section of the Gates-MacGinitie Reading Test, Form D2.

3. Lower 27% (L 27%) are the scores of the readers who placed in the lower 27% in House 7-C of the Princeton Regional Middle School on the comprehension section of the Gates-MacGinitie Reading Test, Form D2.

Limitations

This study was confined to one grade (seventh) in one school (Princeton Regional Middle School, Princeton, New Jersey), which is above average in intelligence and reading ability.

CHAPTER II

REVIEW OF THE LITERATURE

For many years, investigations of concept formation have differed not only in their views of the problem but also in the facets measured and in their definitions. Experimental approaches, in general, have been well reviewed by Vinacke (1952), Kress (1955), Zaslow (1957), Russell (1960), Sigel (1964), and Sax (1969).

Because of the breadth and complexities of the subject, the literature survey is organized along the following topical questions:

1. What theory of concept formation would be appropriate for the framework of this study of some relationships between concept formation and reading achievement?

2. What has research found about some relationships between concept formation and other factors?

3. What test of concept formation would be suitable, the results of which could be correlated statistically with reading achievement scores?

4. What cognitive-developmental model of reading would fit the conceptual framework of this study?

5. What experimental research has been done on relationships between concept formation and reading achievement?

Theory of Concept Formation

An appropriate theory would cover the early years of childhood when conceptual and reading abilities are developing and changing.

A basic question is whether development follows "the same general pattern . . . in a sequential, invariant order"; and, if so, how do these "stage-dependent theories" account for individual differences (Sigel, 1964, pp. 211-214)? There are three streams of educational thought, which Kohlberg (1968) identifies as Maturationist: "basic mental structure results from innate patterning"; Associationistic or Learning Theory: "basic mental structure results from patterning or association of events in the outside world"; and Cognitive-Developmental: "basic mental structure results from interaction between certain organismic structuring tendencies and the structure of the outside world" (pp. 1014-1020).

> The most systematic account of early intellectual development has been offered by the renowned Swiss scholar, Jean Piaget. His studies of children's thinking are fortified by a versatile array of interests, including zoology, epistemology, and logic. He has combined these interests, with a capacity for astute observation of children and what seems to be an inexhaustible store of energy [Jersild, 1968, p. 103].

Besides giving us a comprehensive system, a cognitive-developmental one, Piaget has uncovered phenomena that are a starting point for a wealth of experimental research (Elkind & Sameroff, 1970, p. 211). His influence is one of two factors related to the present trend in research on conceptual development, the other being an increasing concern with process and with how conceptual ability develops (Endler, 1968, p. 15).

Piaget himself is interested in determining the laws under which knowledge develops and changes (Flavell, 1962, p. 20). In the case of The Child's Concept of Number (Piaget, 1965), his hypothesis is that "the construction of number goes hand in hand with the development of logic, and that a pre-numerical period corresponds to the pre-logical level" (1965, p. viii). This investigation was his first on the mechanisms that determine thought in a systematic study of quantity, logic, number, time, movement, velocity, space, geometry, matter, weight, volume, chance, adolescent reasoning, and perception (Flavell, 1963, p. 239).

Piaget's method of objective probing of the child's explanations of his actions gives results which he is able to classify. These classifications he groups into stages. What delineates the different stages is the degree of, or lack of, conservation, a concept formulated by Piaget, who also developed the method of assessing it (Zimiles, 1966, p. 1).

Piaget developed the conservation concept by reasoning that every idea, whether scientific or merely common sense, presupposes "a set of principles of conservation, a certain permanence in definitions." Arithmetically, a set remains unchanged in spite of changes in the relationship between the elements. A number is intelligible only "if it remains identical with itself, whatever the distribution of units of which it is composed."

"Whether it be a matter of continuous or discontinuous qualities, of quantitative relations perceived" or "sets and numbers thought," of a child's "earliest contacts with number or the most refined axiomatizations of any intuitive system, conservation is a "necessary condition for any mathematical understanding" (Piaget, 1965, pp. 3, 4).

This conservation and the development of thought is "the result of a process of elaboration that is based essentially on the activity of the child" (Inhelder, 1962, p. 20). Piaget describes children's thinking by identifying the patterns of classification, seriation, and quantification, for example, which are characteristic of each sequential stage. The Piagetian approaches seem most appropriate for the conceptual framework of this study.

Some Relationships Between Concept Formation and Other Factors

Kress (1955) reviewed the research on developmental concept acquisition finding a positive relationship to age, intelligence, training or experience, socioeconomic level, vocabulary, sex, and interest or motivation (p. 30), the same variables used by Vinacke in his review (1952, pp. 118, 119). Kress's experimental design was to use 25 matched pairs of males, ages 8.0 to 11.11, of normal or above normal intelligence. The matching criteria were sex, chronological age, school experience, and intelligence (p. 32). Having minimized the variability of these factors, he found:

> . . . identifiable quantitative and qualitative differences do exist between non-readers and achieving readers, as measured by the tests used in this study, in their ability to conceptualize at the (a) concrete, (b) functional, and (c) abstract-conceptual levels [p. 101].

Sigel (1964) reviewed research on intelligence, affective factors, strategies, and the effects of training in relation to concept formation. Sax's (1969) review included experiments using the variables, intelligence, sex, motivation, and reinforcement (pp. 198, 199).

Zaslow (1957) analyzed genetic levels and studies of mentally impaired subjects, without isolating the variables as such. Using his test and the information available on the subjects, it was possible in this study to measure age, intelligence, level of concepts, width and consistency, and accuracy of performance.

From Piaget's point of view, an important variable is experience. This is difficult to measure, but Piaget would expect it to show up in the level of conceptualization.

Is perception a factor in concept formation?

Kress defines concept formation, in part, as

> the articulation of past experience with the perception, selection, and evaluation of sensory stimuli relevant to a given context, resulting in the formulation of a tentative hypothesis in terms of the organization of common elements which have been abstracted and classified [p. 7].

Speaking of the method of scoring his test, Zaslow wrote:

> Since errors of perception occur even though the continuum principle is intended by the subject, slight misplacements of only one or two places from the true position of the design would be less serious than those of greater magnitude . . . deviation scores are squared to place greater weight on those misplacements of greater magnitude. We may assume that errors of large magnitude probably reflect a conceptual level rather than a perceptual process [p. 131].

Singer's teaching model for a conceptual response system draws its rationale from several theoretical formulations. Figure 1 depicts a subsystem of related elements mobilized as a conceptual response to a printed word stimulus that represents a class of objects (modified, after Russell, 1956).

However, the relationship of perception to concept formation has not been determined.

Elkind discussed the present hypotheses concerning the development of perception in relation to cognitive development:

(a) Perception and cognition are parallel but separate systems.

(b) Perceptual activities are cognitive abilities applied to visual material.

(c) Cognitive abilities are generalized perceptual skills.

Experiments that can adequately define and test these are difficult to devise. Piaget theorizes that his experiments support the first hypothesis (Elkind, 1969a, p. 25).

Suitable Tests of Concept Formation

What test of concept formation is suitable, the results of which could be correlated statistically with reading achievement scores?

Previous to the 1940's, the majority of investigations looked upon words as concepts. However, the experimental approach of psychologists resulted in a shift in the recognition of the verbal response as only a label for the internal cognitive system, the concept (Kress, 1955, p. 14).

Investigations have used factor analysis, case studies, and such diverse designs as Chinese characters, words, objects, and geometric figures. Geometric figures have been used most frequently (Sax, 1969, pp. 197, 198). The use of geometric forms eliminates content as a confounding variable in studying concept attainment (Elkind & Flavell, 1969, p. xiii).

The tests Kress (1955) used included parts of already existing intelligence tests: the verbal Similarities subtest of the Wechsler-Bellevue, and the Verbal Opposites subtest of Detroit Tests of Learning Aptitude. He also used three Goldstein-Scheerer tests, as well as the Wisconsin Card Sort Test and the Kasanin-Hanfmann Test.

The Goldstein-Scheerer (1941) investigations of abstract and concrete behavior used five sorting tests for determining the capacity status of brain-injured subjects, although Ach (1921) had been the first to use sorting tasks for the objective study of conceptual thinking (Zaslow, 1957, p. 1).

Goldstein formulated a classic description of "organicity," which included symptoms of a decrease in the ability for abstract thought, and a tendency to respond to extraneous stimuli that disrupt normal perception (Anastasi, 1969, p. 312). The Goldstein-Scheerer Sorting Tests sample this abstract behavior and shift of set.

The Wisconsin Card Sorting Test (Berg, 1948, p. 15), a current research test, combines the shifting frame of reference of the Goldstein-Scheerer Sorting Test with the empirical discovery of categories, characteristic of the Ach-Sacharov-Hanfmann-Kasanin Test (1940).

Zaslow criticized these Goldstein-Scheerer-type sorting tests that are based on Aristotle's categorical system as having been superseded by Galilean modes of thought in contemporary psychology, thereby leading to a heirarchical system. Zaslow used the continuum principle for proper quantification "in contrast to the qualitative and rigid classifications found in the Goldstein tests" (p. 72). Differences between these two systems of classification were presented by Lewin (1931, p. 4) and summarized by Elkind (1969b, pp. 183, 184) as continuity vs. discontinuity, heterogeneity vs. homogeneity, and class vs. particular case. Piaget's version of a concept is also influenced by Galilean thought (Elkind, 1969b).

Zaslow criticized Goldstein-Scheerer-type sorting tests because they permit "those very operations of concrete behavior that the young child, the brain-damaged adult, or the mental-defective can best perform. . . ." Their limitations are:

a) Qualitative evaluation on an all-or-none basis precluded objective scoring by quantitative means.

b) The level of difficulty was inadequate as many children and patients could easily do the tests.
c) Successful performance on the Hanfmann-Kasanin test required superior intelligence and education.
d) These tests did not handle rigidity and concreteness as quantifiable variables.
d) They emphasized dichotomous concepts; ignored serial ordering [p. 104].

For his test, Zaslow developed a card sort of 14 similar geometric forms, which, when placed side by side, form a continuum, gradually changing from a triangle into a circle. He also wished to demonstrate an emergent level of concept formation at about 12 years, not tapped by the traditional sorting test. The continuum principle, Zaslow stated:

1) reduces the emphasis upon identical elements,
2) emphasizes variation in the concept,
3) requires maximum amount of shifting between and among the concepts that form the continuum, . . .
   a) shifts from one extreme concept to another,--in fact, is continually shifting, . . .
   b) emphasizes direction,
   c) emphasizes maximum internal structure of the conceptual field,
   d) requires anticipation and planning ahead,
   e) is not perceptually visible until actually formed,
   f) and requires a more sensitive type of judgment than if continuum were treated in a dichotomous fashion [p. 96].

If the tests Kress used are inappropriate here, what of Piaget's tests and methods? Piaget has used the case study method of investigation. Without training, an experimenter does not easily replicate Piaget's methods, which, though systematic, are not standardized. Piaget views operations as actions, first physical and then mental, which lead to the construction of concepts. His research has been designed to reveal the operational mechanism of thought (Piaget, 1966, pp. 19-21).

> To avoid imposing preconceived notions on data, our investigations of the child's thought are always initiated by an exploratory method adapted to the child's level of comprehension with regard to both the nature of the question and to the order of presentation [Inhelder, 1962, p. 21].

His experiments take account of the child's responses, and also ask for the child's explanation of them. He believes this method gives a truer picture of the child's thoughts than the standardized tests. The procedure consists of "free conversations" with the child, "conversation which is governed by the questions put, but which is compelled to follow the directions indicated by the child's spontaneous answers" (Inhelder, 1962, p. 21).

Piaget's early examinations of sensory-motor intelligence showed him the necessity for actual manipulation of objects, when the child, "instead of thinking in the void, is talking about actions" he has just performed (Piaget, 1965, p. viii).

Resembling Piaget's methods, the Zaslow Test requires the actual manipulation of the cards of geometric design.

For Piaget, a "central prerequisite for the acquisition of subsequent development of logical thought" (Sigel & Hooper, 1968, p. 3), is conservation, the phenomena of which are undeniable, so uniform are the developmental descriptive data across nations and social classes (Elkind & Samaroff, 1970, p. 210).

Mistakes are scored objectively in Zaslow's conservation task which is maintenance of the concept of the triangle while it is gradually transformed into the circle.

Saltz and Sigel (1967) linked conservation to concept width in a study, the results of which supported the hypothesis that "lack of conservation in young children may be due to their tendency to form narrow concepts" (p. 7). Lack of conservation in Piaget's experiments is frequently characterized by inconsistencies.

Width and consistency of concepts are also scored objectively on the Zaslow Test, Phases C and D.

Despite these similarities between Piaget's and Zaslow's methods of testing concept formation, Piaget's results are generally given as percentages of children conserving, a method not easily treated statistically. Therefore, the Zaslow Concept Formation Test seemed most suitable for this study. A more detailed explanation of the administration of the test is found in Chapter III.

Model of Reading

To match the developmental, hierarchical levels of concept formation in Piaget's theory, a model of reading is needed that is also cognitive-developmental and hierarchical. What of Singer's conceptual response system? A conceptual response system is only one subsystem of more comprehensive models for attaining speed and power of reading (Singer, 1970, p. 155).

A teaching model for instruction to develop a conceptual response to printed words is depicted in Figure 1. The model indicates that, according to Russell's formulation (1956, pp. 248-249), concepts develop out of related perceptual experience. The related elements, percepts, images, memories, information, and feeling tone, are organized through the process of concept formation, and linked by a linguistic form to a printed word representing a class of objects (Singer, 1970, p. 151).

Accordingly,

> A conceptual response in reading [would] . . . be defined as an intermodal communication system of ideas, percepts, memories and images which are mobilized in response to value determined purposes of the individual and the stimulus demands of the printed word [Singer, 1970, p. 152].
>
> A strategy for developing a conceptual response to printed words can be initiated in the beginning stage of reading development and could be continued with appropriate modifications throughout reading instruction. The objective at the initial stage is merely to present printed and spoken words in close contiguity with each other and their corresponding referent class of objects so that materials of thinking related to a particular class of objects can be associated with each other and with the referent object. . . . A class of objects, such as a set of toy cars with the word car printed on the side of each car, [could] serve as the instructional objects.

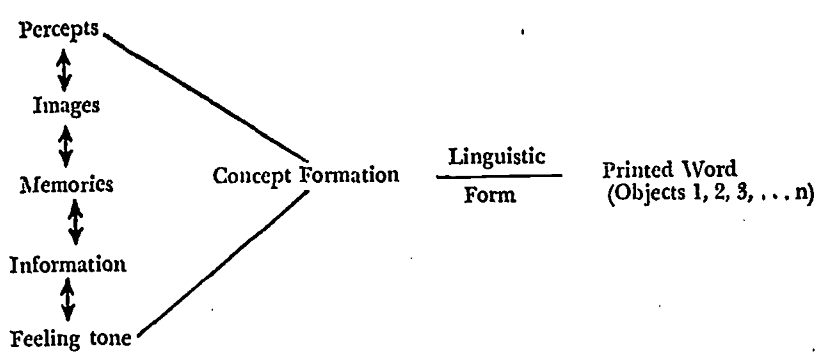

FIGURE 1. A subsystem of related elements mobilized as a conceptualized response to a printed word stimulus that represents a class of objects. (Modified, after Russell, 1956.)

> . . . As lessons progress, children could develop flexibility in mental organization by practice in switching from one conceptual response to another [p. 153].
>
> The development of such a mediational response system would have several effects on learning to read and on performance in reading. . . . If formed at an early age, the concepts would serve as advance organizers to facilitate subsequent learning and retention . . . (Ausubel, 1960). One hypothesis . . . [is] that the rate of learning would probably be greater because categorization of stimuli would effectively reduce the perceptual and cognitive load . . . (Singer, 1960, 1965). [Another] hypothesis . . . [is] that individuals who had experienced and benefited from a conceptual response strategy are more likely to respond appropriately, within the limits of their stage of mental development, . . . (Piaget & Inhelder, 1958) to a printed word intended to represent a concept than are individuals whose educational experience has been more in the direction of learning to recognize a particular label as representing a particular object. . . . Speed of reading depends, in part, not only upon level of thought, but also on flexibility in organizing and reorganizing working systems, including mediational responses [pp. 154, 155].

Singer's conceptual response model of reading is based on his doctoral dissertation, "Conceptual Ability in the Substrata-Factor Theory of Reading" (1960). At that time the increasing interest and experimentation in the United States in Piaget's cognitive-developmental theory was just beginning. This new interest was due to a change in emphasis by psychologists themselves from quantitative behavior theory to theories of cognitive development (Flavell, 1962, p. 14), to a change in Piaget's methodology to a more exact method of data collecting and a more generalized theory (Berlyne, 1957), to the increased availability of translations of Piaget's works (Flavell, 1962, pp. 14-16); and to the dovetailing of Piaget's theories with those of Hebb and Harlow (Hunt, 1961, p. 354).

An updated model of reading required here in the framework of Piagetian theory would more closely approximate that described by Kamii (1970, in press).

> Piaget's theory is a descriptive one that says nothing about pedagogy. However, since it describes the child's cognitive development from birth to adolescence, it gives a unique developmental perspective to early childhood education. . . . It also gives the perspective of a broad theory of knowledge . . . and . . . suggests what a [child] has to master in order to progress to the [next] level [p. 23].
>
> The Piaget-based preschool curriculum being developed in Ypsilanti, Michigan, believes that the child should be helped to construct certain prerequisite abilities, but that these abilities should not be imposed by the teacher [p. 24].
>
> . . . "knowing" an object involves knowing it in a social sense, in a logical sense, and in a representational sense. For example, a glass should be known socially (e.g., it is used to drink milk, but not to drink soup) and physically (it breaks, it rolls, it is transparent, etc.). Glasses should be known logically (they can be classified with certain objects, seriated according to size, and quantified so that there will be enough glasses for all the children in the class. They should also be known spatially in terms of "top-bottom," "in-out," "round-straight," linear ordering, etc. An example of knowing a glass in a temporal sense is the sequence of washing it, drying it, and putting it away . . . [p. 17a].
>
> Conservation is another example of a broad cognitive area that is rooted in infancy and is applicable to many school subjects. . . . The child who does not have the conservation of real quantities cannot be expected to handle the hypothetical quantities which are constructed during the period of formal operations . . . [p. 27].

> Reading and arithmetic also show the relevance of a Piaget-based preschool curriculum. . . . Reading first of all requires representation, i.e., the evocation of vivid mental images. From the mechanical point of view, it requires a well structured space to discriminate letters (e.g., p vs. q) and to conserve directions (e.g., left to right). The letters are grouped into words and sentences which require a classificatory scheme. Letters are also arranged linearly (e.g., saw vs. was). A classificatory rule states when a capital letter is required at the beginning of a word, and when a period is required at its end. Most of the time, only an empty space is required between words. From the point of view of content, the child must have not only the mental images of static, unrelated objects, but also the mobility of thought to coordinate the relationships among objects in space, time, and logic. For example, the passage, "John went to the circus with his sister and father. There, he saw elephants and clowns," involves space, time, classification, seriation, number, social knowledge, and physical knowledge [p. 28].

Aware of Piaget's influence on the present trend in research on conceptual development, Singer stated (1970):

> . . . the relationships of stages in development of logical thinking . . . to acquisition and performance in various systems and subsystems of reading behavior should be investigated. For example, Piaget's stages of mental development may explain the change in factor patterns that occur at the sixth grade level: the average sixth grader may be passing from the concrete to the more abstract, formal stage of mental development [p. 170].

Singer in 1965 had presented "A Developmental Model for Speed of Reading in Grades Three Through Six":

> The major hypothesis of the substrata-factor theory of reading . . . states that as an individual learns to read, he sequentially develops a hierarchically organized mental structure of interrelated neuropsychological subsystems. In response to the changing purposes of the reader and the demands of

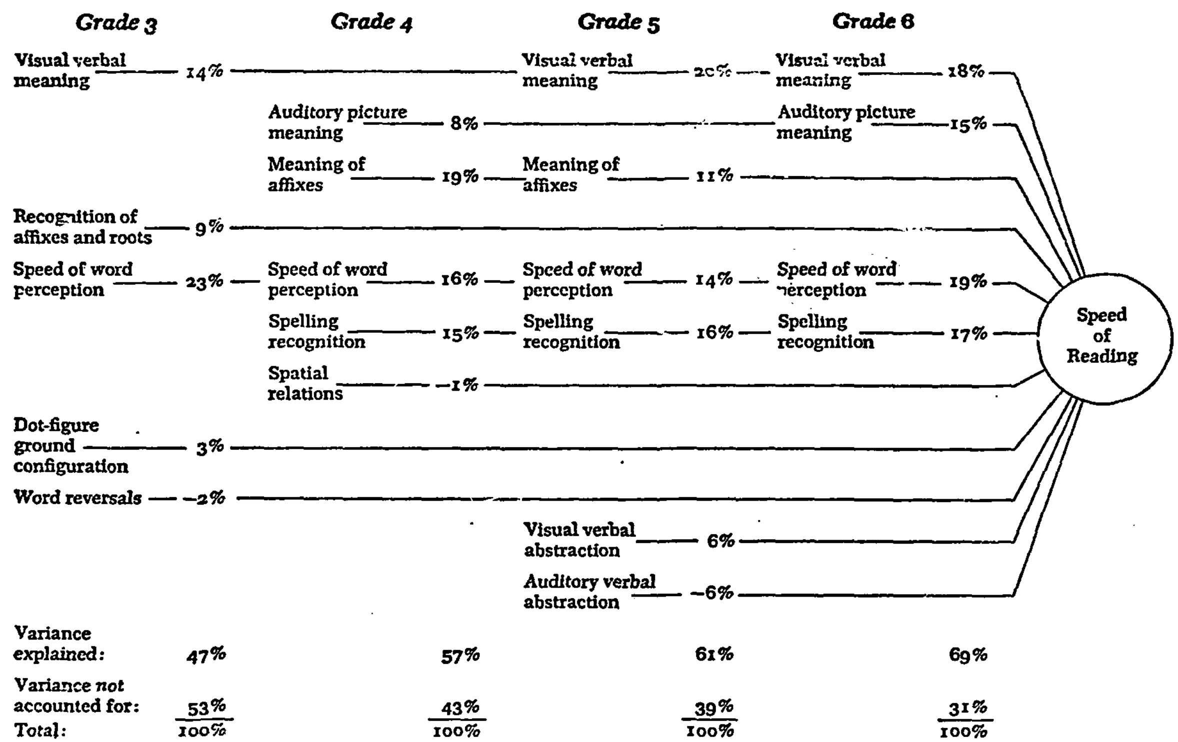

FIGURE 1. Diagrammatic model of the substrata factors accompanying development of Speed for Reading in grades three to six. The model shows for each grade the first level substrata factors and their per cent contribution to variance in Speed of Reading. The variance *not* accounted for is probably attributable to Functional Oculomotor Efficiency, Speed of Processing Visual Stimuli, Mobilizers, Biological Support System, and Verbal Flexibility (Singer, 1970, p. 211).

the task-stimuli, these subsystems are organized and reorganized or mobilized into a variety of working systems for attaining speed and power of reading. As a function of maturation, instruction, experience, and mediation, an individual's subsystems improve. Consequently, he can mobilize increasingly more effective working systems. However, improvement in speed and power of reading results not only from changes in the magnitude of substrata-factors which comprise an individual's subsystems, but also from the way in which his subsystems are organized [Singer, 1970, p. 198; italics added].

According to this hypothesis, two individuals could have quantitatively identical subsystems, but one individual might still read better or more rapidly than the other because of a superior integration or a more mature organization of his subsystems [p. 198].

Although the combination of subsystems that can be organized into a working system for attaining speed and power of reading may vary from individual to individual, at least at the high school level, known groups of individuals--such as boys vs. girls or fast vs. slow readers--if they are to read at all, must mobilize certain necessary subsystems, whether these subsystems draw upon strengths or weaknesses in their substrata factor repertoire. However, the working systems of known groups of individuals, according to their unique patterns of strengths and weaknesses, vary quantitatively and qualitatively around the common structure [Holmes & Singer, 1961, 1964, p. 199].

This evidence at the high school level is consistent with the hypothesis that there is for the average reader at each grade level a common structure or general working system for attaining speed and power of reading . . . it would seem that this common structure would undergo systematic changes as individuals, in general, develop towards maturity in speed and power of reading . . . [p. 199].

In grades three through six, the average scores of pupils on speed and power of reading, plus many other subabilities, increase each year (Singer 1964). Pupils within these grades, however, vary widely not only in speed and power of reading, but also in a multitude of interrelated subabilities, such as phonics, knowledge of affixes, vocabulary, conceptual

> abilities, and many other variables which teachers instructionally emphasize. . . . If teachers knew a) which of the multitude of subabilities constitute a parsimonious set of factors that are, in fact, related to speed and power of reading at each grade level, and b) which of this set of factors have concomitant changes that are associated with improvement in speed and power of reading, they could use this knowledge as a guide for more precise developmental instruction (Singer 1962) [Singer, 1970, p. 199, italics added].
>
> The major developmental hypothesis of the substrata factor theory of reading was tested by administering a selected battery of variables to approximately 250 pupils in each grade, three through six. Substrata analyses of the resulting correlation matrices confirmed the statistically-formulated hypothesis that quantitative and organizational changes in substrata factors are, in fact, associated with development in Speed of Reading. A theoretical model, constructed to depict these substrata factor changes, also revealed the following developmental trends: a) The general working system for attaining Speed of Reading undergoes a developmental shift from a predominance of visual perceptual abilities at the third grade to a more equitable organization of visual perceptual and word meaning factors at the sixth grade level. b) Throughout grades three through six, when substrata factors that are more visual in their modality are mobilized, the working system for attaining Speed of Reading can function with greater efficiency. c) Because Speed and Span of Word Perception and Verbal Meaning Factors precipitated at each grade level as first predictors of Speed of Reading, they must be considered as necessary factors in the general working system for attaining Speed of Reading [p. 216, italics added].

The added italics point up similarities between Singer's Developmental Model and Piagetian theory. A cognitive-developmental reading model similar to Singer's would utilize the development of children's concepts from a sensorimotor level in beginning to read activity, to a concrete perceptual level similar to those found by Singer at the third-grade level, and finally to an abstract conceptual level, using logical forms of categorization, which emerges at about sixth or seventh grade.

Experimental Research on Relationships Between Concept Formation and Reading Achievement

Little research has been done on the relationships between concept formation and reading achievement. Kress's study (1955), noted by Russell (1968, pp. 20-21), was apparently the first. Stauffer declared that reading is a form of problem solving in much the same way as is concept development. All three are "active cognitive processes of seeking relationships to, differentiating from, and reconciling with existing ideas, and the processes therefore overlap in many ways" (1970, p. 134). Carroll (1964) discussed in general terms the differnces between verbal deductive concept learning in school and inductive nonverbal learning in the laboratory: school-taught concepts are similar, but "are more likely to involve complex relationships among prerequisite concepts," inadequately mastered and taught (p. 202). Holmes and Singer (1964) summarized their substrata factor analyses of speed and power of reading, attempts to devise instruments for measuring aspects of conceptualization, Laycock's flexibility hypothesis, and the need for further research. Gibson (1965) presented an analysis of the process of learning to read as discrimination, decoding, and "getting meaning from the printed page." Gibson's "discrimination" would be close in meaning to Piaget's "construction of space."

Other recent research has found impulsivity-reflectivity a characteristic of good and poor readers (Kagan, 1965, p. 609); combinatorial thinking (Elkind, 1968, p. 1015); and figurative perception (Elkind, 1969a). These are the studies which show marked Piagetian influence. When discussing perceptual activities in the cognitive function reading, Elkind, in the above-mentioned study, stated

> . . . that learning to read from the very beginning requires logic like processes . . . is particularly evident in English wherein one and the same letter can signify different sounds and one and the same sound can be signified by different letters [pp. 21-22].

This study attempts to sample conceptualization and assess its relationship to reading as manifested by the <u>Zaslow Concept Formation Test</u> and the <u>Gates-MacGinitie Reading Test</u>.

CHAPTER III

PROCEDURES

It was the purpose of this study to determine whether the conceptual ability of seventh-grade students is associated with reading achievement to the extent that superior ability in conceptualizing tends to be positively correlated with superior ability in reading, and, concomitantly, inferior ability in conceptualizing tends to be positively correlated with inferior ability in reading. This chapter describes the sample, the tests used, and the method of administration.

Sample

The sample for this study was confined to one grade (seventh) in Princeton Regional Middle School, Princeton, New Jersey. The sample consisted of one-third of the entire seventh grade, 350 pupils, for this suburban community of about 25,000 population.

Kress (1955, p. 30), in his summary of research, stated that "concept formation has been found to bear a positive relationship to socio-economic level." Almy (1967) reported: "there is some indication in the floatation studies that the children from disadvantaged homes had less difficulty in sorting than they did in making verbal identification of the properties" (p. 128).

She added that the differences between the middle and lower class groups "may also be matters of cognitive 'style' . . . [which] might be termed 'relational' in contrast to the more 'analytical' approach of their middle class peers" (p. 128).

Table 1 presents for this study's sample a comparison of means, standard deviations and *t*-test data for age, intelligence, and reading achievement for U 27% and L 27%. As for age, the mean for both groups was 13.0, or no significant difference (raw scores in Appendix B).

There were significant differences: 12.26 between the means of the U 27%, 138.0, and that of the L 27%, 99.2, or close to normal for IQ; 30.63 between the means of the U 27% and that of the L 27% in reading achievement, or about five grade levels, even though the mean of the L 27% was on grade level. Needed for 5% level of significance is 2.00.

As to the proportion of males to females in the two groups, the U 27% group was 69% male and 31% female. The L 27% was 38% male and 62% female.

Description of the Tests

The three tests used in this study were: Gates-MacGinitie Reading Test, TOGA, and Zaslow Concept Formation

TABLE 1

COMPARISON OF MEANS, STANDARD DEVIATIONS, AND *t*-TEST DATA
FOR AGE, INTELLIGENCE, AND READING ACHIEVEMENT
FOR UPPER 27% (N = 32) AND LOWER 27% (N = 32)

Characteristic	Mean		S.D.		*t*-Test
	U 27%	L 27%	U 27%	L 27%	
CA	13.0	13.0	.39	.54	.33*
IQ	138.0	99.2	15.78	8.72	12.26
RA	11.7	6.8	.31	.85	20.63

*2.00 is needed for the 5% level of significance.

Test. The latter was administered by the investigator, while the scores from the other two were obtained from school records.

The Gates-MacGinitie Reading Test, Survey D, for grades four through six, has three parts: Speed and Accuracy, Vocabulary, and Comprehension. For this study, only the Comprehension Section was used. First, the seventh graders had not been tested on speed and accuracy. Second, vocabulary tests are similar to verbal tests of concept formation, which measure concept formation at the abstract level, which is frequently verbalization without understanding (Kress, 1955, p. 44). Besides, vocabulary was minimized as a confounding variable in Zaslow's concept formation test by his use of geometric forms.

About the Comprehension test, Della-Piana (1968) reported:

> Since the pupil can reread the paragraph as many times as he wants to get the answer, the test cannot measure comprehension of once-read material and be compared with tests which do not allow rereading [p. 165].

The test's predictive validity is interpreted by Dorothy Holberg in a review of an earlier version of the test as overestimating a pupil's reading ability, tending to place him above his true instructional level in reading. However, this "is not a serious criticism if there is a constant or consistent overestimation " (Della-Piana, 1968, p. 165).

Concurrent validation: At the grade six level Lorge-Thorndike Verbal IQ correlates with comprehension, .72 (Technical Manual, p. 16).

Equivalence of forms or internal consistency: for grade six, alternate forms reliabilities are: Comprehension: .87. Split-half reliabilities are: Comprehension: .95. Subtest intercorrelations for grade six between Vocabulary and Comprehension are .77.

The TOGA, grades four through six, is described in Burros (1965):

> All TOGA test items at all levels are multiple choice and are pictorial in form. Two classes of items are represented: those which require reasoning and those which require information, vocabulary and concepts. Information required . . . is the kind . . . gained outside the classroom, and stress is placed upon application rather than knowledge accumulation [p. 775].
>
> R. Schutz: . . . The items . . . are intended to test the individual's ability to grasp meanings, recognize relationships, and understand the basic concepts and underlying principles of our national and social environment [p. 776].
>
> J. L. Horrochs: . . . promising, carefully constructed general measure of verbal intelligence with excellent quantitative background information. . . . Attempt to eliminate school-centered information in writing test is a particularly strong feature [p. 776].

The Zaslow Concept Formation Test

The Zaslow Concept Formation Test (1957) was selected for the 64 subjects to differentiate their ability to form concepts on high, medium, or low levels. This qualitative analysis is followed by an objective quantitative analysis, testing for conceptual span, measuring the concept span, and testing for consistency of concept boundaries, or, all in all, five separate operations or phases. Russell (1960) stated: "A number of these sorting tests may be used as measures of . . . flexibility of thinking . . ." and cited Zaslow's test (p. 324). The range extends from grades two and three through college, and demonstrates an emergent level of concept formation at about 12 years. (See Appendix for samples of concept level sorts.)

The test may be said to have concurrent validity, in that it discriminates between presently identifiable groups. In addition, it has construct validity: it demonstrates that certain explanatory constructs account to some degree for types of performance on the test. "The construct validity found in this test is the result of logical analysis and empirical findings" (Zaslow, 1957, p. 222).

The problem of reliability is not as yet resolved. As with many of Piaget's tasks, so the test is in itself a learning situation. The test-retest correlational method is inappropriate. The principle is demonstrated to all of the subjects during the procedure. There is no alternate form. However, Zaslow's results were closely replicated in this study.

The Zaslow Concept Formation Test was administered individually by the same examiner. Instructions for administering it are standardized (Appendix B).

Because this test is not well known, and is highly experimental, a full description is given of its various parts.

> The test is divided into three basic divisions which involve a total of five separate operations or phases. As previously mentioned, these basic divisions reflect three essential functions of the test: (a) testing for concept level, (b) measuring the concept span, and (c) testing for the consistency of concept boundaries. . . .
>
> Phase A: The cards are randomly scattered; the subject is requested to group them in one row. Scored as Concept Level I, II or III and an error score for Concept Level I.
>
> Phase B-1: The triangle and circle are used as anchoring points and the subject is requested to order the remainder of the designs. Scored as Concept Level I, II or III and an error score for all three levels.
>
> Phase B-2: The subject is requested to arrange the designs from triangle to circle. The triangle and circle are anchored as in phase B-1. Performance is scored as in B-1.
>
> Phase C: The examiner places all the designs in the proper position on the continuum and the subject designates the triangle and circle boundaries.
>
> Phase D: The subject removes all designs not belonging to the triangles and circles. A discrepancy score is obtained [Zaslow, 1957, pp. 121, 122].
>
> The subject's verbalized principle of grouping is accepted as the key criterion for assigning him to a concept level. The quantitative analysis is done separately. Its main purpose is to justify the use of a quantitative score that will reflect the qualitatively determined level. Thus, test may be used with psychotics who do not verbalize well or subjects

> who may be handicapped in verbal communication . . . permits adequate statistical treatment and is a major step toward objective measurement [p. 130].

Testing Procedure

The Zaslow Concept Formation Test was administered to all 64 subjects individually over a 4-day period. None of the students selected for testing was absent all 4 days. Testing was done at 10-minute intervals.

Reading achievement test and TOGA test scores given within the same year were obtained from school records. The reading achievement scores were ranked for 118 seventh-grade pupils, with 27% of the highest and 27% of the lowest scores selected as the sample to be tested on the Zaslow Concept Formation Test. This gave 64 subjects: 32 high-scoring readers and 32 low-scoring readers.

Treatment of the Data

To test the null hypotheses (no differences which could not occur by chance exist in the performance of the U 27% and L 27% on the tests used), the mean for both groups was found for their error scores, width of circle and triangle boundaries, and consistency. The number of subjects falling above and below the mean was determined and used in the formula for tetrachoric correlation (Garrett, 1960, p. 385).

	−	+
+	B	A
−	D	C

$$r_t = \cos\left(\frac{180° + \sqrt{BC}}{\sqrt{AD} + \sqrt{BC}}\right)$$

The same formula was used to determine the correlation between U 27% and L 27% who did and did not achieve the highest concept level on the first, second, and third sorts.

Tetrachoric correlation is especially useful in finding the relation between two characteristics or attributes, neither of which is measurable in scores, but both being capable of separation into two categories.

> Tetrachoric correlation assumes that the two variables under study are essentially continuous and would be normally distributed if it were possible to obtain scores or exact measures and thus be able to classify both variables into frequency distributions [Dixon & Massey, 1969, p. 216].

In order to check whether assumption of normality was fulfilled, the following is offered as evidence for Gates-MacGinitie Reading Test scores. In the section about establishing norms, the Technical Manual states:

> In using the results of the intelligence testing (Lorge-Thorndike Intelligence Tests, 1964 Multi-Level Edition), it was assumed that the circumstances that contribute to high or low IQ scores in school population are also the main factors contributing to high or low reading scores. The reading test scores of pupils taking each form of each reading test were therefore adjusted by the same proportion as was required to adjust the mean and standard deviation of their intelligence test scores to conform to the national average [p. 4].

For the <u>Zaslow Concept Formation Test</u>, Zaslow noted:

> There is a general trend for conceptual thinking, as measured on the test, to improve with an increase in chronological age and grade level of the normal samples. Inspection of Table 2 shows that 3.33% of the grade 2 and 3 group, 80.95% of the grade 7 and 8 group, 88.10% of the high school group and 97.87% of the college group manage to attain concept level I on Phases A, B-1, and B-2 of the test . . . intelligence was controlled by selecting subjects falling within the 90-110 IQ range (in the grade 2 and 3 group and the grade 7 and 8 group). . . .
>
> The pathological groups tend to approximate the grade 2 and 3 level in respect to concept level I. Only 12.50% of the mental defectives and 8.70% of the paretic group attain concept level I [Zaslow, 1957, p. 153].

> A breakdown of concept level I scores attained by the samples is shown on Table 9. . . . In contrast (to the college sample) the grade 7 and 8 and high school groups have a wider range of scores and higher means, at 6.56 and 7.54 respectively. The medians for the grade 7 and 8, high school, and college groups are 5.70, 6.19 and 2.10 respectively [p. 154].

Further, the investigator recomputed Zaslow's findings for skewness and kurtosis as measures of divergence from normality. For grades 7 and 8, mean was found to be 6.56; median, 5.70; sk, .49, and ku, .346. From these calculations, it can be assumed as normal distribution with McNemar's (1955) caution: the assumption of normality is fairly satisfactory. Inferences are approximate: .347 approaches normality (p. 30).

CHAPTER IV

FINDINGS AND DISCUSSION

Findings

Hypothesis 1: There would be a significant positive correlation between the reading achievement scores of seventh graders and the level of their ability to form concepts. To test hypothesis 1, it was necessary to tabulate the number of U 27% who did attain Concept Level I, the number of U 27% who did not, the number of L 27% who did, and the number of L 27% who did not. Then it was necessary to calculate the tetrachoric correlation for Phases A, B-1, and B-2 on the Zaslow Test. Table 2 presents the results of the tetrachoric correlation.

The correlation coefficient, .09, was not significant on Phase A, but was significant on Phases B-1 and B-2 at the 5% level.

Zaslow described the concept levels as High, Intermediate, and Primitive, or I, II, and III, as given in the Appendix. These levels may be attained on the first phase; if not Level I, then on the second phase; if not Level I, then on the third phase of the Zaslow Test "as the test proceeds from an unstructured

TABLE 2

TETRACHORIC CORRELATION BETWEEN UPPER 27% AND LOWER 27% IN READING ACHIEVEMENT AND QUALITY OF CONCEPT FORMATION

Variables			N	df	r_t	Significance[a]
Phase A						
	B	A[b]				
U 27%	17	15	32	60	.09	N.S.
L 27%	19	13	32			
Phase B-1						
	B	A				
U 27%	10	22	32	60	.30	Signif.
L 27%	16	16	32			
Phase B-2						
	B	A				
U 27%	5	27	32	60	.34	Signif.
L 27%	10	22	32			

[a]A correlation of .25 is needed to be significant at the .05 level of confidence.

[b]"A" represents attainment of Concept Level I, "B" represents failure to attain Concept Level I.

spontaneous organization in Phase A to a fully structured task or fully verbalized instruction on Phase B-2" (Zaslow, 1957, p. 118).

The increase in clues and direction as to the nature of the task, which is presented perceptually as well as verbally, did not seem to improve the conceptual performance of 31.25% of the L 27% as contrasted with only 15.63% of the U 27%.

Hypothesis 2. There would be a positive correlation between the reading achievement scores of seventh graders and the quantitative scores on their concept formation test. To test hypothesis 2, the number of U 27% and L 27% who had error scores above and below the mean of both groups were tabulated for tetrachoric correlation, thus separating both reading and concept formation accuracy, measured quantitatively, into two categories (Table 3).

TABLE 3

TETRACHORIC CORRELATION BETWEEN UPPER 27% AND LOWER 27% IN READING ACHIEVEMENT AND ACCURACY OF CONCEPT FORMATION

Variable			N	df	r_t	Significance
Accuracy (best effort on all sorts)						
	+20	-20				
U 27%	4	28	32	60	.43	Signif.
L 27%	10	22				

The correlation coefficient was .43, significant at the .05 level. The mean of both groups was 20. By using this mean, wide allowance is given to subjects who might otherwise not be considered to have achieved Level I.

Zaslow (1957) concluded that the discriminating function of the objective scoring system was "quite high in the lower end of the range. . . . Within the 0-4 range, the examiner may be 90% certain that it represents a concept level I classification" (p. 162). Zaslow found magnitude of error to decrease with age (p. 157), but also, conceptual ability to be positively correlated with intelligence: "mental age may be a more important factor for superior conceptualization than is chronological age" (p. 211).

Therefore, tetrachoric correlation was tabulated for reading achievement and IQ, as well as IQ and magnitude of error, or accuracy.

As can be seen from Table 4, reading achievement had a high correlation with IQ, .96; while IQ correlated .43 with accuracy, significant at the .05 level.

Hypothesis 3. There would be a positive correlation between the reading achievement scores of seventh graders and the width and consistency of their concepts. To test hypothesis 3, the numbers were tabulated using

TABLE 4

TETRACHORIC CORRELATIONS BETWEEN UPPER 27% AND LOWER 27% IN READING ACHIEVEMENT AND IQ, IQ AND ACCURACY OF CONCEPT FORMATION

Variable			N	df	r_t	Signif-icance
IQ						
	M*					
	−	+				
U 27%	3	29	32	60	.96	Signif.
	29	3	32			
IQ and Accuracy						
	+20	−20				
118.5	4	28	32	60	.43	Signif.
	10	22	32			

*M = 118.5.

Zaslow's definitions:

> In a previous study (1950, 1951) empirical findings demonstrated that scores of 1 and 2 may be considered as abnormal constrictions of the concept span, demonstrating rigidity and concreteness of thought. The range of 3-5 was considered as the normal limits, . . . while scores falling beyond 5 were considered to be abnormally fluid or loose. Fluidity may be described as overgeneralization in that dissimilar elements belonging to the middle or circle concepts were included within the triangle group. Since fluidity represents a greater distance from the nucleus of the triangle concept, the fluid boundaries were considered to be weak or loose. In contrast, the rigid boundaries were considered to be tight, as this approach tends to stress identity of elements. . . . The normal range of 3-5 represents a balance between excessive fluidity and excessive rigidity, or between excessive concreteness and excessive abstraction [pp. 177, 179].

The mean for both groups on width of triangle concept was 4.92, the correlation coefficient .19 and not significant as shown in Table 5. For width of circle concept mean for both groups was 12.71, with a .09 difference, and correlation coefficient not significant.

TABLE 5

TETRACHORIC CORRELATION BETWEEN UPPER 27% AND LOWER 27% AND WIDTH OF TRIANGLE CONCEPT

Variable			N	df	r_t	Significance
Width of Δ Concept						
	narrow	fluid				
U 27%	20	12	32	60	.19	N.S.
L 27%	17	15	32			

As for the consistency of concepts under hypothesis 3 using Zaslow's scoring method, U 27% who maintained correct boundaries, and U 27% who made boundary breaks, were tabulated with similar categories of L 27%, to yield a correlation coefficient of .17, which was not significant as shown in Table 6.

TABLE 6

TETRACHORIC CORRELATION BETWEEN UPPER 27% AND LOWER 27% AND CONSISTENCY OF CONCEPTS

Variable			N	df	r_t	Significance
Consistency						
	inc.	correct				
U 27%	9	23	32	60	.17	N.S.
L 27%	12	20	32			

Discussion

The correlation coefficients of .09 on Phase A, .30 on Phase B-1, and .34 on Phase B-2 between reading achievement and ability to attain Concept Level I are similar to the findings by Zaslow (1957) and Kress (1955). Zaslow found that the increase in clues and direction as to the nature of the task, which is presented perceptually as well as verbally, did not seem to improve the conceptual performance of "the majority of the 2 and 3 grade, mental defective and paretic subjects . . ." (p. 163) who were very significantly different from the grade seven and eight, high school, and college groups (p. 165).

Kress reported findings on the Wisconsin Card Sort Test as no significant differences between non-achieving readers and achieving readers "in their ability to form concepts as measured by the scores on the first sorting category" (p. 92), but observed a tendency for achieving readers to need fewer clues to complete design 8 with the Goldstein-Scheerer Cube Test than the non-achieving readers, who required more clues of a concrete nature (p. 94).

The correlation coefficient of .43 found between reading achievement scores and low error scores on the concept formation test is also similar to Kress's finding: "There is a greater tendency for non-readers than for achieving readers to be unable to recognize the incorrectness of their reproductions of the designs used in this" (Goldstein-Scheerer Cube Test, p. 94).

The correlation coefficient found for IQ and accuracy, .43, the same as for reading achievement and low error scores, is corroborated by Sigel, in his report "The Attainment of Concepts" (1964): the efficiency of concept attainment "is associated with the higher IQ. . . . Once he hits upon the correct hypothesis, he immediately learns the concept and thereafter makes no errors" (p. 238).

The evidence to date thus indicates that the higher IQ children attain concepts more readily than

> less-bright children. However, children of average IQ do eventually have available abstract as well as concrete concepts [p. 238].

Zaslow not only found magnitude of error to decrease with age (p. 157) but also conceptual ability to be positively correlated with intelligence: "mental age may be a more important factor for superior conceptualization than is chronological age" (p. 211).

In Kress's chapter, "Interpretation and Implications," he pointed out that "inspection of raw scores . . . reveals cases from NR population whose performances exceeded many of AR group." He mentioned in particular NR in pair #22. In Appendix B, where individual scores are recorded, it is not surprising to note that "NR in pair #22 had a mental age of 13-3, not only above his paired AR, but near the upper end of the range of the mental age for the NR population. Kress did not classify his results by age level, thus ignoring the developmental factor in his age range of 8.0 to 11.11.

Piaget believes that children's concepts develop from a sensori-motor level to a concrete perceptual level. At this stage children solve problems in manipulation of materials by trial-and-error. Finally children, appreciating the significance of their actions, acquire the form of reversible operations in the mind, less dependent on perception (Sigel, 1968, p. 19).

If, with Zaslow's test, the child performed it by trial-and-error manipulation, his time for the test would be longer than that of the child who was able to figure it out mentally. Of the U 27%, 40.63% attained Concept Level I in 80 seconds or less. Of the L 27%, only 21.88% attained Concept Level I in 80 seconds or less: the most efficient and mature readers used mental operations instead of concrete operations.

CHAPTER V

SUMMARY AND CONCLUSION

Summary

The purpose of this study was to investigate the relationship between reading achievement of 64 seventh-grade students and their scores resulting from performance on the Zaslow Concept Formation Test.

The hypotheses tested were that there would be a significant positive correlation between the reading achievement scores of seventh graders and

1. the level of their ability to form concepts,
2. the quantitative scores on their concept formation test,
3. the width and consistency of their concepts.

Conclusion

To test hypothesis 1, tetrachoric correlation coefficients were computed for the U 27% and the L 27% on their ability to attain Concept Level I on Phases A, B-1, and B-2. There is no significant difference between the U 27% and the L 27% in their ability to understand the continuum on Phase A of the Zaslow Test.

There is some difference between these two groups when comprehension of the continuum is related to task structure. Tetrachoric correlation coefficients were computed for the U 27% and the L 27% on their ability to attain Concept Level I on Phases B-1 and B-2 of the Zaslow Test. They were both significant at the .05 level.

To test hypothesis 2, a tetrachoric correlation coefficient was computed for the U 27% and the L 27% on their quantitative scores on their concept formation tests. The correlation coefficient was .43, a significant positive relationship between reading achievement and error scores on the Zaslow Concept Formation Test. The same correlation coefficient was found for high IQ and low error score and low IQ and high error score: .43. Therefore, there is a significant positive relationship between IQ and error scores on the Zaslow Concept Formation Test.

To test hypothesis 3, tetrachoric correlation coefficients were computed for the U 27% and the L 27% on their width and consistency of concepts. They were not significant, indicating no measurable relationship between reading ability and width and consistency of concepts as measured by the Zaslow Concept Formation Test.

Essentially, the findings of this study corroborate those of other studies on concept formation by Kress and Zaslow that there are some relationships between reading ability and ability to form concepts in children about 11 or 12 years of age.

Need for Further Research

The results of this study point to the need for further investigation in the following areas:

1. Standardization of the Zaslow Test with norms for age levels seven and up.

2. Further experimentation with the Zaslow Test to determine more specific relationships between concept level and error score. For example, do the errors in the middle area of the continuum indicate grouping on Level II?

3. The need for the development of tests to determine the conceptual level of readers of varying abilities with a view toward mastering the teaching of the prerequisite concepts Carroll (1964) stated were needed for "school-taught" concepts.

4. The need for determining norms for speed of completion of Zaslow's Test. Preliminary trials indicated that the speed of concept formation on the Zaslow Test would be a significant factor in reading achievement at the seventh-grade level.

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