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ABSTRACT

Two school entrance assessments were compared to determine whether or not they are theoretically unique approaches to kindergarte. screening. The first test was the "Brigance K and 1 Screen" (Brigance, 1982), a kindergarten entrance assessment which focuses on perceptual-motor development, background experience, and rote memory as determinants for school success. This test does not focus on language development. The second test, a battery of Piagetian tasks, focused entirely on cognitive functioning. Subjects were 30 students (14 males and 16 females) who scored 90 and above and 30 students (17 males and 13 females) who scored 80 and below on the Brigance test administered as part of school readiness screening in a school district in Idaho. Scores for each assessment were tabulated, compared, and analyzed using a one-way analysis of variance and Pearson product-moment correlations. Students scoring high on one test were likely to score high on the other test; low scorers on one test were likely to be low scorers on the other test. The implications for readiness assessment of the correlations between the subtests are discussed. Further study could provide greater insight and more recommendations for school practice. Nineteen tables present study data. The Brigance K and 1 Screen scoring sheet, a sample contact letter to parents, the parents' response card for testing, two-way and three-way classification test materials, and the Piagetian tasks scoring sheet are appended. An 87-item list of references is included. (SLD)

A COMPARATIVE STUDY OF TWO PRE-SCHOOL ASSESSMENTS AND THEIR RELATIONSHIPS TO SCHOOL ACHIEVEMENT

by

Nancy B. Davis

A thesis submitted in partial fulfillment of the requirements for the degree of

MASTER OF EDUCATION

in

EARLY CHILDHOOD EDUCATION

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To the Graduate Faculty:

The members of the committee appointed to examine the thesis of Nancy B. Davis find it satisfactory nd recommend that it be accepted.

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CHAPTER 1

INTRODUCTION

Many types of kindergarten and first-grade entrance assessments have been utilized to identify children who are "ready" or "not ready" for kindergarten or first-grade placement. In his review of school readiness and screening tests, Meisels (1986) outlined three major purposes of school entrance assessments. First, information gained about students from readiness tests might be examined to determine which entry behaviors are lacking and need to be taught before a particular student can participate in a determined program of instruction with a reasonable degree of academic and social success. Information gained from testing aids educators and administrators in determining the appropriate placement or grouping for students within a particular program of instruction. Readiness tests are only concerned with identifying which curriculum-related skills a child has already acquired. According to Meisels (1987), the function of readiness tests is to facilitate curriculum planning. Readiness tests are not valid assessments for identification of children who, because of developmental delays or deficits, require special services or early intervention programs.

The second use of school entrance assessments outlined by Meisels (1986) is to predict in the early years of their school careers which children will be high-risk or handicapped learners. The appropriate assessment, according to Meisels, for ascertaining such information about students is a developmental screening test. Developmental screening tests assess a child's ability or potential to acquire skills.

Meisels (1986) states that this type of assessment should focus on a wide range of developmental tasks including speech, language, cognitive development, perceptual skills, affective development, and gross and fine motor skills. Developmental screening tests are intended to help identify students who need to be referred for more extensive evaluation in order to determine the existence of a disability that may cause learning problems. Children whose test results place them in the "at risk" category should receive diagnostic testing to determine the specific deficit or developmental delay. Special educational or intervention programs are then designed according to the needs of the child.

The final use of school entrance assessment devices, according to Meisels (1986), is to determine which children are "developmentally ready" for school. Those who appear to be at risk for school success, but do not require special educational services and intervention programs, may be rescreened within six to eight weeks of the initial assessment. If test results still indicate that the student is at risk, educators often use this information to advise parents as to the most appropriate placement for the child in the school setting. Typically, if the child does not show "developmental readiness" parents are advised to delay the child's entrance into school or to place the child in a "transitional class" with an altered curriculum, different from the regular kindergarten or first grade class, but theoretically more able to meet the needs of the "unready" child.

Relative to the testing purposes cited above, researchers and theorists such as Ilg and Ames (1964), Getman (1981), Wanat (1976), Hirsh (1988) and many others have identified several student proficiencies which they believe are necessary for school success. Among these proficiencies are an appropriate level of language development, background experience, rote memory, number concepts, perceptual-motor development, and cognitive development. However, researchers and theorists have not come to a consensus on exactly which aspects of the child's development are most critical in determining readiness and most predictive of future school success.

Due to the apparent disparity between types of skills included in various school entrance assessments, the question arises as to which tests provide the most accurate and valid assessment of the child. To provide insight into that question, the present study compared two school entrance assessments. Each test claims to successfully assess children for school success, however, each test assesses differing and exclusive skills and abilities. The first test considered was the Brigance K and 1 Screen (1982), the required kindergarten entrance assessment for children in the school district wherein the study sample was chosen. Helfeldt (1984) indicates that the majority of the Brigance subtests focus on proficiencies in perceptual-motor development, background experience, and rote memory as determinants for school success. Subtests assessing language development and cognitive development are extremely limited and provide very little information about the child in these areas.

Due to the lack of subtests on the Brigance K and 1 Screen which assess children's language and cognitive abilities, a second school entrance test which dealt entirely with cognition was chosen for comparison. The chosen test was a battery of Piagetian tasks which has as its theoretical basis a theory of cognitive development postulated by Jean Piaget (1952). For the purpose of the present study, a comparison of scores on what appears to be two entirely different and exclusive school entrance tests was made.

Purpose of Study

The purpose of the study was to determine if two school readiness screening tests, the Brigance K and 1 Screen (Brigance, 1982) and a battery of Piagetian tasks are truly differing approaches to kindergarten screening or if they do, indeed, overlap in theoretical constructs. Toward that end, the present study investigated, first, if the Brigance K and 1 Screen and the Piagetian Battery are related and, second, if the tests are, in fact, testing the same skills and cognitive abilities in different ways. Answers to the following questions were sought:

1. Will children who score high on the Brigance K and 1 Screen also score high on the Piagetian Battery? Furthermore, will children who score low on the Brigance K and 1 Screen also score low on the Piagetian Battery?

2. Which Brigance K and 1 Screen subtests show a significant correlation with subtests comprising the Piagetian Battery?

Hypotheses

The present study investigated the following hypotheses:

1. There is no significant difference in the mean scores of the Piagetian Battery of the high scoring Brigance group and the low scoring Brigance group.

2. There is no relationship between Brigance Total scores and Piagetian Total scores.

3. There is no relationship between scores on each Brigance subtest and total Piagetian score.

4. There is no relationship between Brigance subtest scores and Piagetian battery subtest scores.

Limitations

The only identifiable limitation placed on this study was the inability to assess or procure IQ scores for all the study subjects. The possibility exists that some student test scores were a reflection of innate ability rather than an indication of the degree of school readiness or developmental readiness the student had attained.

Delimitations

Delimitations placed on the present study were as follows:

1. Students to be included in this study were limited to those students that were screened in April, 1988, for kindergarten entrance in Madison School District 321, Rexburg, Idaho. The date of anticipated kindergarten entrance was fall of the same year according to the state of Idaho school entrance age requirements.

2. The sample of students in this study were limited to 30 of those students who scored 90 and above on the Brigance K and 1 Screen, and 30 of those students who scored 80 and below on the Brigance K and 1 Screen.

Definition of Terms

For the purpose of the present study, the following definitions were used:

Readiness tests: a criterion-referenced measurement instrument designed to assess those curriculum-related skills a child has already acquired (Meisels, 1987). Meisels (1987) further indicates that the skills which the assessment device tests are typically prerequisite for specific instructional programs. Readiness tests are used to facilitate curriculum planning and to identify a child's relative preparedness to benefit from a specific academic program. Items on a readiness test focus on current skill achievement, performance and general knowledge.

School success: "the ability to learn and still have enough energy left over to be a competent, growing human being in all areas of living" (Gesell Institute, 1987).

Developmental readiness: the capacity to learn and simultaneously cope with the school environment. Sometimes developmental readiness is referred to as school readiness or learning readiness as opposed to reading readiness or math readiness. The latter two terms refer to acquisition of prerequisite skills for a particular curriculum (Gesell Institute, 1987).

Traditional class: a special class designed for students who after a year of kindergarten for one or a variety of reasons indicate a current inability to be successful in the offered first-grade program. After one year in the transitional class following kindergarten, most children then enter the first grade a year older than their classmates who went through the traditional sequence.

Schema theory: a portion of the theory of cognitive development postulated by Jean Piaget (1952). In Piaget's theory, schemes are the strategies by which the individual understands his environment and makes sense out of what he or she encounters. A modern definition of the term "schema" as identified by Rumelhart (1980, p. 35) is "a data structure for representing the generic concepts stored in memory." Information for retrieval from memory speculatively has been thought of as stored in organizational chunks which connect and interrelate with all other information that the individual possesses.

Operativity: the degree to which the subject can impose a logical structure on input (Lunzer, Wilkinson & Dolan, 1976).

Significance of Study

Many types of school entrance assessments are currently used to determine the correct placement for kindergarten and first-grade age children within the elementary school system. Wendt (1978) indicates there is much disagreement as to which test, assessing which abilities, will best help place children in academically appropriate programs and predict future school success. One of the reasons for this confusion and disagreement, according to Wood, Powell, and Knight (1984), is not having an agreed-upon definition of readiness. Kulberg and Gershman (1974) express this same concern regarding the ambiguity apparent in definitions of school readiness, assessments of school readiness, the factors that influence it, and how test results are utilized in placing children in academically appropriate programs.

One of the reasons for the ambiguity in definitions is the relationship between reading achievement and school achievement. Successful school achievement has been closely linked to reading achievement by educational researchers and practitioners. Telegdy (1974) states that readiness is commonly associated with academic and social characteristics of entering school-age children that are believed to be predictive of reading and arithmetic skill acquisition. Such skills lead to subsequent school success.

Randel, Fry, and Ralls (1977) also indicate that successful school achievement in the primary grades is largely dependent on the child's progress in learning to read. Therefore, many school entrance tests assess potential reading achievement as part of the total test battery. Unfortunately, according to Rude (1973) little is known or agreed upon about the specific skills prerequisite to successful reading. The variety of available school entrance assessments and the differing variety of skills and abilities assessed, further points to the lack of agreement and understanding of the reading process and prerequisite skills.

With the many school entrance tests available that claim to accurately assess children for school readiness and potential learning problems, one might wonder if so many tests are truly testing differing skills and abilities. If the underlying skills for each of the subtests were understood, subtests that appear to assess differing skills may reveal similar embedded tasks. Perhaps if relationships between seemingly dissimilar tasks were identified, many of the controversial issues surrounding school entrance assessments could be resolved. Resolution of such issues could mean much in terms of time, effort, and funds expended in school entrance assessment. It is for these reasons, Telegdy (1974) explains, that discovery of overlapping subtests which indicate a replication of effort, and subsequent elimination of such duplications would be a valuable and worthwhile effort. Resources could then be expended in more cost effective ways that would truly provide additional information about the entering school-age child and not simply duplicate prior efforts.

Besides elimination of duplication in skill assessment, discovery and clarification of embedded skills and relationships among a variety of differing subtests could provide clarity to the question of which prerequisite skills are most predictive of school success. In addition, such analysis could provide insight into the reading process and its prerequisite skills by identifying the most basic of skills and abilities that are predictive of reading and subsequent school success.

For the purpose of the present study, two school entrance tests were examined. Each test claims, either through the test author or through research, to provide insight into the status of entering school-age children. The first of these tests, the Brigance K and 1 Screen, was chosen because it was the required entrance assessment for entering kindergarten students in the district from which the study sample was taken. A second assessment, a battery of Piagetian tasks, was selected for comparison because of its exclusive focus on assessment of cognitive development, for which the Brigance K and 1 Screen was lacking. It was hoped that the comparison of two apparently dissimilar tests could provide the insight sought.

The Brigance K and 1 Screen (Brigance, 1982), is one of the testing devices available that claims to accurately assess students for kindergarten and first-grade placement. According to the testing manual (Brigance, 1982), the Brigance K and 1 Screen is a criterion-referenced screening assessment which measures a broad cross-section of skills and abilities. John B. Helfeldt (1984) notes that approximately one-half of the Brigance subtests rely heavily on background experience and rote memory; approximately one-third of the tasks are perceptual or motor; and the remainder measure levels of subsequent development or cognitive functioning. Language development is assessed only minimally with a total absence of receptive language assessment tasks.

The importance of the type of assessments contained in the Brigance for the screening and subsequent placement of kindergarten and first-grade students does not appear to be lacking in theoretical support. Several researchers and theorists cited below have identified these assessment tasks as being significant for school success. The first of these tasks, background experience, which comprises the greatest part of the test, appears to be one of the most important factors in determining student success in both reading and listening comprehension. According to Bransford, Barclay, and Franks (1972) sentence comprehension depends largely on the context in which the sentence is given and on prior knowledge of the receiver. Hirsh (1988) indicates that research of the past two decades has revealed that background experience is a far more important ingredient to the process of reading than was previously supposed. In addition, Spiro (1980) concludes that what one already knows largely determines what one will come to know. Based on theory and research, the role of background experience in reading and other learning clearly cannot be understated.

The second largest portion, nearly one-third of the Brigance, is comprised of perceptual-motor assessments, according to Helfeldt (1984). Perceptual-motor skills have gained their notoriety as prerequisite skills for school success largely through the work of Arnold Gesell supported by Francis Ilg and Louise Ames (1965). The perceptual-motor theory proposed by Gesell posits that a child's level of maturity and, therefore, developmental readiness for school can be ascertained, at least in part, by assessing the perceptual-motor skills of the child. Perceptual-motor skills are frequently included in other assessments to screen kindergarten and first grade children.

The remainder of the assessments on the Brigance K and 1 Screen which are aimed at assessing the cognitive functioning and development of the child, comprise a very small portion of the entire test. Little information on the cognitive functioning of the entering school-age child can be ascertained through the use of the Brigance K and 1 Screen (Helfeldt, 1984).

The second type of assessment investigated in the present study was a battery of Piagetian tasks. Piagetian tasks deal entirely with the cognitive functioning of the child. A number of researchers (Althouse, 1985; Cannella, 1982; Lunzer, Dolan, & Wilkinson, 1976; Freyburg, 1966; Witson and Hogan, 1983) indicate that the stages of cognitive development as postulated by Jean Piaget determine the child's ability to problem solve in ways that are necessary for school success. Tests on the Piagetian Battery used to determine the degree of operativity of a child most often include seriation, classification, and conservation with various expansions to more accurately determine the cognitive abilities of the child.

Several studies (Althouse, 1985; Arlin, 1981; Kaufman and Kaufman, 1972) show a positive correlation between student performance on

Piagetian tasks and readiness for beginning reading and math, as well as a positive correlation between student performance on Piagetian tasks and achievement tests. Lunzer, Dolan, and Wilkinson (1976) found that measures of operativity constitute the best single predictor of mathematical understanding and success in reading.

The efficacy of these two school entrance assessments to determine school readiness are both well supported by theory and research. The present study was designed to provide some insight into the theoretical constructs which are the bases of these tests and to investigate to what extent these theoretical constructs are related. It is hoped that the conclusions of this study will provide information that will aid parents, educators, and administrators in selecting school entrance assessments that will most accurately provide appropriate information regarding the status of the entering school-age child. It is also hoped that study results will provide insight into the most time and cost effective means of doing so.

Chapter II

REVIEW OF LITERATURE

In recent years school districts have become increasingly concerned and involved with preschool screening and readiness testing of children entering kindergarten and first grade. Several purposes for this involvement in preschool testing can be identified. The first and perhaps the most important purpose is to assess the abilities of children and identify those with special or exceptional needs (Wendt, 1978). Federal regulations such as Public Law 99457 are beginning to mandate such testing and identification of children with special needs as young as three years of age. These same federal regulations also mandate subsequent intervention programs for identified children. Theoretically, early intervention programs are designed to prevent later school failure by providing assistance early in the child's life before the learning problems become too entrenched and the secondary effects of learning difficulties have taken their toll on the child. According to Meisels (1987) screening tests are the type of assessments utilized to identify special needs children and children that need an interventive or modified educational program.

A second purpose of pre-school testing identified by Bear and Modlin (1987) is to determine whether or not a child is "ready" or at the optimum level of development to begin formal schooling. If the child is not ready as indicated by the assessment administered, several options usually apply. According to Bear and Modlin (1987), the child may stay at home for one year and delay entrance into kindergarten to allow for further maturation before beginning formal schooling; attend a prekindergarten program; spend two years in kindergarten; or attend a transitional or "pre-first" class after one year of kindergarten and before entrance into first grade. Recommendations for any given child will vary with what the local school district has to offer for such children.

A third purpose of pre-school testing identified by Meisels (1987) is to facilitate curriculum planning based on the child's "entry level" of skills mastered. Tests generally measure skills and knowledge which are prerequisite for a particular kindergarten program. Information gained from readiness tests can be utilized to identify a child's relative degree of preparedness to benefit from a specific academic program. This type of criterion-referenced test, according to Meisels (1987), assesses the child in terms of skill mastery with no overt or covert relationship to other children either nationally or within the tested population. The child is assessed according to specific academic skills and knowledge.

The final purpose of pre-school testing is less common, but beginning to emerge, according to Wendt (1978), as a result of experimental programs and research into Piagetian and information-processing cognitive models. Wendt (1978) indicates that the focus of this type of testing is upon the child's level of cognitive development which will allow the learning of higher level symbolic tasks. This type of testing can be used to facilitate curricular and instructional planning based on what a child is able to understand according to his level of cognitive development. Lunzer, Dolan, and Wilkinson (1976) further identified the predictive ability of Piagetian tasks, or measures of operativity, with regard to children's success in mathematical and reading achievement. Lunzer, et al. (1976) found that, "measures of operativity constitute the best single predictor not only for mathematical understanding but also for success in reading recognition" (p. 302).

Of the types of testing approaches identified, the present study was concerned with two school entrance assessments. One of the chosen assessment devices, the Brigance K and 1 Screen, is unique according to the test author (Brigance, 1982) in that it was designed to address several of the purposes of preschool screening as defined by Wendt (1978). These purposes according to the Brigance K and 1 Screen test manual (Brigance, 1982, iv) are:

1. to identify any student who should be referred for a more comprehensive evaluation to determine the existence of a disability that may cause learning problems;
2. to help determin the most appropriate placement or grouping of students;
3. to assist the teacher in planning a more appropriate program for the students;
4. to comply with mandated screening requirements.

While the Brigance K and 1 Screen addresses the first three purposes of preschool testing identified by Wendt (1978), (1) identification of special needs children; (2) identification of children who are developmentally "ready" or "not ready" to begin formal schooling; (3) and to facilitate curriculum planning according to the child's entry level of skills, a battery of Piagetian tasks addresses the fourth, although less common, purpose for pre-school testing. A battery of Piagetian tasks serves to identify a child's level of cognitive development and subsequent abilities to handle higher order symbolic tasks which are often required early in a child's school career. Curricular decisions may then be made based on the child's developmental ability to understand.

A battery of Piagetian tasks was chosen for the purpose of the present study as a comparative assessment with the Brigance K and 1 Screen because of the lack of cognitive based subtests contained in the Brigance K and 1 Screen. Therefore, the content of both the Brigance and the Piagetian Battery are examined and the theoretical bases supporting the rationale of each test are identified.

Brigance K and 1 Screen

Test Overview

Boehm's (1985) test review of the Brigance K and 1 Screen indicates that the Screen was developed to provide an overall developmental assessment of entering school-age children. Information gained from the use of the Brigance K and 1 Screen is useful in making readiness decisions about individual children; to facilitate curriculum planning; to make placement decisions; and to serve as a search-and-serve instrument to identify children who require a more extensive evaluation or referral to special services. In Wright's (1985) review of the Brigance K and 1 Screen it is stated that the Brigance provides a shallow inquiry into a broad cross-section of skills. The test is useful as a school entrance assessment due to the fact that the test is easily administered by paraprofessionals and testing can be completed within ten to twenty minutes per child.

According to Helfeldt (1984), the Brigance K and 1 Screen measures student performance in such areas as language development, motor ability, number skills, body awareness, and auditory and visual discrimination. Helfeldt (1984) indicates that all but the picture vocabulary subtest were adopted or excerpted from the more comprehensive Brigance Inventory of Early Development (1978) and the Brigance Diagnostic Inventory of Basic Skills (1976). While the Brigance Screen measures a broad cross-section of skills, approximately one-half of the assessment subtests rely heavily on background experience and rote memory; one-third are perceptual or motor; and the remaining few subtests minimally measure language or cognitive functioning. One of Helfeldt's (1984) criticisms of the Brigance Screen is that language development does not appear to be assessed to the same degree that other types of development are assessed.

Theoretical Bases

The rationale for including particular subtests on the Brigance K and 1 Screen can be examined according to general abilities the Screen claims to test. According to Helfeldt (1984), the major areas the Brigance Screen was designed to test include background experience and rote memory, and perceptual-motor ability.

Background Experience and Memory. Background experience, or prior knowledge has become recognized (Ausubel, 1963; Bransford, Barclay, and Franks, 1972; Spiro, 1980) as one of the most important factors in predicting school success in all areas of learning. The role of background experience in reading comprehension alone cannot be overstated (Goodman, 1984; Pearson, Hanson, and Gordon, 1979; Rumelhart, 1977).

The most recent research on reading comprehension has shown that the process of reading comprehension is much more complicated than was previously thought. Hirsh (1988) indicates in his best selling book, Cultural Literacy, that the model of reading which supposes that we first identify letters, then words, then word meanings, combine words and their meanings to get the meanings of sentences, and finally combine the meanings of all the sentences to get the meaning of the entire text, is oversimplistic in its assumption that the meaning to be derived is explicit in the text itself. Hirsh (1988) likens the explicit meaning of the text to the tip of an iceberg. The larger part of the meaning lies below the surface of the text and is constructed from the reader's own relevant knowledge.

The landmark research of Bransford, Barclay, and Franks (1972) yielded insights through a series of experiments that demonstrated that our initial understanding of a text depends on our application of prior knowledge that was not explicitly found in the text. These researchers divided subjects into paired groups and conducted a series of recognition tests in which each group was given one of two slightly different sentences. All of the sentence pairs were similar to the following example:

1. Three turtles rested beside a floating log, and a fish swam beneath them.
2. Three turtles rested on a floating log, and a fish swam beneath them.

The differences between the two sentences is slight. However, in the first sentence it is not necessarily inferred that the fish swam under the log, only that the fish swam under the turtles. In the second sentence, where the turtles were on the log, it can be easily inferred that the fish did indeed swim under the log, even though this information was not explicitly given in the test. The study subjects were asked at a later date if they recognized the test sentences. The one related to the turtles and the logs were as follows:

1. Three turtles rested beside a floating log, and a fish swam beneath it.
2. Three turtles rested on a floating log, and a fish swam beneath it. (p. 195)

Study subjects who were presented the "beside" original were given the "beside" test question. Subjects who were first presented with the "on" original were presented with the "on" test question.

The experimenters in this study were examining two conflicting hypotheses about the way in which language is understood. From a bottom-up theory, the reader interprets the meanings of sentences as they come from the text and store them in long-term memory. A conflicting hypothesis takes a top-down approach and states that the reader constructs meaning based on what words imply as he or she has learned from prior experiences. Based on the constructive hypothesis, one would expect the subjects who heard the sentence with "beside" to not mistakeably think that the original sentence stated that the fish swam under the log. Conversely, for subjects who were presented the sentence that said the turtles were "on" the log, one would expect the subjects to think that the original explicitly stated that the fish swam under the log, although there was no relationship between the fish and the log stated explicitly. Subjects consistently erred in this respect, lending credence to the theory that meaning of texts is inferred and constructed from prior knowledge.

A second study conducted by Bransford and Johnson (1972) demonstrated in still another way how the reader constructs a mental model of meaning based on the context and prior knowledge they are able to bring to text. A passage written so vaguely and generally that no mental model could be constructed from the explicit text was presented to the study subjects. The passage was as follows:

> "The procedure is really quite simple. First you arrange the items in different groups. Of course one pile may be sufficient depending on how much there is to do. If you have to go somewhere else due to lack of facilities that is the next step; otherwise you are pretty well set" (p. 722).

Some subjects were given the title, "Washing Clothes" before reading the passage, some were given the title after reading the passage, and others were never given the title of the passage. Only those subjects who were given the title before they began reading were able to recognize sentences from that passage at a later time. Constructing a mental model about washing clothes based on the title of the passage, gave the subjects a frame of reference based on prior knowledge about washing clothes that allowed that information to be stored in long-term memory. There was a structure to "hang" the information on for storage and later recall. In other words, sentence comprehension depends on the context and the background knowledge of the reader or the listener.

Kenneth and Yetta Goodman (1977) discovered the same processes involved in comprehending oral or written language postulated by Bransford, Barclay, and Franks (1972) by analyzing miscues in oral reading of both children and adults. What the Goodmans discovered was whenever readers are asked to read something for which they do not have adequate prior knowledge they had difficulty. That is, what a particular reader finds difficult depends on background experience and prior knowledge. Goodman (1984) explains that the ability of a reader to comprehend a text is very much limited by the conceptual and experiential background the reader brought to the task of reading. He also states that there are very strong limitations on how much new knowledge can be gained simply from reading a text. In other words, "What one knows after reading is the product of what one knew beforehand plus how well one read the text" (Goodman, 1984, p. 831).

Analyzing readers' miscues became a window into the mind of the reader and a barometer of the linguistic and conceptual background that the reader brought to the task of reading. Semantically correct miscues in oral reading, as were analyzed by Goodman and Goodman (1977) which did not disrupt meaning of the passage indicated an understanding of concepts embedded in the reading task at hand. Those readers whose miscues were not semantically correct, and who made no attempt to correct themselves in spite of the fact that their miscues disrupted the meaning of the passage, were said to lack the conceptual background to understand the meaning of the passage.

The roots of what educators identify as "background experience" can be found in what has come to be known as "schema theory." Schemata, according to Anderson and Pearson (1984), may be thought of as mental models of past experience or of human knowledge. However, as Hirsh (1988) points out, these mental models are not exact replicas of our former experience, but prototypes of that experience. Cognitive psychologist have given these prototypes various names, including "theories," "frames," "scripts," "concepts." "plans," "definitions" and "schemata," (Hirsh, 1988; Rumelhart and Ortony, 1977). These various names of how knowledge is organized and stored can give some insight into the meaning of what, for the purpose of the present study, shall be called "schemata." Schemata appear to not only be responsible for storing knowledge, but also of organizing it.

Schema (singular) or schemata (plural) according to Rumelhart and Ortony (1977) is the postulation of interacting knowledge structures. Anderson and Pearson (1984) have called a schema "an abstract knowledge structure" which summarizes what is known about a variety of situations or cases that differ in many of the particulars, but have significant similar component parts that categorize them into the same general mental structure or schema. A schema appears to be structured in such a way that the relationships among the component parts of the concept or scheme are mapped in the mind.

Ausubel (1963) and Ausubel and Robinson (1969) have clarified the implications that schema theory has for learning. While Ausubel did not call his theory a schema theory, he postulates that meaningful learning can only take place when the new incoming information can be anchored to already existing knowledge structures. In order for meaningful learning to take place, existing knowledge or concepts must be stable, clear, and easily distinguished from other concepts. When the learner is presented with the new information he or she can anchor it to the appropriate existing concept, thereby expanding existing knowledge or concepts. This expansion of existing concepts or knowledge structures has the effect of qualifying the learner to engage in even more meaningful learning experiences.

The challenge to make learning "meaningful" which has been posed to educators really is a challenge to link the new information to prior knowledge. Without the link to prior knowledge, the new information does not become incorporated into the learner's repertoire of background knowledge and retention of the new material is unstable. So it is, that the processing of information from short-term memory to storage in long-term memory is dependent upon existing knowledge structures which are available upon which to meaningfully "hang" the new information. Information which appears to the learner to be irrelevant in terms of existing knowledge structures has little likelihood of being stored and later retrieved from long-term memory.

Based on the foregoing research literature, there seems to be sufficient support for including subtests on the Brigance K and 1 Screen which require a broad background of experience and recall from memory. Considering the importance of background knowledge to future learning, there seems to be ample support for approximately one-half of the Brigance K and 1 Screen requiring a reliance on background knowledge for successful completion.

Perceptual-Motor Abilities. Measurement of perceptual-motor abilities has long been a component of school assessments to determine the presence of a potential learning disability in children and is an important component of the Brigance K and 1 Screen. According to Balow (1971) the postulated relationship between severe reading disability and impaired perceptual-motor ability has a hundred-year history. However, in a review of studies over a thirty-year period, Robinson (1972) states that the efficacy of perceptual-motor development programs designed to improve reading or school readiness has not been adequately determined, nor has a relationship between perceptual-motor abilities and reading been clearly determined. In spite of this fact, reading and school readiness tests have regularly included perceptual-motor subtests, especially those relating to visual perception.

The perceptual-motor abilities model and the relationship between learning and school success (although empirical evidence is inconclusive) has become the traditional model for school success largely due to the efforts of Arnold Gesell and his associates Francis Ilg and Louise Ames (1965). The Gesell School Readiness Test is largely perceptual-motor in nature as indicated by Kaufman in a 1971 psychometric analysis of the test. Such perceptual-motor tasks to determine perceptual-motor maturity and, therefore, readiness for school learning, according to the Gesellian perspective include (1) writing name; (2) writing numbers; and (3) copying forms of various levels of difficulty. In addition to assessments similar to the Gesell Tasks outlined above, the Brigance K and 1 Screen includes assessments of other perceptual-motor abilities such as (1) standing on one foot with eyes open and closed; (2) hopping on first one then the other foot; and

(3) walking heel to toe both forward and backward. Included on the Brigance Screen are also visual and auditory perceptual discrimination tasks.

According to Saphier (1973), one of the problems in assessing perceptual-motor ability is that no one knows precisely what perceptual-motor ability is. No one is sure what specific skills are associated with specific kinds of learning. Generally speaking, states Saphier (1973), those skills associated with the perceptual-motor model of school success speak in terms of skills such as balance, laterality, directionality, body awareness, and body image. It is thought that through one's body, or kinesthetic awareness, one builds a frame of reference for other kinds of perceptual and motor activity. The other perceptual-motor domains are visual perception, auditory perception, and sensory integration of percepts from each of the sensory domains. Generally speaking, according to Saphier (1973) perceptual training has been a "laundry list of perceptual subcategories based on intuition and logic rather than research" (p. 585).

The lack of an adequate definition of perceptual-motor ability has also been observed by Hammill (1972). Hammill (1972) located thirty-three definitions of "perception" in current research literature. A summary of these definitions leads Hammill, Goodman, and Weiderholt (1974) to an operational definition of perception to which almost all current training programs and perceptual-motor assessment devices appear to adhere. The definition summarized by Hammill, et al. (1974) makes a distinction between the lower order visual processing tasks such as visual acuity from the higher order tasks of visual perception such as visual discrimination and spacial organization. Perception, according to Hammill, et al. (1974) involves those brain operations responsible for interpreting and organizing the physical aspects of stimuli and not the symbolic aspects. Such visual processing tasks which include semantic interpretation and reading comprehension comprise an even higher order of tasks that is generally subsumed under the definition of visual perceptual processes.

Hammill et al. (1974) cite the most common assessment devices--Marianne Frostig Developmental Test of Visual Perception (1961), Bender Visual-Motor Gestalt Test (1962), Perceptual Forms Test (1969), Motor-Free Test of Visual Perception (1972), and selected tests from the Wechsler Intelligence Scales (1974) and the Illinois Test of Psycholinguistic Abilities (1968) as including tasks which require matching of geometric or nonsense forms, fine visual-motor coordination activities and figure-ground. These tasks appear to be most representative of perceptual-motor tasks on most school entrance and reading readiness tests. Similar tasks are included in the Brigance K and 1 Screen.

The perceptual-motor hypothesis (especially in the visual domain) has in the past, according to Whitson and Hogan (1983), received wide support as a model upon which reading specialists based the diagnosis and treatment of reading dysfunction in normal, non-brain-injured children. This position focuses remediation and training on such perceptual skills as visual discrimination, with the belief that improved perceptual skills will produce improved reading. Many programs which have been implemented to improve school or reading readiness, according to Robinson (1972), have included exercises dealing with auditory and visual perception and discrimination, along with visual-motor skills.

Proponents of the perceptual-motor model lobby the importance of sensory screening tests prior to school entrance to identify children at risk for a reading disability and subsequent school failure based on the respective sensory deficit. If deficits are identified by whatever screening device is utilized, a program for sensory training is usually implemented to reduce the risk of school failure (Casbergue & Greene, 1988). The initial hypothesized purpose of screening for sensory deficits identified by Casbergue and Green (1988) was to permit educators to train children in their particular areas of sensory and perceptual weakness. Sensory-perceptual training, in turn, was intended to help prepare children to become more proficient readers and reduce the likelihood of reading dysfunction since reading, is at least in one aspect, a visual-perceptual-motor function.

While the relationship between perceptual-motor abilities and reading may seem logical, neither early or recent research adequately supports the claim that improved perceptual-motor abilities improve reading or school achievement. Several researchers have used visual-perceptual training materials developed by Frostig and Horne (1964) to test the training effects of visual perception on subsequent reading improvement. Rosen (1966), after training students for 29 days on Frostig materials, found that the experimental group had superior performance over the control on the Frostig Tests, but no comparable gains in reading achievement. Jacobs, Wirthlin, and Miller (1968) found that even when the program was introduced in kindergarten and first grade, scores on readiness tests were higher for the experimental group, but in first grade there was no significant difference in reading between the two groups. By the second grade, the group that did not receive the perceptual training surpassed the experimental group on measures of reading.

In still another study, Buckland (1969) used Frostig visual perception workbooks to train children in sixteen first grade-classrooms who scored low on reading readiness tests. Experimental treatments (Frostig training) and control treatments (listening to tape recorded stories followed by small group discussion) were conducted for 40 periods of 15 minutes each in small groups of 5 to 6 children. Buckland's (1969) findings were unexpected. Of the students scoring the lowest on the initial Frostig test, the control (story listening) group surpassed the experimental group on measures of readiness. Even after treatment, the control groups did better on post-treatment tests of visual perception than did the experimental group who were specifically trained in visual perceptual skills. Based on these and other studies in which the Frostig-Horne materials were utilized to improve visual-perception with questionable success in reading improvement, the efficacy of such training appears doubtful (Balow, 1971; Casbergue & Greene, 1988; Klesius, 1972; Robinson, 1972; Wong, 1979).

A second type of perceptual-motor assessment and training program devised by Kephart (1960), emphasizes physical coordination and eye-hand coordination or sensory-motor coordination as a means of improving visual-perception and reading. Kephart's (1960) rationale for training is to integrate sensory and motor systems. Kephart and his followers postulate that children who are unable to integrate sensory and motor systems must concentrate on lower-order skills, displacing higher-order cognitive skills. Automaticity of sensory-motor integration skills of the lower-order frees the learner to concentrate on higher-order cognitive skills such as those involved in reading and comprehension (Solan, Mozlin, & Rumpf, 1985).

O'Connor (1969) studied the effects of a Kephart-type program of perceptual-motor activities with 59 male and 64 female first-grade students. During the six-month training period, the treatment group participated in a special perceptual-motor activities program and the control group participated in a traditional physical education program. Conclusions at the end of the study indicated that Kephart-type training has little or no effect on perceptual or academic ability.

In a study by Litchfield (1970) involving 80, primary-aged, learning disabled children, treatment utilizing visual-motor perceptual activities was administered for a six-month period, for a half-hour session each day. Post-treatment testing with the Lorge-Thorndike Intelligence Test (1966), the Stanford Early School Achievement Test (1969), and the Gates-MacGinitie Reading Test (1970) revealed no significant difference in intelligence and achievement scores.

Wimsatt (1967) attempted to identify the effects of visual-motor training on intelligence, school achievement, and language functioning. Using kindergarten, first, and second grade children, Wimsatt found that the experimental kindergarten group made significant gains in reading aptitude but not in intelligence. The first- and second-grade children showed no signs of benefit from the training program. It could be that the gains found in kindergartners may have been a result of development and not the effect of the training program.

The criticism of research which claims improved reading readiness or improved reading scores due to perceptual-motor training programs is vivid. Goodman and Hammill (1973) reviewed forty-two studies in which intervention techniques utilizing Kephart, Getman (optometric vision training) or a combination of these techniques. Goodman and Hammill's (1973) evaluation found that most of these studies suffered from serious methodological deficiencies. In an attempt to define the better research from which to draw conclusions about the efficacy of perceptual-motor training programs, the following criteria was established to identify such research:

1. studies had at least twenty experimental subjects.
2. at least twelve weeks or sixty sessions of training were provided.
3. a control group was employed in the experimental design.

Of the forty-two studies reviewed by Goodman and Hammill, (1973) only sixteen met the established criteria.

Some of the research flaws common to studies supporting causes and treatments of learning disabilities were outlined by Levin (1984):

1. overreliance on anecdotal evidence,
2. a lack of carefully matched comparison groups (both normal and dysfunctional),
3. an initial preconception that a factor in isolation causes a reading disability,

4. a lack of consideration for multiple interactive factors,
5. an assumption that there exists only one method by which children learn to read,
6. a tendency to interpret findings too narrowly,
7. a failure to control for the Hawthorne effect often created by bestowing increased attention upon the child,
8. a tendency for research to be undertaken by individuals with a vested interest in a positive outcome.

Levine (1984) states that it is not surprising that investigators, teachers, and clinicians have sought the answer to reading problems in ocular and visual functions and placed children with reading delays in intervention programs. Placement in these programs according to Levine (1984) is based on the assumption that children with reading delays have functional visual deficits that are etiologically linked to their reading problems. Since reading at first glance appears to be a visual function, then visual therapy, according to this thinking, should correct the impairment. Like Goodman and Hammill (1973), Metzger and Werner (1984) cite flaws in the research design of many studies which support the visual deficit hypothesis and that recent research suggests flaws in visual perception are as common in normal readers as they are in poor readers.

Levine (1984) clearly points out that while many parents, teachers and professionals are looking for the single cure for behavioral and learning difficulties, many "cures" are attributed to treatments which happen to coincide with the child's normal development, therefore, the treatment gets all the credit for the "cure." When in truth, the natural development of the child over time may be responsible for increased perceptual abilities. The likelihood of the child naturally developing out of his or her "learning difficulties" is plausible, but not accounted for in most research designs.

Based on the above review of the perceptual-motor construct for reading readiness, it would appear that the inclusion of perceptual-motor subtests on any school entrance assessment would have the value of providing some interesting but irrelevant information when considering the child's readiness for school entrance or readiness for beginning reading. However, Kavale (1982) points out that perceptual-motor skills become important for achievement when the primary instructional modality focuses on developed visual-perceptual skills. Children who have not developed these skills simply as a function of their individual developmental time clock may have difficulties and labeled "learning disabled" if the curriculum does not provide for these individual differences in growth.

The second type of school entrance assessment examined in the present study, a battery of Piagetian tasks, approaches school readiness differently than the Brigance K and 1 Screen. The concern addressed by the Piagetian Battery is that of cognitive development. A review of Piagetian theory and Piaget's postulated stages of development offers some insight into the efficacy of assessing the child's cognitive developmental level prior to school entrance.

Piagetian Battery

One type of school entrance assessment test identified by Wendt (1978) which is beginning to emerge is the cognitive development approach. The focus on cognitive development as a means of assessing students' current cognitive abilities to facilitate curriculum planning has as its origins the cognitive developmental theory of Jean Piaget. While Piaget did not involve himself with pedagogy, his contributions toward the understanding of the development of intelligence has provided impo. ınt insights into child development and the mechanisms of learning.

Historical Overview

The biographical sketches of Jean Piaget by Flavell (1963), Furth (1969), Elkind (in Piaget, 1967), and Wadsworth (1989) all attest to the fact that Jean Piaget (1896-1980) lived a life of hard work and varied scholarship. While Piaget's intellectual pursuits and diverse interests qualify him equally as a biologist, philosopher, psychologist, and logician, Piaget is responsible for the evolution of a new interdisciplinary field of study--genetic epistemology. As a genetic epistemologist Piaget was concerned with the origins of intelligence in the individual that could be generalized to the development of intelligence in the species (Elkind in Piaget, 1967).

Wadsworth's (1989) biographical sketch of Piaget describes him as primarily a biologist whose interest in the development of intelligence began through his study of mollusks. In studying differences in shell structure between mollusks which lived in rough lake water as opposed to calm water, Piaget was led to conclude that organismic development was due to not only maturation and heredity, but also to variable environmental factors. Successive generations of mollusks developed shell characteristics that could only be attributed to a change from a lake environment of rough water to a calm pond. Piaget ascertained from his observations that biological development was a result of 'aptation to environmental changes and not attributable to maturation alone. Piaget's conviction that biological development was rooted primarily in adaptation to environmental changes through biological processes was the forerunner of his later view of mental development.

After completing his doctoral study in biology, Piaget developed a keen interest in psychology. Working in psychological clinics in Zurich, and a short time later in the Binet's Paris grade school laboratory, Piaget did psychological experiments and worked to standardize Binet's tests. Through his standardization of Binet's tests, Piaget's interests were directed to children's incorrect responses to test questions. His study of the reasoning process children used to arrive at their incorrect answers soon became his passion for study. Thus, began Piaget's sixty-year study of the mental development of children.

Piaget's research and methodology, according to Wadsworth (1989), were foreign to the American population of researchers whose views were steeped in behavioristic models dominated by stimulus-response and reinforcement relationships. Research techniques accepted by American researchers made use of absolute control over variables and employed rigorous statistical measures to interpret data. Piaget did not approach research from this prospective, but through his research in Binet's clinic, developed his clinical-interview method of observation and description that became unique to Jean Piaget. Piaget's methode clinique involved the careful questioning of children about selected situations and events, analyzing and recording their responses, and determining the children's reasonings which led to those responses. Piaget kept meticulous notes of his longitudinal observations of children's qualitative thinking, frequently observing and recording the responses of the same children over many years. Through his observations of the qualitative differences in children's thinking as they matured, Piaget postulated his stage theory of the development of intelligence.

Piaget's Stage Theory of Cognitive Development

Through his observational clinical method described above and the noting of the qualitative changes in children's thinking over time, Piaget (1967) postulated that the development of intelligence proceeded through a predictable series of successive and invariant stages. Rowland and McGuire (1971) note that unlike the Gesellian approach to stage theory with inflexible upper and lower limits of normative development, Piaget's conception of developmental stage theory makes use only of invariant sequences with no time boundaries imposed upon the developing child. In fact, as Rowland and McGuire (1971) point out, the rate at which a child moves through Piaget's postulated stages of cognitive development is generally not susceptible to acceleration through training. Only when a child is on the verge of a stage change, and an appropriate degree of readiness has been attained at the time of intervention, can training have any efficacy in promoting the next successive stage.

Inhelder (in Furth, 1969) discusses Piaget's approach to cognition, clarifying Piaget's postulated invariance of his successive stages. Inhelder's (Furth, 1969) interpretation states that development toward a particular stage is dependant on the successful completion of the previous stage and all other stages before that one. The knowledge a child has constructed at any particular stage has embedded within it the cognitive structures of all previous stages. The new structures, however, are modified from the old ones as the child s conceptual abilities emerge and he or she is faced with new experiences to confirm prior constructions or evidence which contradicts prior understandings.

While Piaget's theory is considered a stage theory, Wadsworth (1989) clarifies that Piaget conceptualized his stages as a continuum of development and not as discretely identifiable stages. Cognitive development continually flows in a cumulative manner, but looking at sections or chunks of the continuum has been regarded as helpful in identifying the qualitative changes characteristic of children's thinking as intelligence evolves. Each step, according to Piagetian theory, is built upon and integrated with all prior steps. Piaget (1952) explains that the stages do not succeed each other in a linear way with the characteristics of one stage disappearing as the following stage emerges, but have a cumulative quality as new behavior patterns complete, correct, or combine with the old ones to produce a qualitative superior stage to the preceding one.

Rowland and McGuire (1971) specify that Piaget did not think that maturation alone nor experience alone was sufficient to explain the subsequent changes in cognitive structures, but saw maturation and experience as interactive components that produce the subsequent changes in the cognitive structures. The progression of intellectual development as conceptualized by Piaget is a result of odifications of mental structures, or schemes, due to maturation coupled with active interactions with the environment.

The cognitive structures to which Piaget alluded can appropriately be called schemes or schemata. While the previously discussed "schema theory" as it relates to background experience and prior knowledge share the Piagetian term, the conception of schemata by Piaget holds a slightly different meaning. Schemata with reference to prior knowledge appears to have more application to specific content of thought, knowledge, and understanding, and how knowledge interrelates (Hirsh, 1988), while Piaget's conception of schemata consists of organized patterns of behavior or thought. The definition of the Piagetian term "schemata" provided by Elkind in Piaget (1967) states: "In a specific sense schemata are the sensori-motor equivalents of concepts in that they permit the infant to deal economically with different objects of the same class and with different states of the same object. In the general sense schemata are the structures at any level of mental development" (p. 2).

For Piaget, all new schemes have their origin in basic reflexive behavior of the human organism (Furth, 1969). Schemes are the "coordination and organization of adaptive action, considered as a behavioral structure within the organism, such that the organism can transfer or generalize the action to similar and analogous circumstances" (Furth, 1969, p. 44).

The changes through which cognitive structures or schemes evolve as a result of cognitive adaptation are due to processes which Piaget (1952, 1967) terms assimilation and accommodation. Assimilation, as explained by Piaget, is the process by which a person integrates new information, perceptions, motor activity, or concepts into existing schemata. When a person is faced with new stimuli, he tries to fit it into patterns of thought or behavior that he has at the time. Assimilation theoretically does not change the existing schema, but without a doubt, the new experiences certainly expand and broaden it. Assimilation, therefore, produces a quantitative change in schemata. If, on the other hand, a child presented with new experiences finds that there is not a suitable "fit" for the new experience, he may adjust his existing schema to provide a "fit" for the new experience, or he may develop a new schema to take the new experience into account. Both of these forms of accommodation result in new or changed schemata. After accommodation, the new experience is easily assimilated into the new cognitive structure, and a qualitative change has taken place in the thought of the developing child.

Still another uniquely Piagetian concept (Piaget, 1964, 1967) is that of equilibration. Equilibration is the result of the processes of assimilation and accommodation. When assimilation and accommodation are in balance, the child is said to be in a state of equilibrium. However, when the child is in a state of cognitive conflict, disequilibrium is said to dominate. According to Piaget (1964), all development is composed of conflicts and incompatibilities which must be resolved to reach a higher level of cognitive development or equilibrium. Duckworth (1964) clarifies that the state of disequilibrium is the motivating factor which causes the child to employ his powers of assimilation and accommodation to adjust or expand existing schemata, or to create a new schema to account for the new experience and produce cognitive comfort. Equilibrium is most often a fleeting state of affairs for the developing child, as the child is constantly acquiring new experiences that engage the child's schemata.

A final mechanism of cognitive development that must be considered in Piagetian theory is the role of social transmission in cognitive growth. Piaget (1964) identifies social ansmission as the exchange of ideas among people. Wadsworth (1989) states that Piaget regards social transmission as imperative for the acquisition and understanding of social knowledge. To the degree that concepts are defined by social circumstances, and not defined sensorily by physical referents the child is dependent upon others for development of that concept. An example given by Wadsworth (1989) is the concept of honesty. In addition to the role social transmission plays in the development of social concepts, Jacob (1982) and Duckworth (1964) note that interaction with peers can also induce cognitive conflict within the child and initiate a growth or change in existing schemata and promote the development of certain concepts.

Based on the mechanisms of accommodation, assimilation, and equilibration Piaget (1952, 1964, 1967) postulated that cognitive development evolves through four major stages: sensori-motor, preoperational, concrete operational, and formal operational.

Sensori-motor stage. According to Piaget (1952, 1964, 1967) the sensori-motor stage lasts approximately the first 18 months of life before the emergence of language. The beginning of this stage relies on basic reflex actions with which the child was born. All other schemes that the child develops throughout his life has its origins in innate reflexive behavior the child possessed as an infant. The child's behavior is primarily motor while experiencing the world through the senses. He begins to coordinate motor activity and perceptions, and later to coordinate these functions into intentional acts. At this point he also develops the phenomenon of object permanence. That is, he will try to search for objects that have been hidden from view. Before this point in development, "out of sight, out of mind" held true for objects which were present and then subsequently hidden from the child's view.

According to Piaget (1952, 1964, 1967) as the child develops through the sensori-motor stage he begins to generalize schemata to new situations and to imitate auditory and visual experiences. Shortly thereafter, the child begins to discover new means through experimentation and systematically imitates new models. During the last phase of the sensori-motor stage, the child invents new means of action through mental combinations and begins symbolically imitating previous experiences. Piaget maintains that this beginning symbolic function is responsible for the emergence of the ability to learn language in the next cognitive stage.

Preoperational stage. The second stage of cognitive development as defined by Piaget (1964, 1967) is the preoperational stage or preconceptual stage lasting from approximately age 2 to 7 years. This preconceptual or preoperational stage is characterized by the development of language and representational thought or imagery. According to Piaget (1967) images are static and simplistic and based solely on perception rather than logic. Rapid conceptual development takes place as the child makes use of his increased ability to represent and process experiences. Children in the preoperational stage are egocentric in their thought and lack the quality of reversibility, transformational reasoning, and decentration. Piaget (1967) clarifies that while the characteristics of preoperational thought may seem like obstacles to logical thought, they are necessary stages in the construction of schemata and important forerunners to logical operations.

Concrete operational stage. The third stage of cognitive development cited by Piaget (1964, 1967), the concrete operational stage, lasts from approximately 7 to 11 years. During this time the child is beginning to apply logical thought to concrete experiences. They are concrete operations because the child is acting on existing objects and not on internally or verbally represented hypotheses. That is, the child is as yet unable to conceive a problem and develop a wide range of alternative solutions. The underlying general systems of seriation, classification, and conservation are intact during the concrete operational stage, where these underlying systems were only in the making during the previous preoperational stage.

Formal operational stage. According to Piaget (1964, 1967), the final stage of cognitive development, the stage of formal operations usually begins at approximately 11 years and extends into adolescence and even into adulthood. The child's cognitive structures at this point of development reach their highest potential. The child is able to reason abstractly, in the absence of concrete situations, and apply logical reasoning to all classes of problems. The child is able to apply many possible solutions to hypothetical problems. He is able to conceive of new ways of thinking and combining alternatives into new solutions.

Piaget (1967) postulates his cognitive developmental stages as invariant sequences through which all human beings develop and eventually arrive at the final stage of formal oper ions with the ability to reason logically and abstractly. Of Piaget's postulated mechanisms of development, (1) maturation, (2) experience, (3) equilibration, and (4) social transmission and their interactions with one another, not one of the four factors alone can explain cognitive growth (Piaget, 1964). The interaction of all four is essential to create the conditions for cognitive development to take place.

Relationship of Cognitive Development to School Achievement

In recent years a renewed interest in Piaget's theory of cognitive development has lead researchers to seek a relationship between the acquisition of concepts in Piagetian terms and readiness for reading and mathematical instruction (Arlin, 1981; Althouse, 1985; Cannella, 1982; and Whitson & Hogan, 1983). Piagetian concepts which are of interest to researchers are those which distinguish a preoperational child from one who has achieved the state of concrete operations.

One characteristic of preoperational children, according to Piaget (1967) is the dominance of perception over reason. This is manifested clearly when the child is posed a conservation problem. Conservation, as defined by Piaget & Inhelder (1969), is the ability to recognize that the volume or quantity of matter stays the same when it is transformed in irrelevant dimensions. For example, (Wadsworth, 1989) the preoperational child is shown a beaker of water or other liquid and observes the liquid from the beaker being poured into a taller, narrower container. When asked if the tall container has the same amount of liquid as the shorter, wider container had, the child would say that the taller, narrower container held the greater amount of liquid, or that the shorter, wider container held the greater amount of liquid, but never does the preoperational child recognize that the volume of liquid remains the same when poured into a different container. At this point in development she is unable to reason that nothing has been added or taken away, therefore, the volume must have remained the same.

One reason, outlined by Piaget (1967), that the preoperational child is unable to solve the conservation problem is due to her inability to re e operations. She is unable to observe an action and mentally reverse that action to what the state of affairs were before the action took place. For example (Wadsworth, 1989), in the conservation problem the preoperational child is unable to reverse the process of pouring the liquid into the taller, narrower container by being able to mentally pour the liquid back into the shorter, wider container from which the liquid was originally poured. If the child were able to mentally reverse this process, she would recognize that the volume of liquid when poured into either of the two containers would remain the same. Irreversibility of thought limits the preoperational child in her ability to reason logically, but is a natural and vital step in the development of logical thought.

A second reason, outlined by Piaget and Inhelder (1969), for the preoperational child's difficulty in solving the conservation problem and, therefore, a limiting factor in his ability to reason logically, is his inability to de ter. Preoperational thought is unable to attend to all perceptual aspects of an event. The child focuses on a limited set of perceptions and evaluates the event from a limited perspective. In Wadsworth's (1989) example of the conservation problem, the child is unable to attend to the two perceptual features of each container as they relate to the container's dimensions. The child is unable to see that the short container is also wide, and that the tall container is also narrow. He is unable to perceive that the shorter height of the one is compensated for by the larger diameter, or that the taller height of the other is compensated for by the smaller diameter. The child is only able to focus on the height of each container or the diameter of each, but not to both dimensions at once. This inability to decenter leads the child to erroneous conclusions when posed with a problem that requires the child to attend to several features of an event at once.

A third characteristic of preoperational thinking outlined by Piaget (1964) and Piaget and Inhelder (1969) is the inability of the young child to follow transformational processes. According to Wadsworth's (1989) example, if a pencil is held in an upright position and allowed to fall to a horizontal position, the child is unable to reproduce the successive steps in the transformation. Instead, she focuses on the beginning state and the final state, but is seemingly unaware of the steps in between. This, according to Wadsworth (1989), prohibits the child from making comparisons between states of events. She is unable to reconstruct and integrate a series of events that constitute beginning and ending relationships. The inability to follow transformations interferes with logical thought according to Piagetian theory.

A fourth characteristic of preoperational children, outlined by Piaget (1967), is egocentrism. Egocentrism inhibits the child from seeing or seeking the viewpoint of others. The child assumes that his thoughts are the only thoughts and are, therefore, the only correct ones. It does not occur to the child that anyone could have thoughts that are different from his own. He feels no need to question his thought or reflect on his thinking. When faced with evidence contrary to his thinking the child assumes that the evidence is incorrect. Because the child is not motivated to question his thinking at this period of time and reconstruct his concepts, his cognitive development is inhibited for a time. Wadsworth (1989) indicates that while this phase of development in one sense inhibits cognitive growth, it is also an essential element of this stage and of any newly acquired cognitive characteristic.

When the child has acquired the characteristics of thought which include decentration, reversibility, transformational reasoning, and is less egocentric, she is said to have moved into the stage of concrete operations, having the ability to reason logically about concrete situations and problems. Several cognitive tasks have been designed by Piaget, which upon successful completion, indicate that the child has moved from the preoperative stage to one of concrete operations. These tasks include the ability to seriate, classify and conserve.

The first of these tasks which indicate a movement of the child cognitively into logical concrete operations is seriation. Piaget and Inhelder (1969) define seriation as the ability to order objects according to size, weight, volume, color, or some other increasing or decreasing feature. Preoperational children will go from imposing no order whatsoever on the objects, to ordered pairs, to adjusting the features to "fit" in a configuration that in one dimension appears to satisfy the criterion for ordering the objects, to finally accurately ordering the objects according to increasing or decreasing size, weight, volume, or color intensity, shade or tone.

The ability to seriate has been found to have a positive correlation to reading readiness. Scott (1969) found that seriation was highly related to reading readiness with a correlation of .82. Kaufman and Kaufman's (1972) longitudinal study found seriation activities to correlate with the Stanford Achievement Tests for first graders at .55. In still another investigation of seriation ability and reading readiness and achievement Waller (1977) examined the results of the Scott (1969) and Kaufman and Kaufman (1972) studies and postulated the relationships between seriation and reading. Waller (1977) noted that for reading a child must separate spoken words into component sound parts and then reassemble them into a whole in the proper order, a task which Waller (1977) sees as a seriation task. In addition, the proper ordering of words in sentences and the correspondence of sound and symbol relationships, for Waller has seriation-like dimensions for their successful achievement.

The second task described by Piaget and Inhelder(1969) which upon successful completion indicates a move toward the concrete operational level of intelligence is that of conservation of length, mass, volume, and number. As outlined earlier, a typical conservation of volume tasks requires the child to observe a liquid being poured from a short, wide container into a taller, narrower one. The child is then asked if there is more or less liquid in the taller, narrower container than in the shorter, wider one or if the amount of the liquid remains the same. A child who is advancing toward the concrete operational stage will state that there is the same amount of liquid in the taller, narrower container as there was in the shorter, wider one. The concrete operational child understands that nothing has been added or taken away from the volume of liquid. He also understands that the taller container has been compensated by its narrower diameter, so the water level is higher in this container than in the shorter, wider one without an increase in the water volume. Other dimensions of conservation ability are measured in similar ways, each requiring the ability to decenter, follow transformations, and to think reversibly.

The relationship of successful performance on conservation tasks and school achievement has been postulated by several researchers. Althouse (1985) posits that conservation ability is necessary for children to understand some reading readiness tasks such as recognizing that there is more than one sound for the same letter symbol or that an "A" is the same letter as an "a" and is the same letter as an "a" written in manuscript handwriting. Non-conservers are likely to be confused at these reading concepts. The Althouse (1985) study showed that the relationship of conservation to reading performance was moderately to highly significant and positive. Kaufman and Kaufman (1972) found conservation of number to correlate at .44 with reading achievement in the first grade.

A third task common to Piagetian theory is that of classification. Piaget and Inhelder (1969) define classification as the ability to mentally group objects according to similarities. As the preoperational child evolves in his ability to classify, he first begins his attempts at classifying objects in a set two at a time. The child selects objects that go together based on their similarities, for example, two circles; one white and the other one black. The child identifies that they go together because they are both circles. He may then add a white triangle to the set to go with the white circle stating that they are both white, and subsequently add a gray triangle to go with the white triangle because they are both triangles while insisting that all of the objects in the set he has created go together. Differences in the set are ignored as the child has no overall plan for the total set.

The next level to develop in classificational ability is for the child to form collections of objects according to one like dimension such as shape, color, or size. Children at this level are unable to recognize the relationship a subclass has to the entire class or the class inclusion principle. For example, in a class inclusion task from Arlin (1981), the child is shown two groups of colored beads. Discussion with the child would result in a recognition by the child that all of the beads are wooden and seven of them are green and two of them are white. This child is then asked, "Are there more green beads or more wooden beads? What do you think? Are there more wooden beads or are there more green ones?" A child not yet at concrete operations indicates that there are more green beads, failing to recognize the relationship that the green beads have to the whole class of wooden beads. The child's difficulty in solving class inclusion problems, according to Cannella (1982), is his lack of ability to decenter. When he focuses on the part, (the green wooden beads) he loses the whole (the class which includes all wooden beads). The child is unable to attend to two perceptual aspects of the stimulus, color and materials, at once. Class inclusion ability, according to Arlin (1981) is one of the last to emerge in the acquisition of concrete operations.

Classification and class inclusion ability, like other of the Piagetian tasks, has been shown to influence school achievement. Classification and class inclusion ability has been demonstrated by Kaufman and Kaufman (1972) to be related to early reading achievement. Waller (1977) states that a child who has the ability to decenter is then free to consider all reading cues at once in achieving the "whole" of reading. He is able to consider individual letters and sounds where appropriate and combine those parts into the whole word. Kirkland (1978) points out that the child who is able to decenter is able to memorize rules and apply them, while the preoperational child who is unable to decenter can memorize rules, but is unable to keep them in mind. This has significance to beginning reading where generalizability of rules is necessary to be able to consistently apply reading insights to new words or sentences.

While it appears that the ability to perform singular Piagetian tasks affects the child's ability to achieve in school, Arlin (1981) points out it must be understood that the ability to solve the tasks does not appear in a linear fashion. The abilities emerge as a gradual acquisition of thought represented by classification, seriation, and conservation, the three subsystems of the concrete operational stage. For this reason many researchers (Arlin, 1981; Freyberg, 1966; Lunzer, Dolan, and Wilkinson, 1976; Whitson and Hogan, 1983) are beginning to consider the degree of operativity the child has acquired in assessing readiness for school instead of focusing on specific tasks, none of which, according to Arlin (1981) hold a ` of the keys required for school achievement.

One such study by Arlin (1981) consisted of testing 192 kindergarten age children to determine their degree of operativity based on a battery of Piagetian tasks and to retest one year later the children's development of concrete operativity. The second purpose of the study was to examine the interrelationships among and between tasks and the child's performance on the Metropolitan Achievement Test (1958) at the end of first grade. This was done to determine if any or all of the Piagetian tasks could serve as a readiness test for reading and mathematics. The third purpose of the study outlined by Arlin (1981) was to determine which components of concrete operational thought would account for variance in reading and mathematical achievement as indicated by the Metropolitan Achievement Test (1958). Arlin's (1981) conclusions indicate that there is not a simple solution to relating a child's operativity to mathematic and reading achievement, however, it seems clear that little can be said about school readiness or achievement based on one or two of the Piagetian tasks. All three subsystems must be represented before attempting to identify the child's operational level. Increased operativity does appear to make significant contributions to the child's reading and mathematical achievement. In addition, operativity, which appears to contribute significantly to school success, does not appear to account for individual differences in achievement.

In another study relating cognitive development to school achievement, Freyberg (1966) evaluated the relationships between general intellectual ability, concept development in Piagetian terms, and achievement in arithmetical computation, arithmetic problem solving and spelling. The two year longitudinal study involved 151 New Zealand children from the age of 6 to 9 years. The results of the study indicated that in no case did a child score low in conceptual development and attain a high score on arithmetic ability. Freyberg (1966) also found that aspects of conceptual thinking appear to affect some aspects of school performance that are not adequately assessed by conventional intelligence tests. While the specificity of the contribution that cognitive or conceptual development plays in school achievement is unclear, Freyberg's (1966) study seems to support a positive relationship between conceptual development and some aspects of school learning.

In still another study, Whitson and Hogan (1983) compared a Piagetian model for reading effectiveness with a perceptual model. There was found to be a significant positive correlation between classification ability and reading performance, indicating that a child's cognitive developmental level is related to his reading performance. No relationship was found in this particular study between perceptual ability and any measure of reading.

A final evaluation of the relationship of operativity to school achievement was conducted by Lunzer, Dolan, and Wilkinson (1976). School achievement was examined in relationship to operativity, language, and short-term memory. It was found that operativity constituted the be .ngle predictor of both mathematical understanding and success in reading.

While the specificity of the relationships between operativity and school achievement may be unclear with many questions worthy of further study, evidence appears positive. The greater the achieved degree of operativity, or the development of Piagetian concepts indicative of concrete operational functioning, the greater the chances of successful school achievement. This evidence provides a case for assessing the cognitive level of entering school age children, both as a predictive measure for future school achievement and as a guide to curriculum planning for accommodating the unique educational needs of the preoperational child.

Summary

The present study was concerned with two school entrance assessments: the Brigance K and 1 Screen and a battery of Piagetian tasks, each appearing to offer differing approaches to school entrance assessment. Of the theoretical constructs upon which the two chosen screening devices are based, research literature appears to support the role of background experience and memory. There also appears to be substantial support for the role of cognitive development in predicting reading achievement and/or school success as well as identifying readiness for school entrance. However, research literature reflective of the perceptual-motor construct indicates that the attainment of perceptual-motor skills, or a lack of such skills, is a weak determiner of school readiness and an equally weak predictor of either school success or reading achievement. For the purpose of the present study, the Brigance K and 1 Screen and a battery of Piagetian tasks were compared to investigate what relationships exist between them and to provide insight into the most efficacious method of screening entering school-age children.

CHAPTER III

METHOD

The purpose of the present study was to determine if two school readiness screening tests, the Brigance K and 1 Screen and a battery of Piagetian tasks are truly differing approaches to assessing students' school readiness and subsequent placement or if they do indeed overlap in measured abilities. Toward that end, the present study investigated first, to what extent the Brigance K and 1 Screen and the Piagetian Battery are related and, second, if the tests are, in fact, testing the same skills and abilities in different ways. Students who had been screened for school readiness with the use of the Brigance K and 1 Screen were selected for the study sample. Students comprising the study sample were then administered a battery of Piagetian tasks. Scores for each test were tabulated, compared and analyzed to investigate the questions posed in the present study.

Subjects

In April, 1988, over 300 students eligible for kindergarten placement by state age requirements were screened in Madison School District, Rexburg, Idaho, a small rural school district in Southeastern Idaho. All students were administered the Brigance K and 1 Screen (Brigance, 1982). Study subjects were selected from among the entire population of students screened in April 1988 for Fall 1988 kindergarten entrance in the Madison School District 321. The individual Brigance scoring sheets, each identifying the test score total as well as subtest scores of each student screened in April 1988, were made available to the principal investigator by the school district administration. Other available information on the Brigance scoring sheets included the name of the student, age of the student in years and months and the school the student was expected to attend. Gender was determined by the student's given name.

The principal investigator selected the study participants through a hand sorting and selection process. First, two groups, one consisting of all students who scored 90 and above on the Brigance and the other consisting of those students who scored 80 and below were created. The study participants were selected from among those scoring only within these ranges. After the high and low Brigance groups had been determined, students were then divided according to gender. Students were also divided according to age for both the high and low groups. Very young students (4 years 6 months and younger at the time of testing) who scored within the determined low range on the Brigance were not included in the study sample. Likewise, older students (age 5 years 5 months and older) who scored in the determined high range on the Brigance were also excluded from the study sample. This was done to eliminate, as far as possible, age as a confounding variable in test results for the high and low groups of students.

Based on the above criteria, high and low scoring Brigance groups were determined. The high scoring Brigance groups had a total N of 30 consisting of 14 males and 16 females. Ages ranged from 54 to 65, with a mean age of 59.6 months. Brigance scores ranged from 90-100, with a mean score of 96.6/100. The low scoring Brigance group had a total N of 30 consisting of 17 males and 13 females. Ages ranged from 56-64 months with a mean age of 59.4 months. Brigance scores ranged from 42.5-79.5 with a mean score of 69.9/100. Study sample data appears on Table 1.

Table 1

Data on Study Sample

	High Scoring Brigance Group	Low Scoring Brigance Group
Males	14	17
Females	16	13
Total N	30	30
Age Range	54-65 months	56-64 months
$\bar{X}$ Age	59.6 months	59.4 months
Brigance Score Range	90-100/100	42.5-79.5/100
$\bar{X}$ Brigance Score	96.6/100	69.9/100

Selection of the study sample was followed by the administration of a battery of Piagetian tasks to these selected students. Students' scores on the two school entrance assessments were compared and analyzed using a one-way ANOVA and Pearson product-moment correlations. Procedures for test administration and descriptions of instrumentation for both the Brigance K and 1 Screen and the Piagetian Battery are presented.

Brigance K and 1 Screen

The first school entrance test to be administered to the study population was the Brigance K and 1 Screen. The Brigance Screen was the school entrance test chosen by Madison School District 321, Rexburg, Idaho to assess incoming kindergarten age students. Based on scores obtained on the Brigance K and 1 Screen, the sample for the present study was chosen using the previously discussed procedures.

Procedures

Over the course of three days in April 1988, over 300 students eligible for entrance to kindergarten in the fall of 1988 in Madison School District 321, Rexburg, Idaho were administered the Brigance K and 1 Screen. The Brigance K and 1 Screen was the school entrance assessment required by Madison School District 321 for entering kindergarten students to assess school readiness and the possible need for further evaluations to identify a possible learning handicap.

Students were alphabetically assigned a screening date based on surname. Students were tested individually by a member of the district kindergarten faculty or special services personnel. Students were not rotated to various examiners for each section of the test. Therefore, the same examiner administered all subtests to the individual student. Six testing stations were set up throughout the Adams Elementary School gymnasium using movable partitions. After initial registration in the foyer of Adams Elementary School with district personnel, parents were permitted to escort their children to the school gymnasium where six testing stations were set up using movable partitions. Parents were permitted to escort their child to the examiner of their choice or to wait for the next available examiner. Chairs were provided near each testing station for parents and their children to wait until the examiner was available. Parents were invited to remain with their child throughout the testing procedure. However, if the parent proved to be a detrimental factor in obtaining an accurate assessment, the parent was either asked to "remain a non-participating observer" or it was suggested that the parent leave the immediate testing area until the assessment could be completed.

Children who, for one reason or another, proved to be "untestable" at the scheduled screening times were provided another appointment with the district special services for testing later in the year or just prior to the starting of school in the fall. In addition to the Brigance K and 1 Screen, all children were also evaluated for speech and hearing difficulties. Based on observations and subsequent recommendations of the examiner, or a score of 70 or below on the Brigance K and 1 Screen, some students were also assessed for language deficits by the district speech and language therapists.

Prior to testing, the examiner sought to establish rapport and a relaxed atmosphere for the child. The examiner introduced herself and attempted to engage the child in conversation. The child was then invited to play some "games" with the examiner. Both the examiner and the child being tested were seated on child-size chairs at a child-size table. No standardization was required for seating arrangements; however, an attempt was made to seat the child in such a way that the child was unable to look to the parent during the assessment process. This was done to keep the child's primary focus on the examiner and the testing materials.

The testing proceeded in order from the first subtest to the last, with the examiner marking the child's responses on the scoring sheet. A facsimile of the scoring sheet appears in Appendix A. No indication was made to the child for incorrect responses, but positive comments and encouraging remarks were generally made throughout the test to maintain rapport and keep the child engaged in the testing process. Testing time for each student was approximately ten to twenty minutes.

At the end of the test the examiner tabulated subtest scores and the total test score and entered them in the appropriate spaces on the scoring sheet. The score was circled if it fell below 70/100, or if the examiner made observations about the child that placed the child into a questionable readiness category. Space was available on the scoring sheet for the examiner to enter comments and observations about the child that may provide important information regarding the child's degree of school readiness. The child's score was shared with the parent and the child was thanked by the examiner for playing the games with her. The parent and child were then directed to special services personnel who collected the scoring sheet and based on test scores or indications by the examiner were directed to another location for either speech and hearing assessments or language testing.

Instrumentation

The Brigance K and 1 Screen, a criterion-referenced school readiness test for assessing incoming school-age children, was the mandated school entrance assessment adopted by the Madison School District 321, Rexburg, Idaho for children scheduled to enter kindergarten in the fall of 1988. According to the test manual (Brigance, 1982) the Brigance K and 1 Screen claims to serve not only as a readiness test for entering kindergarten and first-grade children, but also as a screening device to identify children needing further assessment to determine the existence of a learning disability for which intervention may be necessary.

The Brigance K and 1 Screen is a brief (10 to 20 minute) school entrance test that assesses a broad range of skills educators deem as requisite skills for school success (Brigance, 1982; Wright, 1985). Among assessed skills are (1) Personal Data Response, (2) Color Recognition, (3) Picture Vocabulary, (4) Visual-Motor Skills (5) Rote Counting, (6) Numerical Comprehension, (7) Printing Name, (8) Visual Discrimination, (9) Gross Motor Skills, (10) Identification of Body Parts, (11) Following Verbal Directions, (12) Syntax and Fluency. In a test review, Boehm (1985) states that specialized training is not required to administer the Screen which can be administered by paraprofessionals.

A test review of the Brigance K and 1 Screen by Helfeldt (1984), notes that all but the picture vocabulary assessment were extracted from the more comprehensive Brigance Inventory of Early Development (birth to

7 years) (1979), and the Brigance Diagnostic Inventory of Basic Skills (1976). Helfeldt (1984) indicates that approximately one-half of the subtests on the Brigance K and 1 Screen rely heavily on background experience and rote memory; one-third of the subtests focus on perceptual-motor development; and the remainder of the subtests, Following Verbal Directions, and Syntax and Fluency, minimally measure subsequent development or cognitive functioning. In regard to validity and reliability of the screen, Helfeldt (1984) states that, although the test appears to have content validity, substantive data to support the test's functional validity, domain selection validity, and reliability are lacking. The lack of validity and reliability evidence is one of the strongest criticisms of the Screen; that is, validity and reliability for each subtest appear to be borrowed from the more comprehensive Brigance assessments. Helfeldt's (1984) concern is that in generalizing validity and reliability from the original testing device to the new short form (the Brigance K and 1 Screen), that true reliability and validity may not in reality exist for the new test. Helfeldt (1984), Boehm, (1985), and Wright (1985) all express the need to ascertain reliability and validity in the context of the new test.

Piagetian Battery

For the purpose of the present study, a second school entrance assessment, a Battery of Piagetian tasks, was administered to the study sample. Piagetian tasks were chosen as a comparative school entrance assessment because of the lack of cognitive assessments available on the Brigance K and 1 Screen.

The successful completion of tasks set forth in the Piagetian Battery determines the level of cognitive functioning a particular child has attained. Wadsworth (1989) indicates that, according to Piagetian theory, children are unable to learn without first developing the necessary prerequisite cognitive skills, or schemata. Therefore, knowledge about the child's readiness to learn should be of concern to educators at all levels of education. Without this information, children may be taught but are unable to learn a particular program of instruction due to the lack of cognitive skills necessary to understand it.

According to Wadsworth (1989), the successful completion of Piagetian tasks which include seriation, classification, and conservation indicate a qualitative change in the child's thinking from earlier cognitive developmental stages. Children who are able to complete the battery of Piagetian tasks are said to have advanced from the stage of preoperations to the stage of concrete operations. While stage changes are gradual, the child's degree of operativity can be ascertained by his or her performance on the outlined tasks. For the purpose of determining the child's level of operativity the Piagetian tasks of seriation, classification, and conservation were administered.

Instrumentation

The tasks administered in the Piagetian Battery were those, according to Wadsworth (1989), that upon successful completion indicate a qualitative change and advancement in the child's reasoning abilities. The basic tasks administered in the Piagetian Battery include the following:

Seriation: "the ability to arrange mentally a set of elements accurately according to increasing or decreasing size, weight, or volume" (Copeland, 1984, p. 101).

Conservation: "the conceptualization that the amount or quantity of a matter stays the same regardless of any changes in an irrelevant dimension" (Copeland, 1984, p. 73).

Classification: "mentally ordering objects according to similarities" (Copeland, 1984, p. 103). Class inclusion, the ability to understand the logical relationship between a class and a subclass (Copeland, 1984, p. 103) is an advanced assessment included in the principle of classification.

Procedures

Study participants were selected from among the children who were assessed for kindergarten entrance in the Madison School District 321, Rexburg, Idaho. On June 29, 1988, parents of the selected study sample were contacted by letter explaining the study and the selection of their child as a participant. A facsimile of the contact letter appears in Appendix B. Included was a brief explanation of the Piagetian Battery. A gift to the child of a unique pencil and eraser was offered to study participants to increase the likelihood that parents would commit time to bring their child to participate in the study. A self-addressed and stamped post card was provided with the letter for parents to choose a time convenient for them to bring their child to the testing location. A facsimile of the return post card is included in Appendix C. Where duplicate requests for time and date occurred, parents were contacted by telephone to arrange another compatible time for testing.

As the testing date approached, those who had not returned the post cards were contacted by telephone by the principal investigator to establish permission and commitment from the parent for the child's participation in the study. Approximately twenty-five parents were contacted by telephone either to arrange another time or date for testing, or to seek permission to include their child in the study. Those who could not be contacted, or those for whom permission to participate in the study could not be obtained, were dropped from the study sample. Substitutions were then made with other students who met the criteria for selection and for whom permission to participate in the study could be obtained. Approximately ten of the original selected study subjects fell into this category and had to be replaced.

The administration of the Piagetian Battery to the study subjects was conducted over a period of three weeks, from July 12th to July 28th, 1988. Testing took place in the classroom of the principal investigator at Adams Elementary School in Rexburg, Idaho. The Piagetian Battery was administered individually to each subject, with the principal investigator being the sole examiner and interpreter of test responses.

Students ai ing at the testing site were greeted by the examiner. The examiner attempted to establish rapport by engaging the child in conversation and inviting the child to play "thinking games" with her. The child was seated to the left of the examiner at a round child-size table. Both the examiner and the child were seated on child-size chairs. Parents were invited to observe the testing procedures and were seated behind the child in such a way that the child's primary focus was on the examiner and the testing materials. Parents whose actions or words prevented an accurate assessment of the child were asked to remain as "non-participating observers." Those who brought other children with them to the testing site were asked to remain out 'de the classroom with those children until testing on the study subject could be completed. Testing materials not in immediate use were stored to the right of the examiner in a container on the floor. This was done to prevent the study subject from becoming distracted during other portions of the test. Administration of the Piagetian Battery required from 30 to 45 minutes for each subject. At the end of the testing session each child received a special pencil and eraser for having participated in the study. Results and explanation of the tasks were provided for the parent immediately upon completion of the battery.

Specific procedures for administering the battery of Piagetian tasks and materials were adapted from those procedures used by Arlin (1981) in a study using Piagetian tasks as predictors of reading and math readiness. Facsimiles of testing materials appear in Appendices D through G. The protocols for testing, adapted from the Arlin (1981) study, were as follow:

1. Simple seriation. Materials: Nine wooden sticks of graduated size (1 cm.-10 cm.) and nine stacking barrels of varying size (1 cm. diameter-7cm.) Procedures: (the researcher addressed the child) "Will you please line up for me all of these wooden sticks in a row, from the longest stick to the shortest stick?" (Researcher used her hand to show general position of the row and to indicate sizes.)

2. Double seriation. Materials: as above. Procedures: "Now let's pretend that these pieces of wood are flowers and these barrels (barrels were moved over to the child) are flower pots. Will you please give each flower pot a flower that best fits it so that the biggest flower has the biggest flower pot and so on down to the littlest flower having the smallest pot?"

3. Simple classification. Materials: 12.5 cm x 5 cm cards with pictures of animals, i.e., a horse, a duck, a dog, etc. Procedures: "Here are some animals. Please sort them for me on this table. Sort them into 3 or 4 groups of things that go together in some way." (Child completed sorting. The researcher pointed to each group of cards in turn and asked the child) "Will you please tell me how these pictures go together . . ." (Each of the categories the child named was written down.) The pictures were placed in one pile and the child was asked to make some new groups that go together in a different way than the way they have just sorted them.

A second form of classification was used. Materials: 18 attribute blocks, including large and small; red, blue, yellow; triangles, squares, circles. Procedures: The interviewer discussed the collection of shapes with the child and pointed out differences among them such as the variety of colors, shapes, and sizes. The child was then asked by the interviewer, "Will you sort these blocks for me in such a way that the ones you put in a group together are alike in some way?" After the child sorted the blocks, the interviewer asked the child how the blocks in each group were alike. The responses were recorded on the scoring sheet. The interviewer asked the child's permission to "mix-up" the blocks again and asked the child to sort them again into groups in a different way than the way they were sorted before. The procedure followed as above with the child receiving three different opportunities to sort the blocks in still a different way. Categories for sorting were recorded on the scoring sheet each time.

4. Two-way classification. Materials: Matrix with a red flower in the

upper left hand corner; a red apple in the lower left corner and a green flower in the upper right corner. Five cards were provided as choices of objects to complete the pattern: a green fish; a green apple; a red flower; a red apple; and a green flower. A facsimile of testing materials appears in Appendix D. Procedures: (Researcher pointed to each object in the matrix from the left column to the right column.) "Here is a red flower. Here is a red apple. Here is a green flower. Which of these (points to choices) best goes with this flower and this apple?" "Why did you choose ________?" Responses were evaluated by the examiner for an operationally correct reason for the choice. Operationally correct responses took into account the two features in need of consideration; color and the correct object to complete the matrix. Typical operational responses were, "I need an apple to match this one (the apple on the left) and I need a green one to match this one (the flower at the upper right) so I need a green apple." The interviewer then asked, "Can anything else go in this empty place as well as your choice of ________ or is your choice the best choice?" Inconsistent, or unstable responses were recorded.

A second form of the two-way classification was used as well. Materials: a card without the matrix lines, with an array of 3 objects in the first column and the top two objects in the second column. The first column contained a red bird, a red flower, and a red piece of fruit (apple). The second column contained a yellow bird and a yellow flower. A facsimile of testing materials appears in Appendix E. Procedures: The interviewer pointed to each object in the matrix from the left column to the right column. "Here is a red bird, a red flower, and a red piece of fruit. Here is a yellow bird and a yellow flower. Which of these (points to choices) best goes with this piece of fruit and this yellow flower?" Choices included a yellow bird, a yellow flower, a yellow piece of fruit (banana) a red bird nd a red flower. "Why did you choose _________?' Responses were evaluated by the examiner for an operationally correct reason for the choice. The interviewer than asked, "Can anything else go in this empty space as well as your choice of _________ or is your choice the best choice? Inconsistencies and unstable responses were noted by the examiner and reflected on the scoring sheet.

5. Class inclusion. Materials: 8 pink silk flowers and 2 blue silk flowers. Procedures: The child was asked to describe the materials. If the child had difficulty naming the flower colors and materials, they were named for him or her. Then the child was asked the following questions. "What do I have in my hand? . . . Yes, I have a bunch of silk flowers . . . What colors are my silk flowers?" . . . "Pink and blue." "Yes, I have a bunch of pink and blue silk flowers, some of them are pink and some of them are blue, but all of them are made out of silk. Now I want to ask you a question about my pink and blue silk flowers. In my bunch of silk flowers, are there more silk flowers of more pink flowers? What do you think? Are there more pink flowers or more plastic flowers?" . . . "Why do you think there are more silk/pink flowers?" (If the child said that there were more pink flowers, the interviewer called the child's attention to the earlier description of the flowers, i.e., "You have said that there are more pink flowers than silk flowers. Are all of my flowers silk?" . . . "Are

some of them pink and some of them blue, but all of them are silk?" . . . "But you think that there are more pink flowers than silk flowers, right?" If the child solved the problem correctly and said that there were more silk flowers than pink flowers, he was asked to give an explanation of his answer which was evaluated by the interviewer as to whether it was operationally correct or not. Operational answers would include an explanation by the child that all of the flowers were silk so there were more silk flowers.

A second form of class inclusion was used. Materials for this task were: 6 green and 2 white wooden beads with diameters of 1 cm. Procedures: The child was asked to describe the materials. If the child had difficulty naming the materials they were named for him or her. Then the child was asked the following questions. "What do I have in my hand?" . . . "Yes, I have a bunch of wooden beads. What colors are my wooden beads?" . . . "Green and white." "Yes, I have a bunch of green and white wooden beads, some of them are green and some of them are white, but all of them are made out of wood. Now I want to ask you a question about my green and white wooden beads. In my bunch of wooden beads, are there more green wooden beads or are there more wooden beads? What do you think? Are there more wooden beads or are there more green ones?" If the child answered that there were more green beads, the interviewer called attention to the earlier description of the beads. "You have said that there are more green wooden beads than there are wooden beads. Are all of my beads wooden?" . . . "Are some of them green and some of them white, but all of them are wooden?" . . . "But you think that there are more green wooden beads than wooden beads, right?" If the child gave a correct response, his answer was evaluated by the researcher for operativity. An explanation that included the fact that all of the beads were wooden would be accepted as operationally correct.

6. Three-way classification. Materials: A matrix with a green bird facing right in the upper left corner; a green fish facing right in the lower left corner; a red bird facing left in the upper right corner. Six cards were provided as choices to complete the matrix; a red bird facing right; a red fish facing left; a green bird facing left a red bird facing left; a red fish facing right; and a green flower. A facsimile of the testing materials appears in Appendix F. The interviewer pointed to the pictures from the left column to the right saying, "Here is a green bird facing right, a green fish facing right, and here is a red bird facing left. Which of these pictures would go with this green fish facing right and this red bird facing left?" The interviewer evaluated the response for operational correctness. An example would be, "I need one facing this way (left) because of the red bird; I need a red one because this side is red and that one is green; and I need a fish because the fish is at the bottom."

7. Conservation of number. Materials: 10 small red and 10 small white wooden blocks (2 cm on a side). Procedures: Researcher started the procedure by lining up 4 red blocks opposite 4 white blocks in a 1-1 correspondence. The researcher asked, "Are there as many blocks in my row as in your row?" (If the child said "no" the child was asked to make the rows equal.) The researcher then added two blocks to just one of the rows. "Do I still have the same number of blocks in my row as

you have in your row?" The child was asked to add blocks to his or her row to make them equal to the interviewer's row. The same question was repeated: "Do you have just as many blocks in your row of blocks as I have in my row of blocks?" This procedure was continued until there were ten blocks in both rows. The researcher then said, "Now watch what I am going to do." The researcher pushed the white row together and left the red row spread out. "Are there still as many white blocks in this row as there are red blocks in this row? or is there a different number of white blocks than red blocks now that the white blocks have been pushed together?" "Why do you think there are __________?" Operationally correct explanations would indicate that the number of blocks does not change simply because they are pushed together and take up less space as a row.

8. Conservation of continuous quantity. Materials: Two plasticine balls of approximately 3 cm in diameter each. Procedures: Researcher showed the two balls to the child and asked: "Is there just as much clay in this ball as there is in this one?" If the child did not think the balls were equal, the child was asked to make them equal. Then the researcher said, "Now I will take this ball and I am going to make it into a hot dog shape." The researcher then held up the ball and the "hot dog" and asked, "Do I still have just as much clay in this ball as I have in this "hot dog", or do I have more/less clay or the same amount of clay in this "hot dog" as I have in this ball?" . . . "Why do you think that __________?" Operationally correct explanations indicated that the amount of clay does not change simply because the shape has changed.

9. Conservation of discontinuous quantity. Materials: two plasticine balls of approximately three cm in diameter each. Procedures: The interviewer showed the two balls of plasticine to the child and asked: "Is there just as much clay in this ball as there is in this one?" If the child did not think that the balls are equal, the child was asked to make them equal. Then the interviewer said, "Now I will take this ball and break it into pieces. The interviewer pointed to the pieces together and the ball and asked, "Do I still have just as much clay here (the pile of clay pieces), as I have here in this ball, or do I have more/less clay or the same amount of clay in this ball as I have in these pieces?" "Why do you think that __________?" Operationally correct answers included the explanation that the amount of clay remains the same even though the one ball was broken into pieces.

Scoring of the Piagetian Tasks

A total raw score of 18 points was possible for each interview. Most of the tasks were scored on a 0-2 point basis. The distribution of points was shown on the scoring sheet, a facsimile of which appears in Appendix G. A child received a two on the tasks, if and only if, he or she solved the presented problem and gave an operationally correct explanation for the solution. A score of 1 was given to correct solutions, but nonoperative explanations. Operationally correct explanations included all of the elements that needed to be attended to and reasoned about logically in order to arrive at the correct answer. Nonoperational answers were those that had nothing to do with the problem being solved. Examples of nonoperational answers included, "I think this one looks pretty there; There isn't one like this one on the board; I think those two would like to play together, so I'll put them next to each other." Only consistent performance on both presentations for those tasks for which there were two presentations of materials resulted in a score of two. A score of zero was given to nonoperational, incorrect solutions of the task. Arlin (1981) allowed a score of three on simple classification. However, in an effort to avoid weighting one Piagetian task over another, the average of the scores on each of the two presentations of the task was taken as the task score. Total Piagetian Battery test scores ranged from 0-15.5/18.

Statistical Analyses

Statistical analyses consisted of two procedural levels. First a one-way ANOVA was calculated to investigate a difference between the mean Piagetian Battery scores of the high scoring Brigance group and the low scoring Brigance group. Second, Pearson product-moment correlations were calculated to investigate relationships between Brigance total scores and Piagetian Battery total scores; relationships between Brigance subtests and total Piagetian Battery scores; and relationships between Brigance subtest scores and Piagetian Battery subtest scores. Table 2 lists the study hypotheses and accompanying statistical procedures.

Summary

The purpose of the present study was to determine of two school readiness screening tests, the Brigance K and 1 Screen and a battery of Piagetian tasks, are truly differing approaches to assessing students' school readiness and subsequent placement, or if they do, indeed, overlap in measured abilities. The study sample was selected from students who had been administered the Brigance K and 1 Screen as part

Table 2

Study Hypotheses and Statistical Procedures

Hypotheses	Statistical Procedure
1. There is no significant difference in the mean Piagetian Battery scores of the high scoring Brigance group and the mean Piagetian Battery scores of the low scoring Brigance group.	One-way ANOVA
2. There is no relationship between Brigance total scores and Piagetian total scores.	Pearson product-moment correlation
3. There is no relationship between scores each Brigance subtest and total Piagetian score.	Pearson product-moment correlation
4. There is no relationship between Brigance subtest scores and Piagetian battery subtest scores.	Pearson product-moment correlation

students who had been administered the Brigance K and 1 Screen as part of the local school district's required school screening assessment for entering kindergarten students. Study subjects were then given a battery of Piagetian tasks as the comparative assessment. Scores for each assessment were tabulated, compared and analyzed using a one-way ANOVA and Pearson product-moment correlations. Study hypotheses were subsequently addressed.

CHAPTER IV

RESULTS

The purpose of the present study was to determine if two school readiness screening tests, the Brigance K and 1 Screen (Brigance, 1982) and a battery of Piagetian tasks, are truly differing approaches to kindergarten screening or if they do, indeed, overlap in measured abilities. Toward that end, the present study investigated (1) To what extent the Brigance K and 1 Screen and the Piagetian Battery are related and (2) if the two tests are, in fact, testing the same skills and cognitive abilities in different ways. Answers to the following questions were sought:

1. Will children who score high on the Brigance K and 1 Screen also score high on the Piagetian Battery? Furthermore, will children who score low on the Brigance K and 1 Screen also score low in the Piagetian Battery?

2. Which Brigance K and 1 Screen subtests show a significant correlation with subtests comprising the Piagetian Battery?

The study sample was selected from the entire population of entering kindergarten students who had been screened in Madison School District 321, Rexburg, Idaho for school readiness with the use of the Brigance K and 1 Screen in April 1988. Students were scheduled for school entrance in the fall of 1988. Thirty students who scored 90 or above (high Brigance group) and thirty students who scored 80 or below (low Brigance group) comprised the study sample. Students in the study sample were then administered a battery of Piagetian tasks in July of 1988. Scores for each test were tabulated, compared and analyzed to answer the questions posed by the present study.

The study data were analyzed and results described by first computing the frequency, mean and standard deviation for each subtest score and total score for both the Brigance K and 1 Screen and the Piagetian Battery. Second, Pearson product-moment correlations were computed to investigate the relationship between Brigance total scores and Piagetian Battery total scores; the relationship between Brigance subtests and Piagetian Battery total scores; and the relationships between all Brigance subtests and all Piagetian Battery subtests. Third, a one-way ANOVA was computed to investigate if there is a significant difference between the mean Piagetian Battery score of the high scoring Brigance group and the mean Piagetian Battery score of the low scoring Brigance group.

Descriptive Statistics

The scores for each Brigance subtest were computed and analyzed for frequency and percent of sample receiving that score. Means and standard deviations for each Brigance subtest were also computed. Secondly, frequencies, means and standard deviations for Brigance Total scores were computed. The highest mean subtest score was for Subtest 3 (Picture Vocabulary) with a mean score of 9.80/10.00. The lowest mean subtest score was for Subtest 11 (Following Verbal Directions) with a mean score of 3.08/10.00. The mean total score was 83.99/100.00. Results of these analyses appear in Table 3.

Table 3

Descriptive Statistics for Brigance K and 1 Screen

Brigance Screen	Score	Frequency	%	X̄	SD
Subtest 1	3	1	1.7	7.18	1.65
Personal Data Response	4	3	5.0		
	6	24	40.0		
	8	24	40.0		
	10	8	13.3		
Subtest 2	0	2	3.3	9.23	1.90
Color Recognition	7	2	3.3		
	8	5	8.3		
	9	10	16.7		
	10	41	68.8		
Subtest 3	7	2	3.3	9.80	0.65
Picture Vocabulary	8	1	1.7		
	9	7	11.7		
	10	50	83.3		
Subtest 4	1	1	1.7	[illegible].58	2.58
Visual-Motor Skills	2	3	5.0		
	3	2	3.3		
	4	1	1.7		
	5	2	3.3		
	6	2	3.3		
	7	1	1.7		
	8	2	3.3		
	9	7	11.7		
	10	39	65.0		
Subtest 5	0	1	1.7	8.17	2.42
Rote Counting	2	1	1.7		
	4	5	8.3		
	6	10	16.7		
	8	11	18.3		
	10	32	53.3		

Table 3 (continued)

Descriptive Statistics for Brigance K and 1 Screen

Brigance Screen	Score	Frequency	%	$\bar{X}$	SD
Subtest 6 Numerical Comprehension	0	1	1.7	9.28	1.63
	5	1	1.7		
	6	1	1.7		
	7	2	3.3		
	8	5	8.3		
	9	8	13.3		
	10	42	70.0		
Subtest 7 Printing Name	0	1	1.7	4.80	1.41
	1.5	1	1.7		
	2	1	3.3		
	2.5	1	1.7		
	3	2	3.3		
	4	1	1.7		
	5	50	83.3		
	10	2	8.3		
Subtest 8 Visual Discrimination	0.5	1	1.7	3.25	1.15
	1	1	1.7		
	1.5	4	6.7		
	2	7	11.7		
	2.5	9	15.0		
	3	8	13.3		
	3.5	6	10.0		
	4	9	15.0		
	4.5	10	16.7		
	5	5	8.3		
Subtest 9 Gross Motor Skills	2.5	5	8.3	4.80	0.70
	5	55	91.7		
Subtest 10 Identification of Body Parts	0	7	11.7	6.93	3.85
	2	7	11.7		
	4	6	10.0		
	6	4	6.7		
	8	3	5.0		
	10	33	55.0		
Subtest 11 Following Verbal Directions	0	24	40.0	3.08	2.61
	5	35	58.3		
	10	1	1.7		

Table 3 (continued)

Descriptive Statistics for Brigance K and 1 Screen

Brigance Screen	Score	Frequency	%	$\bar{X}$	SD
Subtest 12 Syntax and Fluency	0	1	1.7	8.75	2.37
	5	13	21.7		
	10	46	76.7		
Total Score	42.5	1	1.7	83.99	13.90
	51.5	2	3.3		
	58.5	1	1.7		
	66.5	1	1.7		
	67.0	1	1.7		
	69.5	1	1.7		
	72.5	1	1.7		
	72.9	1	1.7		
	73.0	1	1.7		
	73.5	2	3.3		
	74.5	1	1.7		
	75.5	5	8.3		
	76.0	1	1.7		
	76.5	2	3.3		
	77.0	1	1.7		
	78.0	2	3.3		
	78.5	1	1.7		
	79.0	1	1.7		
	79.5	3	5.0		
	90.0	1	1.7		
	91.0	1	1.7		
	95.0	4	6.7		
	95.5	7	11.7		
	96.0	3	5.0		
	96.5	2	3.3		
	97.0	3	5.0		
	97.5	3	5.0		
	98.0	5	8.3		
	100.0	1	1.7		

The scores for each subtest as well as total scores on the Piagetian Battery were analyzed yielding frequencies, means and standard deviations. In addition, scores on the Piagetian subtests were combined according to the specified measured abilities, i.e., seriation tasks; classification tasks; and conservation tasks, and frequencies, means and standard deviations were computed for the combined scores. The highest Piagetian mean subtest score was for Subtest 3 (Simple Classification) with a mean score of 1.13/2.00. The lowest Piagetian mean subtest score was for Subtest 5 (Class Inclusion) with a mean score of .30/2.00. The combined seriation score yielded a mean of 1.40/4.00 (35%); combined classification score a mean of 2.74/8.00 (34%); and the combined conservation score a mean of 1.85/6.00 (31%). Total Piagetian Battery scores ranged from 0-15.5/18.0. Descriptive statistics for Piagetian Battery scores appear in Table 4.

One-Way ANOVA

The results of the one-way ANOVA found on Table 5 compared the mean Piagetian Battery score of the high Brigance group and the mean Piagetian battery score of the low Brigance group. Results yielded statistically significant different Piagetian Battery total scores (F=24.73, p=.001). The high scoring Brigance group scored significantly higher on the Piagetian Battery than did the low scoring Brigance group. Therefore, Hypothesis (1) which stated that there is no significant difference in the mean scores of the Piagetian Battery of the high scoring Brigance group and the low scoring Brigance group, was rejected.

Table 4

Descriptive Statistics for Piagetian Battery

Piagetian Battery	Score	Frequency	%	$\bar{X}$	SD
Subtest 1 Simple Seriation	0	28	46.7	1.00	0.97
	1	4	6.7		
	2	28	46.7		
Subtest 2 Double Seriation	0	47	78.3	0.40	0.79
	1	2	3.3		
	2	11	18.3		
Subtest 3 Simple Classification	0	3	5.0	1.13	0.58
	0.5	14	23.3		
	1	19	31.7		
	1.5	13	21.7		
	2	11	18.3		
Subtest 4 Two-way Classification	0	24	40.0	0.53	0.57
	0.5	17	28.3		
	1	13	21.7		
	1.5	3	5.0		
	2	3	5.0		
Subtest 5 Class Inclusion	0	49	81.7	0.30	0.67
	1	7	6.7		
	2	7	11.7		
Subtest 6 Three-way Classification	0	27	45.0	0.78	0.80
	1	19	31.7		
	2	14	23.3		
Subtest 7 Conservation of Number	0	35	58.3	0.77	0.95
	1	4	6.7		
	2	21	35.0		
Subtest 8 Conservation of Continuous Quantity	0	39	65.0	0.58	0.85
	1	7	11.7		
	2	14	23.3		

Table 4 (continued)

Descriptive Statistics for Piagetian Battery

Piagetian Battery	Score	Frequency	%	$\bar{X}$	SD
Subtest 9	0	43	71.7	0.50	0.83
Conservation of	1	4	6.7		
Discontinuous Quantity	2	13	21.7		
Combined Scores	0	28	46.7	1.40	1.51
Seriation	1	2	3.3		
	2	18	30.0		
	3	2	3.3		
	4	10	16.7		
Combined Scores	0	2	3.3	2.74	1.78
Classification	0.5	5	8.3		
	1	8	13.3		
	1.5	6	10.0		
	2	6	10.0		
	2.5	9	15.0		
	3	4	6.7		
	3.5	1	1.7		
	4	4	6.7		
	4.5	3	5.0		
	5	7	11.7		
	5.5	2	3.3		
	6.5	3	5.0		
Combined Scores	0	30	50.0	1.85	2.26
Conservation	1	3	5.0		
	2	8	13.3		
	3	3	5.0		
	4	6	10.0		
	5	1	1.7		
	6	9	15.0		

Table 4 (continued)

Descriptive Statistics for Piagetian Battery

Piagetian Battery	Score	Frequency	%	$\bar{X}$	SD
Total Score	0	2	3.3	5.99	4.47
	0.5	5	8.3		
	1	4	6.7		
	1.5	2	3.3		
	2	3	5.0		
	2.5	2	3.3		
	3	1	1.7		
	3.5	4	6.7		
	4	3	5.0		
	4.5	3	5.0		
	5	2	3.3		
	6.5	4	6.7		
	7	6	10.0		
	8	1	1.7		
	8.5	1	1.7		
	9	3	5.0		
	9.5	1	1.7		
	10	1	1.7		
	10.5	2	3.3		
	11.5	1	1.7		
	12	2	3.3		
	12.5	1	1.7		
	13	2	3.3		
	14.5	1	1.7		
	15	1	1.7		
	15.5	2	3.3		

Table 5

One-Way ANOVA

Source	df	SS	MS	*F*	*p*
Treatments	1	352.838	352.838	24.73	.001
Error	58	827.408	14.266		
Total	59	1180.246			

Pearson Product-Moment Correlations

Pearson correlation coefficients were computed to determine if there was a relationship between Brigance total scores and the total scores obtained on the Piagetian Battery. Analysis yielded a significant positive relationship between the Brigance total scores and the Piaget total scores ($r = .529$, $p = .001$); i.e. as Brigance scores increase, so do the Piaget scores. Correlations are presented in Table 6. Therefore, Hypothesis (2) which stated that there is no relationship between Brigance total scores and Piagetian Battery total scores was rejected.

Pearson correlation coefficients were also computed to investigate the relationship between scores on each Brigance subtest and Piagetian Battery Total scores. Results indicated that all correlations between Brigance subtest scores and Piaget Total scores were significant ($p < .05$) except for correlations between Brigance Subtests 8 (Picture Vocabulary); 7 (Printing Name); and 9 (Gross Motor Skills) and Piaget Total score. Results of this analysis are also presented in Table 6. Therefore, Hypothesis (3) which states that there is no relationship between scores on each Brigance subtest and total Piagetian score was rejected for all Brigance subtests except for Brigance Subtest 3 (Picture Vocabulary); 7 (Printing Name); and 9 (Gross Motor Skills).

Pearson correlation coefficients were computed to investigate the relationships between each Brigance subtest and each Piagetian Battery subtest. The first relationship investigated was between Piagetian Battery Subtest 1 (Simple Seriation) and each Brigance subtest. Results indicated that all correlations between Piagetian Battery Subtest 1 (Simple Seriation) and all Brigance subtests were significant ($p < .05$)

Table 6

Correlations: Brigance Scores by Piagetian Battery Total Score

Brigance	r	p
Subtest 1 Personal Data Response	.523	.001
Subtest 2 Color Recognition	.367	.004
Subtest 3 Picture Vocabulary	.112	.393
Subtest 4 Visual-Motor Skills	.357	.005
Subtest 5 Rote Counting	.294	.022
Subtest 6 Numerical Comprehension	.271	.037
Subtest 7 Printing Name	.162	.215
Subtest 8 Visual Discrimination	.313	.015
Subtest 9 Gross Motor Skills	-.035	.793
Subtest 10 Identification of Body Parts	.386	.002
Subtest 11 Following Verbal Directions	.368	.004
Subtest 12 Syntax and Fluency	.291	[illegible]4
Brigance Total	.529	.001

and positive except for correlations between Piagetian Battery Subtest 1 (Simple Seriation) and Brigance Subtests 7 (Printing Name); and 9 (Gross Motor Skills). Results of the analysis are presented in Table 7.

The second relationship investigated was between Piagetian Battery Subtest 2 (Double Seriation) and each Brigance subtest. Results indicated that none of the correlations between Piagetian Battery Subtest 2 (Double Seriation) and Brigance subtests were significant except for correlations between Piagetian Battery Subtest 2 (Double Seriation) and Brigance Subtests 1 (Personal Data Response), (r=.465, p=.002); 10 (Identification of Body Parts), (r=.300, p=.020); and 11 (Following Verbal Directions), (r=.228, p=.008). Results of the analysis are presented in Table 8.

The third relationship investigated was between Piagetian Battery Subtest 3 (Simple Classification) and each Brigance subtest. Results indicated significant positive relationships between Piagetian Battery Subtest 3 (Simple classification) and Briganc Subtest 1 (Personal Data Response), (r=.354, p=.004); Subtest 2 (Color Recognition), (r=.335, p=.009); Subtest 4 (Visual-Motor skills), (r=.291, p=.024); Subtest 5 (Rote Counting), (r=.299, p=020); and Subtest 11 (Following Verbal Directions), (r=.272, p=.035). Results of the analysis are presented in Table 9.

Fourth, correlation coefficients were computed to investigate relationships between Piagetian Battery Subtest 4 (Two-way Classification) and each Brigance subtest. Results indicated significant positive relationships between Piagetian Battery Subtest 4 (Two-way Classification) and Brigance Subtest 1 (Personal Data Response), (r=.274, p=.034); Subtest 2 (Color Recognition), (r=.284,

Table 7

Correlations: Brigance Subtests by Piagetian Battery Subtest 1 (Simple Seriation)

Brigance Screen	r	p
Subtest 1 Personal Data Response	.410	.001
Subtest 2 Color Recognition	.293	.023
Subtest 3 Picture Vocabulary	.266	.040
Subtest 4 Visual-Motor Skills	.404	.001
Subtest 5 Rote Counting	.345	.007
Subtest 6 Numerical Comprehension	.310	.016
Subtest 7 Printing Name	.246	.058
Subtest 8 Visual Discrimination	.356	.005
Subtest 9 Gross Motor Skills	.062	.636
Subtest 10 Identification of Body Parts	.298	.021
Subtest 11 Following Verbal Directions	.432	.001
Subtest 12 Syntax and Fluency	.367	.004

Table 8

Correlations: Brigance Subtests by Piagetian Battery Subtest 2 (Double Seriation)

Brigance Screen	r	p
Subtest 1 Personal Data Response	.465	.002
Subtest 2 Color Recognition	.130	.324
Subtest 3 Picture Vocabulary	.133	.315
Subtest 4 Visual-Motor Skills	.226	.082
Subtest 5 Rote Counting	.232	.075
Subtest 6 Numerical Comprehension	.215	.099
Subtest 7 Printing Name	.043	.746
Subtest 8 Visual Discrimination	.226	.083
Subtest 9 Gross Motor Skills	.155	.238
Subtest 10 Identification of Body Parts	.300	.020
Subtest 11 Following Verbal Directions	.338	.008
Subtest 12 Syntax and Fluency	.228	.080

Table 9

Correlations: Brigance Subtests by Piagetian Battery Subtest 3 (Simple Classification)

Brigance Screen	r	p
Subtest 1 Personal Data Response	.365	.004
Subtest 2 Color Recognition	.335	.009
Subtest 3 Picture Vocabulary	.151	.250
Subtest 4 Visual-Motor Skills	.291	.024
Subtest 5 Rote Counting	.299	.020
Subtest 6 Numerical Comprehension	.241	.064
Subtest 7 Printing Name	.124	.345
Subtest 8 Visual Discrimination	.239	.066
Subtest 9 Gross Motor Skills	-.039	.765
Subtest 10 Identification of Body Parts	.197	13[illegible]
Subtest 11 Following Verbal Directions	.272	.035
Subtest 12 Syntax and Fluency		

p=.028); Subtest 4 (Visual-Motor Skills), (r=.293, p=.023); Subtest 10 (Identification of Body Parts), (r=.284, p=.028). Results of the analysis are presented in Table 10.

The fifth correlation coefficients that were computed to investigate if there are relationships between Piagetian Battery Subtest 5 (Class Inclusion) and each Brigance subtest. Results indicated no significant relationships between Piagetian Battery Subtest 5 (Class Inclusion) and any of the Brigance subtests except for Brigance Subtest 1 (Personal Data Response), (r=.347, p=.006) and Brigance Subtest 8 (Visual Discrimination), (r=.264, p=.042). Results of the analysis are presented in Table 11.

The sixth correlation coefficients that were computed to investigate if relationships exist between Piagetian and Brigance subtests was between Piagetian Battery Subtest 6 (Three-way Classification) and each Brigance subtest. Results yielded significant relationships between Piagetian Subtest 6 (Three-way Classification) and Brigance Subtest 1 (Personal Data Response), (r=.388, p=.002); Subtest 2 (Color Recognition), (r=.289, p=.025); Subtest 8 (Visual Discrimination), (r=.271, p=.037); Subtest 10 (Identification of Body Parts), (r=.416, p=.001); Subtest 11 (Following Verbal Directions), (r=.322, p=.012); and Subtest 12 (Syntax and Fluency), (r=.256, p=.049). Results of the analysis are presented in Table 12.

A seventh set of correlation coefficients was computed to investigate if relationships exist between Piagetian Battery Subtest 7 (Conservation of Number) and each Brigance subtest. Results yielded significant relationships between Piagetian Battery Subtest 7 (Conservation of Number) and Brigance Subtest 1 (Personal Data

Table 10

Correlations: Brigance Subtests by Piagetian Battery Subtest 4 (Two-way Classification)

Brigance Screen	r	p
Subtest 1 Personal Data Response	.274	.034
Subtest 2 Color Recognition	.284	.028
Subtest 3 Picture Vocabulary	.183	.162
Subtest 4 Visual-Motor Skills	.293	.023
Subtest 5 Rote Counting	.231	.076
Subtest 6 Numerical Comprehension	.192	.142
Subtest 7 Printing Name	.225	.084
Subtest 8 Visual Discrimination	.104	.428
Subtest 9 Gross Motor Skills	-.089	.497
Subtest 10 Identification of Body Parts	.382	.003
Subtest 11 Following Verbal Directions	.244	.060
Subtest 12 Syntax and Fluency	.284	.028

Table 11

Correlations: Brigance Subtests by Piagetian Battery Subtest 5 (Class Inclusion)

Brigance Screen	r	p
Subtest 1 Personal Data Response	.347	.006
Subtest 2 Color Recognition	.157	.231
Subtest 3 Picture Vocabulary	.019	.884
Subtest 4 Visual-Motor Skills	.073	.577
Subtest 5 Rote Counting	.072	.580
Subtest 6 Numerical Comprehension	.107	.416
Subtest 7 Printing Name	-.150	.253
Subtest 8 Visual Discrimination	.264	.042
Subtest 9 Gross Motor Skills	-.045	.731
Subtest 10 Identification of Body Parts	.047	.720
Subtest 11 Following Verbal Directions	.140	.290
Subtest 12 Syntax and Fluency	.240	.065

Table 12

Correlations: Brigance Subtest by Piagetian Battery Subtest 6 (Three-way Classification)

Brigance Screen	r	p
Subtest 1 Personal Data Response	.388	.002
Subtest 2 Color Recognition	.289	.025
Subtest 3 Picture Vocabulary	.153	.243
Subtest 4 Visual-Motor Skills	.242	.063
Subtest 5 Rote Counting	.175	.180
Subtest 6 Numerical Comprehension	.138	.291
Subtest 7 Printing Name	.200	.126
Subtest 8 Visual Discrimination	.271	.037
Subtest 9 Gross Motor Skills	-.006	.962
Subtest 10 Identification of Body Parts	.416	.001
Subtest 11 Following Verbal Directions	.322	.012
Subtest 12 Syntax and Fluency	.256	.049

Response), (r=.321, p=.012); Subtest 10 (Identification of Body Parts), (r=303, p=.019); and Subtest 11 (Following Verbal Directions), (r=.261, p=.044). All other correlations were not significant. Results of the analysis are presented in Table 13.

An eighth set of correlation coefficients was computed to investigate if relationships exist between Piagetian Battery Subtest 8 (Conservation of Continuous Quantity) and each Brigance subtest. Results yielded no significant relationships between Piagetian Battery Subtest 8 (Conservation of Continuous Quantity) and any of the Brigance subtests. Correlations are presented in Table 14.

A final set of correlation coefficients was computed to investigate if relationships exist between Piagetian Battery Subtest 9 (Conservation of Discontinuous Quality) and each Brigance Subtest. Results yielded no significant relationships between Conservation of Discontinuous Quantity and any of the Brigance subtests. Results of correlations are presented in Table 15. Based on Pearson correlation coefficients which were computed to investigate if relationships exist between Piagetian Battery subtests and Brigance subtests, Hypothesis (4) which stated that there is no relationship between Brigance subtest scores and Piagetian Battery subtest scores was rejected.

Although no hypotheses were established concerning relationships between scores on the Piagetian Battery subtests which were combined according to general measured abilities, i.e. seriation tasks; classification tasks; and conservation tasks, and Brigance subtests, Pearson correlation coefficients were computed to investigate possible relationships between the combined Piagetian subtests scores and each Brigance subtest. Results of correlations between Piagetian Battery

Table 13

Correlations: Brigance Subtests by Piagetian Battery Subtest 7 (Conservation of Number)

Brigance Screen	r	p
Subtest 1 Personal Data Response	.321	.012
Subtest 2 Color Recognition	.239	066
Subtest 3 Picture Vocabulary	.014	.917
Subtest 4 Visual-Motor Skills	.203	.120
Subtest 5 Rote Counting	.239	.066
Subtest 6 Numerical Comprehension	.165	.208
Subtest 7 Printing Name	.117	.375
Subtest 8 Visual Discrimination	.141	.284
Subtest 9 Gross Motor Skills	-.075	.569
Subtest 10 Identification of Body Parts	.303	.019
Subtest 11 Following Verbal Directions	.261	.044
Subtest 12 Syntax and Fluency	.095	.472

Table 14

Correlations: Brigance Subtests by Piagetian Battery Subtest 8 (Conservation of Continuous Quantity)

Brigance Screen	r	p
Subtest 1 Personal Data Response	.176	.178
Subtest 2 Color Recognition	.219	.093
Subtest 3 Picture Vocabulary	-.099	.451
Subtest 4 Visual-Motor Skills	.182	.163
Subtest 5 Rote Counting	.051	.700
Subtest 6 Numerical Comprehension	.087	.509
Subtest 7 Printing Name	.056	.669
Subtest 8 Visual Discrimination	.074	.574
Subtest 9 Gross Motor Skills	-.149	.256
Subtest 10 Identification of Body Parts	.079	.547
Subtest 11 Following Verbal Directions	.054	.682
Subtest 12 Syntax and Fluency	.032	.810

Table 15

Correlations: Brigance Subtests by Piagetian Battery Subtest 9 (Conservation of Discontinuous Quantity)

Brigance Screen	r	p
Subtest 1 Personal Data Response	.252	.051
Subtest 2 Color Recognition	.182	.163
Subtest 3 Picture Vocabulary	-.140	.287
Subtest 4 Visual-Motor Skills	.122	.352
Subtest 5 Rote Counting	.042	.750
Subtest 6 Numerical Comprehension	.094	.476
Subtest 7 Printing Name	.043	.744
Subtest 8 Visual Discrimination	.106	.419
Subtest 9 Gross Motor Skills	-.036	.782
Subtest 10 Identification of Body Parts	.179	.170
Subtest 11 Following Verbal Directions	.019	.883
Subtest 12 Syntax and Fluency	-.021	.871

Total Seriation (combined scores for Simple Seriation and Double Seriation) and each Brigance subtest yielded significant positive relationships ($p < .05$) between Total Seriation and all Brigance subtests except for Brigance Subtests 3 (Picture Vocabulary); 7 (Printing Name); and 9 (Gross Motor Skills). Correlations are presented in Table 16.

The second set of correlation coefficients to be computed for combined Piagetian Battery subtests was between Piagetian Battery Total Classification (combined scores for Simple Classification, Two-way Classification, Three-Way Classification, and Class Inclusion) and each Brigance subtest. Results yielded significant positive relationships ($p < .05$) between Total Classification and all Brigance Subtests except Brigance Subtests 3 (Picture Vocabulary); 6 (Numerical Comprehension); 7 (Printing Name); and 9 (Gross Motor Skills). Correlations are presented in Table 17.

The final set of correlation coefficients to be computed for combined Piagetian Battery subtests was between Piagetian Battery Total Conservation (combined scores for Conservation of Number, Conservation of Continuous Quantity, and Conservation of Discontinuous Quality) and each of the Brigance subtests. Results yielded no significant relationships between Total Conservation and any of the Brigance subtests except for Brigance Subtest 1 (Personal Data Response), (r=.293, p=.022). Correlations are presented in Table 18.

Summary

The purpose of the present study was to determine if two school readiness screening tests, the Brigance K and 1 Screen and a battery of Piagetian tasks, are truly differing approaches to kindergarten

Table 16

Correlations: Brigance Subtests by Piagetian Battery Total Seriation

Brigance Screen	r	p
Subtest 1 Personal Data Response	.507	.001
Subtest 2 Color Recognition	.257	.048
Subtest 3 Picture Vocabulary	.240	.064
Subtest 4 Visual-Motor Skills	.379	.003
Subtest 5 Rote Counting	.343	.007
Subtest 6 Numerical Comprehension	.312	.015
Subtest 7 Printing Name	.181	.166
Subtest 8 Visual Discrimination	.347	.007
Subtest 9 Gross Motor Skills	.121	.358
Subtest 10 Identification of Body Parts	.349	.006
Subtest 11 Following Verbal Directions	.455	.003
Subtest 12 Syntax and Fluency	.355	.005

Table 17

Correlations: Brigance Subtests by Piagetian Battery Total Classification

Brigance Screen	r	p
Subtest 1 Personal Data Response	.511	.001
Subtest 2 Color Recognition	.389	.002
Subtest 3 Picture Vocabulary	.184	.160
Subtest 4 Visual-Motor Skills	.325	.011
Subtest 5 Rote Counting	.277	.032
Subtest 6 Numerical Comprehension	.242	.062
Subtest 7 Printing Name	.146	.267
Subtest 8 Visual Discrimination	.331	.009
Subtest 9 Gross Motor Skills	-.061	.643
Subtest 10 Identification of Body Parts	.391	.002
Subtest 11 Following Verbal Directions	.364	.004
Subtest 12	.374	.003

Table 18

Correlations: Brigance Subtests by Piagetian Battery Total Conservation

Brigance Screen	r	p
Subtest 1 Personal Data Response	.293	.022
Subtest 2 Color Recognition	.249	.055
Subtest 3 Picture Vocabulary	-.083	.528
Subtest 4 Visual-Motor Skills	.198	.129
Subtest 5 Rote Counting	.135	.305
Subtest 6 Numerical Comprehension	.136	.300
Subtest 7 Printing Name	.086	.514
Subtest 8 Visual Discrimination	.126	.339
Subtest 9 Gross Motor Skills	-.101	.443
Subtest 10 Identification of Body Parts	.223	.087
Subtest 11 Following Verbal Directions	.137	.298
Subtest 12 Syntax and Fluency	.044	.741

screening, or if they do, indeed, overlap in measured abilities. Toward that end, study data were analyzed and results described in frequency tables for Brigance K and 1 Screen subtests and Brigance K and 1 Screen total score, and for Piagetian Battery subtests and Piagetian Battery total score. Second, a one-way ANOVA was computed to compare the mean Piagetian Battery score of the high scoring Brigance group and the mean Piagetian Battery score of the low scoring Brigance group. Third, Pearson product-moment coefficients were computed to investigate the relationship between Brigance total scores and Piagetian Battery total scores; the relationships between Brigance subtests and Piagetian Battery total scores; and the relationships between all Brigance subtests and all Piagetian Battery subtests.

Results of frequencies for each Brigance subtest indicated the highest mean Brigance subtest score was for Subtest 3 (Picture Vocabulary; 9.20/10.00). The lowest mean Brigance subtest score was for Subtest 11 (Following Verbal Directions; 3.08/10.00). The mean total Brigance score was 83.00/100.00. Frequencies for each Piagetian Battery subtest indicated the highest mean Piagetian subtest score was for Subtest 3 (Simple Classification; 1.13/2.00). The lowest mean Piagetian subtest score was for Subtest 5 (Class Inclusion; .30/2.00). The mean total Piagetian Battery score was 5.99/18.0. Scores for combined seriation, combined classification, and combined conservation subtests yielded means of 1.40/4.00 (35%); 2.74/8.00 (34%); and 1.85/6.00 (31%), respectively. The one-way ANOVA which compared the mean Piagetian Battery score of the high Brigance group with the mean Piagetian Battery score of the low Brigance group showed significantly different Piagetian Battery total scores (F=24.73, p=.001).

Computed Pearson product-moment correlations yielded significant positive relationships between Brigance total scores and the Piagetian Battery total scores (r=.529, p=.001). Correlations also showed significant positive relationships between Brigance subtest scores and Piagetian Battery total scores except between Brigance Subtest 3 (Picture Vocabulary); 7 (Printing Name); and 9 (Gross Motor Skills).

Other correlation coefficients were computed to investigate relationships between each Brigance subtest and each Piagetian Battery subtest. Piagetian Battery Subtests 8 (Conservation of Discontinuous Quantity) showed no significant relationships with any of the Brigance subtests. Likewise, Brigance Subtests 7 (Printing Name); and 9 (Gross Motor Skills) showed no significant relationships with any of the Piagetian Battery subtests. In addition, Brigance Subtests 3 (Picture Vocabulary) and 6 (Numerical Comprehension) showed no significant relationships with any of the Piagetian Battery subtests except Subtest 1 (Simple Seriation). Piagetian Battery Subtest 1 (Simple Seriation) showed the greatest number of correlations between Brigance subtests showing positive correlations between all Brigance subtests except Brigance Subtests 7 (Printing Name) and 9 (Gross Motor Skills). Significant and non-significant relationships between Brigance Subtests and Piagetian Battery Subtests are summarized in Table 19.

Table 19

Summary of Correlations Between Brigance Subtests and Piagetian Battery Subtests

Brigance Subtests	Piagetian Battery Subtests 1	2	3	4	5	6	7	8	9
(1) Personal Data Response	s	s	s	s	s	s	s	n	n
(2) Color Recognition	s	n	s	s	n	s	n	n	n
(3) Picture Vocabulary	s	n	n	n	n	n	n	n	n
(4) Visual-Motor Skills	s	n	s	s	n	n	n	n	n
(5) Rote Counting	s	n	s	n	n	n	n	n	n
(6) Numerical Comprehension	s	n	n	n	n	n	n	n	n
(7) Printing Name	n	n	n	n	n	n	n	n	n
(8) Visual Discrimination	s	s	n	n	s	s	n	n	n
(9) Gross Motor Skills	n	n	n	n	n	n	n	n	n
(10) Identification of Body Parts	s	s	s	s	n	s	s	n	n
(11) Following Verbal Directions	s	s	s	n	n	s	s	n	n
(12) Syntax and Fluency	s	n	n	s	n	s	n	n	n

n = not significant
s = significant

CHAPTER V

CONCLUSIONS

The purpose of the present study was to determine if two school readiness screening tests, the Brigance K and 1 Screen (Brigance, 1982) and a battery of Piagetian tasks, are truly differing approaches to kindergarten school entrance assessment or if they do, indeed, overlap in measured abilities. Toward that end, the present study investigated (1) to what extent the Brigance K and 1 Screen and the Piagetian Battery are related and (2) if the two tests are in fact testing the same skills and cognitive abilities in different ways. Answers to the following questions were sought:

1. Will children who score high on the Brigance K and 1 Screen also score high on the Piagetian Battery? Furthermore, will children who score low on the Brigance K and 1 Screen also score low on the Piagetian Battery?

2. Which Brigance K and 1 Screen subtests show a significant correlation with subtests comprising the Piagetian Battery?

The study sample was selected from the entire population of entering kindergarten children who had been screened in Madison School District 321, Rexburg, Idaho for school readiness with the use of the Brigance K and 1 Screen. Screening took place in April 1988. Students were scheduled for school entrance in the fall of 1988 based on Idaho's state school entrance age requirements. Thirty students who scored 90 or above (high Brigance group) and thirty students who scored 80 or below (low Brigance group) comprised the study sample. Students in the study sample were then administered a battery of Piagetian tasks in July of 1988. Scores for each test were tabulated, compared and analyzed.

The study data were analyzed and results described in frequency tables for Brigance K and 1 Screen subtests and Brigance K and 1 Screer total score. Frequency tables were also computed for Piagetian Battery subtests and Piagetian Battery total score. Second, a one-way ANOVA was computed to compare the mean Piagetian Battery score of the high scoring Brigance group and the mean Piagetian Battery total score of the low scoring Brigance group. Third, Pearson product-moment correlations were computed to investigate the relationship between Brigance total scores and Piagetian Battery total scores; and the relationships between all Brigance subtests and all Piagetian Battery subtests.

Frequencies for each Brigance subtest indicated the highest mean Brigance subtest score was for Subtest 3 (Picture Vocabulary; 9,80.10.00). The lowest mean Brigance subtest score was for Subtest 11 (Following Verbal Directions; 3.80/10.00). The mean total Brigance score was 83.00/100.00. Frequencies for each Piagetian Battery subtest indicated the highest mean Piagetian subtest score was for Subtest 3 (Simple Classification; 1.13/2.00). The lowest mean Piagetian subtest score was for Subtest 5 (Class Inclusion; .30/2.00). The mean total Piagetian Battery score was 5.99/18.00. Scores for combined seriation, combined classification, and combined conservation subtests yielded means of 1.40/4.00 (35%); 2.74/8.00 (34%); and 1.85/6.00 (31%), respectively. The one-way ANOVA which compared the mean Piagetian Battery score of the low Brigance group with the mean Piagetian Battery score of the high Brigance group with the mean Piagetian Battery score of the low Brigance group showed significantly different Piagetian Battery total scores ($F=24.73$, $p=.001$).

Calculation of Pearson product-moment correlations yielded significant positive relationships between Brigance total scores and the Piagetian Battery total scores (r=.529, p=.001). Correlations also showed significant positive relationships between all Brigance subtest scores and Piagetian Battery total scores except between Brigance Subtests 3 (Picture Vocabulary); 7 (Printing Name); and 9 (Gross Motor Skills).

Correlation coefficients were also computed to investigate relationships between each Brigance subtest and each Piagetian Battery subtest. Piagetian Battery Subtests 8 (Conservation of Continuous Quantity) and 9 (Conservation of Discontinuous Quantity) showed no significant relationships with any of the Brigance subtests. Likewise, Brigance Subtests 7 (Printing Name) and 9 (Gross Motor Skills) showed no significant relationships with any of the Piagetian Battery subtests. In addition, Brigance Subtests 3 (Picture Vocabulary) and 6 (Numerical Comprehension) showed no significant relationships with any of the Piagetian Battery subtests except Subtest 1 (Simple Seriation). Piagetian Battery Subtest 1 (Simple Seriation) showed the greatest number of correlations between Brigance subtests showing positive correlations between all Brigance subtests except Brigance Subtests 7 (Printing Name) and 9 (Gross Motor Skills).

Discussion

One of the statistical analyses conducted for the purpose of the present study was a one-way ANOVA comparing the mean Piagetian Battery score of the high-scoring Brigance group with the mean Piagetian Battery score of the low-scoring Brigance group. Results yielded one of the most significant findings of the present study with the high- and low-scoring Brigance groups producing statistically significant different Piagetian Battery Total scores (F = 24.73, p = .001). The high-scoring Brigance group scored significantly higher on the Piagetian Battery than did the low-scoring Brigance group. It appears that students scoring high on the Brigance are also likely to score high on the Piagetian Battery, and low-scoring Brigance students are also likely to score low on the Piagetian Battery.

A second related finding is the results of the Pearson product-moment correlations between Brigance Total scores and Piagetian Battery Total scores. Analysis yielded a statistically significant positive relationship between Brigance Total scores and Piagetian Battery Total scores (r=.529, p=.001). Based on both the results of the one-way ANOVA and the correlations between Brigance Total scores and Piagetian Battery Total scores, it appears that either the Brigance K and 1 Screen or the Piagetian Battery could be used for pre-school screening with approximately the same results. One possible explanation for this strong correlation between the Brigance Screen and the Piagetian Battery is the screen's heavy reliance on background experience, over one-half of the test according to Helfeldt's (1984) test review, and the importance of the role of experience in cognitive development as identified by Piaget (1964).

Background experience has been found to be the primary factor in the development of concepts or schema. Rummelhart (1980) indicates that schema are enhanced or restructured according to the individual's experiences. Experience therefore, helps the individual to make greater

Battery subtest on which students scores were the lowest. The lowest scores were found on Subtest 5 (Class Inclusion). According to Arlin (1981) class inclusion ability is among the last abilities to develop in the young child's emerging operativity. Not surprisingly, given the ages of the study sample, one would expect most of the study participants to be developing toward concrete operations, with very few having attained the level of concrete operational thinking. Findings of the present study support Arlin's (1981) assertions that class inclusion is one of the last abilities to develop.

A second finding consistent with previous research is the statistically significant positive correlations between Piagetian Battery Subtest ' (Simple Seriation) and all of the Brigance subtests except for Subtest 9 (Gross Motor Skills). This finding supports Scott's (1969) study in which seriation was found to be highly related to reading readiness with a correlation of .82. The Kaufman and Kaufman (1972) study also supports the relationship of seriation to achievement on the Stanford Achievement Test for the first graders at .55. It might be concluded based on the correlation between seriation and all Brigance subtests except for Subtest 7 (Printing Name) and Subtest 9 (Gross Motor Skills), and on the findings of Scott's (1969) study that the <u>Brigance K and 1 Screen</u> is probably a valid assessment of reading readiness.

A third finding of the present study consistent with previous research is the lack of correlations between Brigance Subtest 9 (Gross Motor Skills), and Brigance Subtest 7 (Printing Name) which may be considered to be a fine motor or perceptual-motor skill, and any of the Piagetian Tasks. Two interpretations may be considered: (1) Gross motor skills and fine motor skills have no relationship to school readiness, reading readiness, or any other level of readiness with regard to school functioning or (2) Gross motor skills and fine motor skills measure important abilities necessary for school functioning that are not measured by the Piagetian tasks. A third interpretation, a combination of the previous two interpretations, may also be considered. That is, gross motor skills and fine motor skills measure abilities of the developing child not measured in any form by the Piagetian Battery. However, based on previous research (O'Connor, 1969; Robinson, 1972) gross motor skills and fine motor skills have no relationship to school readiness, reading readiness, or any other level of readiness with regard to school functioning. Research literature (Goodman & Hammill, 1973; Levine, 1984; Metzger and Werner, 1984) has been skeptical of studies relating perceptual and motor abilities to reading readiness or reading ability, citing poor research design, lack of adequate controls, and lack of replication studies. Considering the lack of research evidence relating perceptual and motor abilities to any measures of reading, the most viable interpretation may be that the measurement of gross motor ability and fine motor ability may provide some interesting but irrelevant information about the entering school age child.

Additional perceptual and motor skills on the Brigance Screen are Visual-Motor Skills and Visual Discrimination. These two areas were tested on the Brigance K and 1 Screen as Subtest 4 and Subtest 8, respectively. Correlations for these two subtests with Piagetian Battery subtests indicated that Subtest 4 (Visual-Motor skills) showed a positive correlation with Piagetian Subtests 1 (Simple Seriation); 3 (Simple Classification) and 4 (Two-way Classification) only, and Subtest 8 (Visual Discrimination) correlated positively with Piagetian Battery Subtests 1 (Simple Seriation); 2 (Double Seriation), and 6 (Three-way Classification). Based on their natures, the Piagetian tasks of Simple Seriation, Two-way Classification, and Three-way Classification appear to carry a strong perceptual requirement for successful completion and, therefore, may explain the positive correlations with Brigance Subtest 4 (Visual-Motor Skills) and Brigance Subtest 8 (Visual Discrimination).

Simple Classification which correlated positively with Brigance Subtest 4 (Visual-Motor Skills) may be either a cognitive task or a perceptual one, depending on the child's method of classifying the pictures. Most of the children in the study sample classified the animal pictures on the Simple Classification task according to perceptual characteristics such as color, as opposed to conceptual characteristics such as zoo animals, farm animals, etc. The reliance on perceptual cues by most children for classifying the animal pictures may have explanatory value for the positive correlation between Brigance Subtest 4 (Visual-Motor Skills) and Piagetian Subtest 3 (Simple Classification).

The relationship of Brigance Subtest 8 (Visual Discrimination) and Piagetian Battery Subtest 5 (Class Inclusion) is less clear. Perhaps the relationship lies in the requirement of the child to decenter and attend to all aspects of the array of objects at once; that is, both the color (a perceptual component) and the substance (a conceptual component).

One finding of the present study in particular was very surprising. This unexpected finding was the lack of correlations between the conservation tasks (conservation of number, continuous quantity, and discontinuous quantity) and any of the Brigance subtests, with the exception of Piagetian Subtest 7 (Conservation of Number) and Brigance Subtest 1 (Personal Data Response); 10 (Identification of Body Parts); and 11 (Following Verbal Directions). The relationship of successful performance on conservation tasks and school achievement has been postulated by several researchers. Althouse (1985) suggests that conservation ability is necessary for children to understand some reading concepts such as recognizing that a letter symbol can have more than one sound or that an "A" is the same letter as an "a" or as an "a" written in manuscript handwriting. Kaufman and Kaufman (1972) also found conservation of number to be positively correlated with reading achievement in the first grade. While conservation ability may be helpful for reading achievement, the present study found no correlation between conservation ability and any of the Brigance subtests. It is possible that the Brigance K and 1 Screen contained no subtests that either directly, or had embedded within them, subtests which tested readiness abilities that would be affected by student conservation ability. A likely interpretation may be the need to include conservation tasks with school entrance screening. Such information could be predictive of future reading achievement based on the Althouse (1985) and Kaufman and Kaufman (1972) studies.

Results of the Total Conservation correlations with Brigance subtests yielded no correlations except with Brigance Subtest 1

(Personal Data Response). Total Conservation correlations were similar to the individual conservation tasks, having few correlations with Brigance subtests. Again, the lack of correlations may indicate that (1) conservation has no relationship to school readiness in any form, or (2) there are no subtests on the Brigance that require conservation ability. The relationship between Total Conservation scores and Brigance Subtest 1 (Personal Data Response) is unclear. The requirement for conservation ability in supplying information about oneself appears to be nonexistent based on the nature of the two tasks. A likely interpretation of the relationship shown between Total Conservation and Brigance Subtest 1 (Personal Data Response) may simply be one of chance.

One particularly interesting finding of the present study was that the correlations between Piagetian Total Scores and each of the Brigance subtests were the same as the correlations between Total Seriation scores and each of the Brigance subtests. All of the Brigance subtests correlated positively with Piagetian Battery Total scores except for Brigance Subtests 3 (Picture Vocabulary); 7 (Printing Name); and 9 (Gross Motor Skills). Piagetian Total Seriation scores correlated positively with exactly the same subtests. This would appear to lend further strength to the Scott (196[illegible]) study in which seriation related to reading readiness with a correlation of .82. Piagetian Total Classification scores also correlated with the same Brigance subtests as Tota[illegible]iation with the lack of correlation with Subtest 6 (Numerical Co[illegible]ension). It appears that classification ability could be nearly as strong an indicator of reading readiness as seriation ability.

The only identifiable limitation of the present study, the inability to procure IQ scores for the study participants, may possibly have had some effect on the study results. Selection of the study sample was based on Brigance K and 1 Screen test scores--30 high scoring Brigance students (90%/100 and above) and 30 low scoring Brigance students (80/100 and below). Inasmuch as IQ scores were not available for the study sample, high or low scores on the Brigance may have been a reflection of IQ rather than pure test results. If IQ were the dominant factor in study sample selection, then scores on the Piagetian Battery or any other test are likely to be similar to Brigance scores. The relationship between test scores, therefore, would be one of student IQ and would not necessarily reflect a relationship between the testing devices themselves as implied by the study data.

Implications

Based on the findings of the present study, several recommendations for school practice can be made. Probably one of the most significant recommendations involves pre-school screening assessment. It was found that students who score high on the Brigance K and 1 Screen also score high on the Piagetian Battery. Due to the nature of the two tests, the Brigance being a 10 to 20 minute assessment that can be administered by paraprofessionals, and the Piagetian Battery requiring 30-45 minutes and a professional trained in Piagetian theory for administration and interpretation, the Brigance K and 1 Screen is a much more cost effective and time efficient assessment for use as a pre-school entrance assessment. Inasmuch as cost and time is of great importance in most school districts, the Brigance may be the assessment of choice over the Piagetian Battery.

Aside from the cost and time factor involved in the choice of pre-school screening assessments, other factors may determine which pre-school entrance assessment is most efficacious. The Brigance K and 1 Screen, according to Wright (1985), is a criterion-referenced screening device which shallowly assesses a broad cross-section of skills. The Brigance measures what specific skills the child has learned, not necessarily what the child is capable of learning were he or she given the opportunity. The Brigance identifies what needs to be taught or which "gaps" need to be filled in order for the child to have the determined prerequisite skills to begin formal instruction within a particular curriculum.

The Piagetian Battery, on the other hand, measures cognitive development and current cognitive abilities based on successful completion of specific cognitive tasks such as seriation, classification and conservation. Information gained about the child from the Piagetian Battery provides a greater and more in depth picture of the child than the Brigance K and 1 Screen. The Piagetian Battery provides insight into the thought processes of the child and what he or she is capable of learning and understanding based on current levels of cognitive development. The information gained about the child from the Piagetian Battery is more generalizable and predictive of success in a variety of learning situations than the specific skill approach taken by the Brigance K and 1 Screen.

Considering the differences between the Brigance and the Piagetian Battery, the choice of screening device will depend largely upon the curricular philosophy of the school district. If the particular school district views the teacher as the deliverer of the curriculum and the child's role as the master of specific skills based on scope and sequence and behavioral objectives, then the Brigance K and I Screen could provide the needed insight. This insight would include whether or not the child is ready to begin work within a designated curriculum or which skills need to be taught before the child is able to begin work within that curriculum. However, if the learner is viewed as the constructor or creator of his knowledge based on activities and experiences provided by the teacher or the environment, then the Piagetian Battery would provide the insight needed by the teacher to provide appropriate activities for the developing child based on existing cognitive abilities and also to provide learning experiences (as opposed to delivering information) that would expand those abilities.

Both tests, the Brigance K and 1 Screen and the Piagetian Battery, could provide information beneficial for curriculum planning. Children's performance on the Piagetian Battery, however, not only has implications for planning the content of curriculum as the Brigance K and 1 Screen provides, but most importantly suggests the form or approach the curriculum ought to take to meet the cognitive developmental needs of the young child. Therefore, the educational philosophy of the school or district will largely determine which of the two screening devices utilized in the present study will most accurately provide information necessary for curriculum planning.

If the Brigance K and 1 Screen is determined to be the screening device of choice, the Piagetian Battery could be extremely beneficial as a second assessment for low scoring Brigance students to determine more closely areas of development that could affect study performance. While the Brigance is more specific in terms of skill assessment, the Piagetian Battery could provide insight into student abilities that would be affected in a general way based on cognitive development. A classroom teacher administered Piagetian Battery could provide some additional benefits by permitting the teacher to see more directly the thinking processes of the student. This first-hand experience with the student's thought processes could provide the teacher more insight into causes of student errors and help him or her plan curriculum appropriately to meet the needs of the preoperational student.

Based on the role of experience in both the development of schema or concepts and the development of cognitive structure, a second recommendation for all teachers is to provide many opportunities for concrete experiences particularly when new concepts are to be learned by the students. Concrete experiences provide opportunities for the child to act upon the learning materials or otherwise experience and be personally involved with the learning situation. Many field trips to enhance background experience and add to the students' understanding of the world would also be extremely beneficial. Real experience as opposed to many paper and pencil tasks add to the students' existing schema and enhances prior knowledge as a resource for future tasks and learning, and provides a catalyst for greater cognitive development.

Based on the research literature concerning the perceptual-motor model for reading readiness (Goodman & Hammill 1973; Litchfield, 1970; O'Connor, 1969; Wimsatt, 1967) and the findings of the present study regarding gross motor skills a third recommendation with regard to school practice is suggested. This suggestion calls for the elimination of emphasis upon physical skills as a means of remediating learning difficulties. However, physical skills are valuable abilities for children to possess for strengthening self-esteem and social skills. Therefore, physical skills should not be excluded from the curriculum but valued for the intrinsic value of the skill and not for remediation of learning difficulties.

A fourth recommendation based on the findings of the present study relates to fine motor skills. No correlations were found between Brigance Subtest 7 (Printing Name) and any of the Piagetian Battery subtests. It appears that fine motor skills such as printing have no relationship to school achievement. Still, kindergarten and first-grade children are instructed to spend many hours practicing writing in the lines of ruled paper. Inasmuch as fine motor skills in normal children develop with age, time could be more effectively spent with age appropriate activities that would enhance abilities and cognition. Writing, however, is still an appropriate and important activity for young children if the focus is on content and purpose and not on form. This recommendation could extend to older children as well when new fine motor skills are being learned. Time should be allowed for the experience without the pressure of performing a skill that will continue to develop with age.

A final recommendation with respect to school practice deals with reading instruction in the early childhood years. Typical reading instruction for young children utilizes sound-symbol correspondences and subsequent "blending" of individual letter sounds into "words." The learning of reading through this direct phonics approach requires the young child to focus on individual letters and their corresponding sounds while simultaneously considering the whole of the word of which a particular letter sound is a part. Focusing on parts while still considering the whole requires the ability to successfully perform the class inclusion task from the Piagetian Battery. Typically, a child who has not yet developed class inclusion may be asked to identify letter sounds such as b-a-t, but is unable to "blend" those sounds into the word "bat." While focusing on letter sounds, consideration of the whole word is lost.

Inasmuch as class inclusion ability appears to be one of the last to emerge as the child develops toward concrete operations, based on Arlin's (1981) assertions and the results of the present study, it appears that typical direct phonics instruction should be delayed until the emergence of class inclusion ability. Due to the relatively late emergence of class inclusion, some children will not be ready for direct phonics instruction until the age of eight--well beyond the age at which such instruction is typically begun in formal educational programs.

Further study could provide greater insight and more recommendations for school practice. An extension of the present study to include follow-up information about the study sample such as scores on achievement tests at the end of first grade could provide information about the predictive ability of both the Brigance K and 1 Screen and the Piagetian Battery. Pearson product-moment correlations between all Brigance subtests and Pearson product-moment correlations between all Piagetian Battery Subtest could also provide insight into overlapping subtests within each of the pre-school screening assessments, with the possibility of eliminating redundant subtests within a particular screening device. As more knowledge is gained about the processes involved in successful reading achievement--a model which at the present is evolving through the efforts of information processing theorists and schema theorists--understanding of prerequisites for reading achievement and, therefore, school success will pave the way for revised testing designs which will hopefully provide even better assessment of entering school-age children.

APPENDIX A

Brigance K and 1 Screen Scoring Sheet

KINDERGARTEN Pupil Data Sheet for the *BRIGANCE® K & 1 SCREEN*

K

A Student's Name ______________________ Date of Screening (Year / Month / Day) ____ ____ ____ School Program ______________

Parents Guardian ______________________ Birthdate ____ ____ ____ Teacher ______________

Address ______________________ Age ____ ____ ____ Assessor ______________

B. BASIC SCREENING ASSESSMENTS			C. SCORING		
Page	Assessment Number	Skill *(Circle the skill for each correct response and make notes as appropriate.)*	Number of Correct Responses	Point Value	Student's Score
2	1	**Personal Data Response:** Verbally gives 1 first name 2 full name 3 age 4 address (street or mail) 5 birthdate (month and day)	×	2 points each	/10
3	2	**Color Recognition:** Identifies and names the colors 1 red 2 blue 3 green 4 yellow 5 orange 6 purple 7 brown 8 black 9 pink 10 gray	×	1 point each	/10
5	3	**Picture Vocabulary:** Recognizes and names picture of 1 dog 2 cat 3 key 4 girl 5 boy 6 airplane 7 apple 8 leaf 9 cup 10 car	×	1 point each	/10
6	4A	**Visual Discrimination:** Visually discriminates which one of four symbols is different 1 . 2 ⊔ 3 O 4 ⬭ 5 Ↄ 6 O 7 I 8 P 9 V 10 X	×	1 point each	/10
8	5	**Visual-Motor Skills:** Copies 1 ○ 2 – 3 + 4 □ 5 △	×	2 pts ea	/10
9	6	**Gross Motor Skills:** 1 Hops 2 hops on one foot 2 Hops 2 hops on either foot 3 Stands on one foot momentarily 4 Stands on either foot momentarily 5 Stands on one foot for 5 seconds 6 Stands on either foot for 5 secs 7 Walks forward heel and toe 4 steps 8 Walks backward toe and heel 4 steps 9 Stands on one foot momentarily with eyes closed 10 Stands on either foot momentarily with eyes closed	×	1 point each	/10
12	8	**Rote Counting:** Counts by rote to *(Circle all numerals prior to the first error.)* 1 2 3 4 5 6 7 8 9 10	×	5 point each	/5
13	9	**Identification of Body Parts:** Identifies by pointing or touching 1 chin 2 fingernails 3 heel 4 elbow 5 ankle 6 shoulder 7 jaw 8 hips 9 wrist 10 waist	×	5 point each	/5
15	11	**Follows Verbal Directions:** Listens to, remembers, and follows 1 one verbal direction 2 two verbal directions	×	2.5 points each	/5
[illegible]	12	**Numeral Comprehension:** Matches quantity with numerals 2 1 4 3 5	×	2 pts ea	/10
21	15	**Prints Personal Data:** Prints first name *Reversals Yes____ No____*	×	5 points	/5
22	16	**Syntax and Fluency:** 1 Speech is understandable 2 Speaks in complete sentences	×	5 pts ea	/10
				Total Score	/100

D. OBSERVATIONS:

1. Handedness Right____ Left____ Uncertain____
2. Pencil grasp Correct____ Incorrect____
3. Maintained paper in the proper position when writing Yes____ No____
4. Record other observations below or on the back

E. SUMMARY: *(Compared to other students included in this screening)*

1. this student scored .... Lower____ Average____ Higher____
2. this student's age is........ Younger____ Average____ Older____
3. the teacher rates this student .... Lower____ Average____ Higher____
4. the assessor rates this student .... Lower____ Average____ Higher____

F. RECOMMENDATIONS: Place in Preschool____ Low Kindergarten____ Average Kindergarten____ High Kindergarten____

Other *(Indicate.)* ______________

APPENDIX B

Contact Letter to Parents

MADISON SCHOOL DISTRICT NO.321
DR. EDWARD E. HILL, SUPERINTENDENT SYLVAN BUTLER, BUSINESS MANAGER

June 2?, 1988

Dear Parents,

Based on age and gender, your child has been selected to participate in a special research project designed to ascertain the validity of the current Kindergarten screening test. Information gathered from this project will be used in making decisons regarding the current Kindergarten entrance screening test used in Madison School District.

In order to carry out this research project, a group of children representative of all Kindergarten children is needed. Your child has been selected because he/she meets the criteria necessary for valid reasearch. Data can then be generalized to the population of Kindergarten children as a whole.

This project will require the children involved to participate in "thinking games" known as Piagetian Tasks. You as the child's parents are encouraged to be present for the "games." You will find them very interesting and they can provide for you valuable information about your child's development. Each child will be assigned a number for identification purposes. No names will be recorded with the the data, and no record of your child having participated in the project will be recorded in the school records. Information gained will be utilized for the purpose of the current research project only. You as parents are welcome to the information gained from this project as it applies to your child.

It must be understood that the assessment device used for this research project does not operate on a pass/fail basis. The Piagetian battery is an assessment of normal childhood development, much like the stages of motor development that all children go through, i.e., lifting head, rolling over, crawling, walking, jumping, hopping, skipping, etc. All children go through the developmental stages that will be assessed. The tasks are indicators of which stage of development the child is in at any given point in time.

The battery of Piagetian tasks is not an assessment of intelligence, knowledge, or academic ability. The tasks are only designed to determine which level of thinking development a child has attained at any given point in time. All children go through these stages at different rates with absolutely no relationship to intelligence, knowledge, or academic ability. Nor are the tasks considered to be predictors of future academic achievement.

Hopefully, with this understanding, you will enjoy your participation in this research project. Your child will find the "thinking games" fun and receive a special gift for having participated.

290 North First East • Rexburg, Idaho 83440 • Telephone 356-5423

This research will be carried out during the month of July on Tuesdays, Wednesdays, and Thursdays at 45 minute intervals. The games will take approximately 1/2 hour per child. The location will be Adams Elementary School, 110 N. 2nd East, Rexburg.

Please fill out the enclosed postcard and return no later than July 5th. If you have any questions, please call Nancy Davis at 356-9462.

Cordially,

Nancy Davis

Edward [illegible] Hall

APPENDIX C

Parent's Response Card for Testing

Child's Name ______________________________

Parent's Name ______________________________

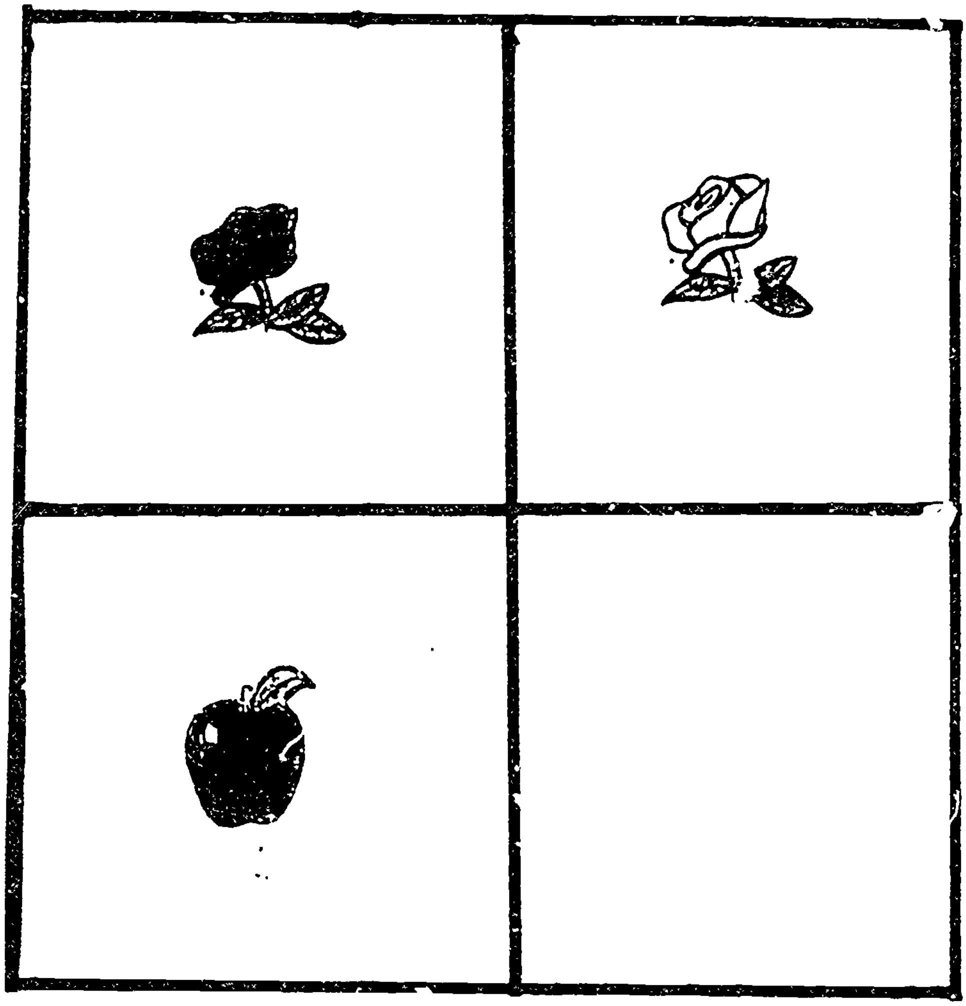
Telephone No. ______________________________

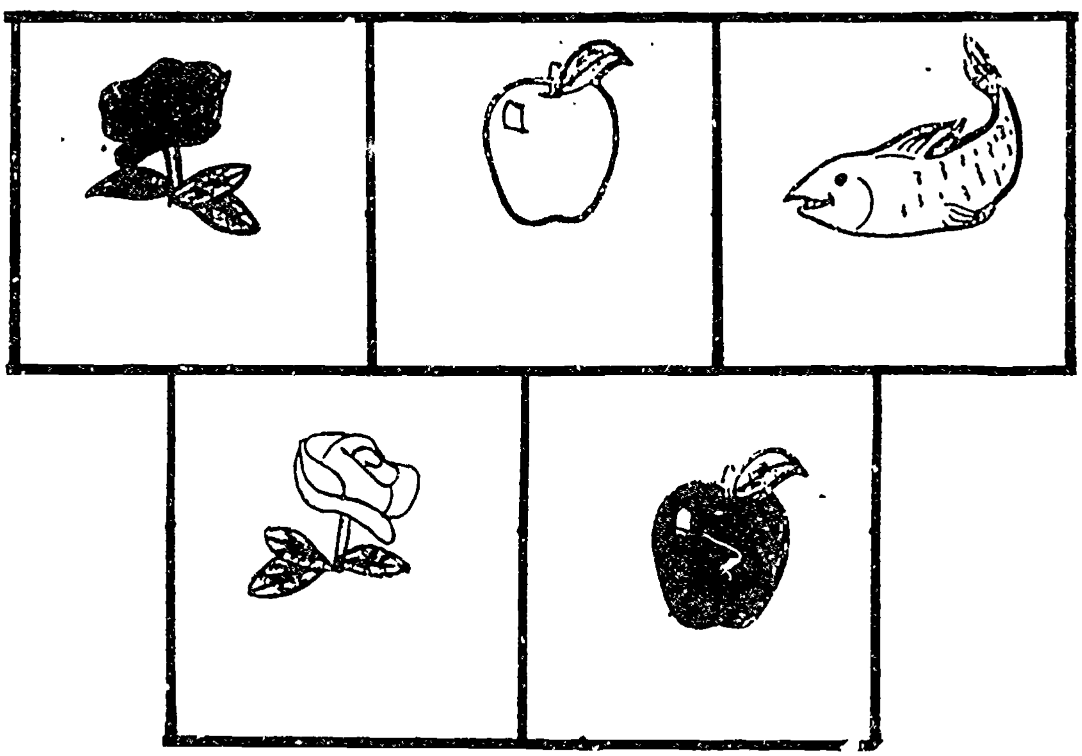
Date Requested:	T	W	Th		
(circle one)	12	13	14		
July	19	20	21		
	26	27	28		
Time Requested:	7:00 a.m.		7:45	8:30	9:15
(circle one)	10:00		10:45	11:30	12:15
	1:00		1:45		

None of these times work for my schedule. Please call me for an alternate time. ☐

APPENDIX D

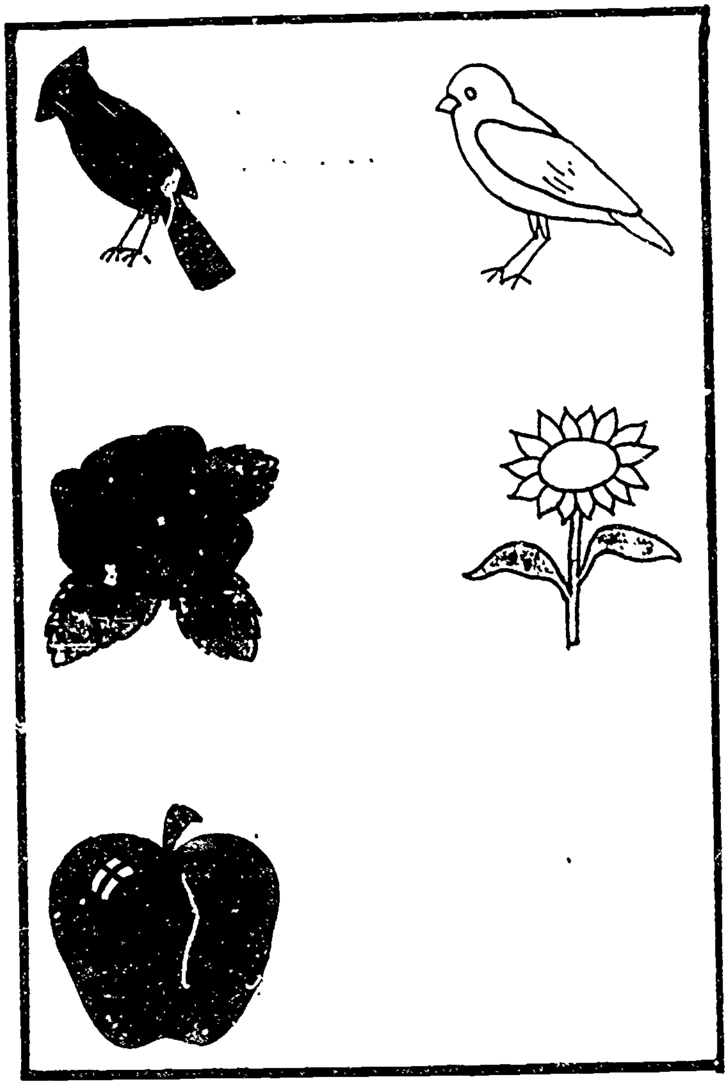
Two-way Classification Test Materials (1)

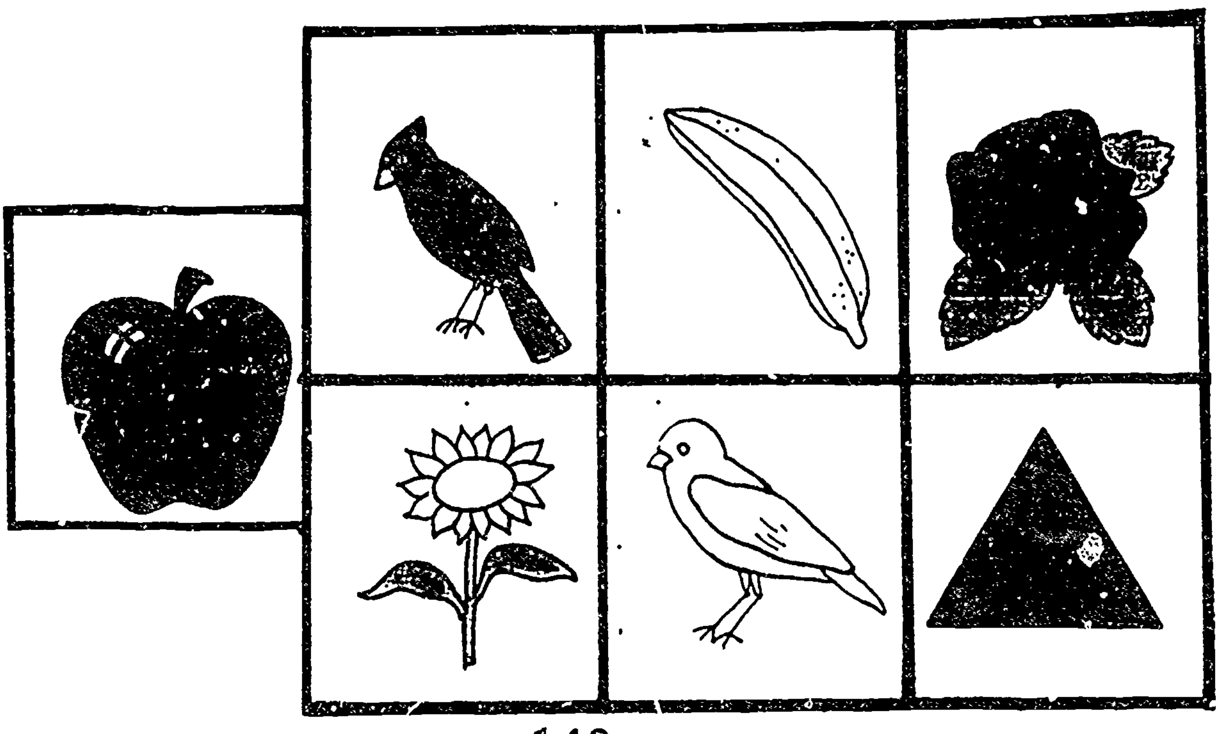




APPENDIX E

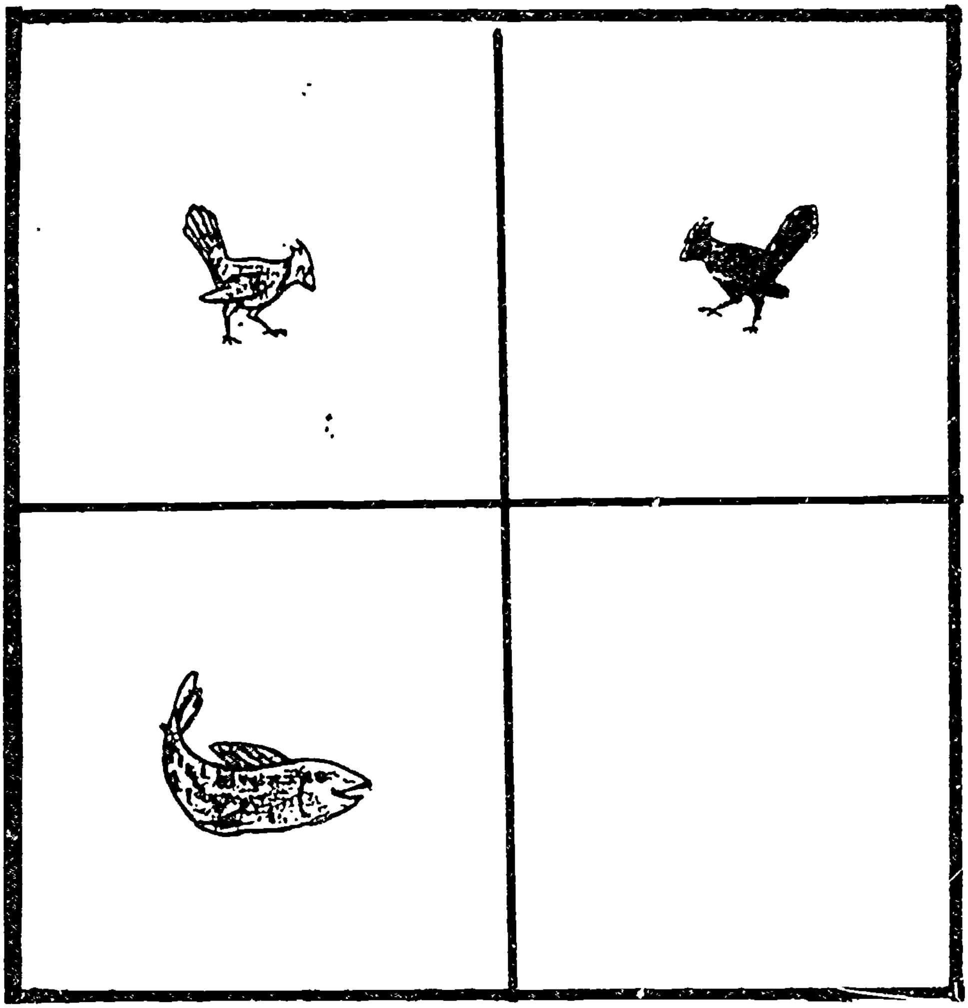
Two-way Classification Test Materials (2)

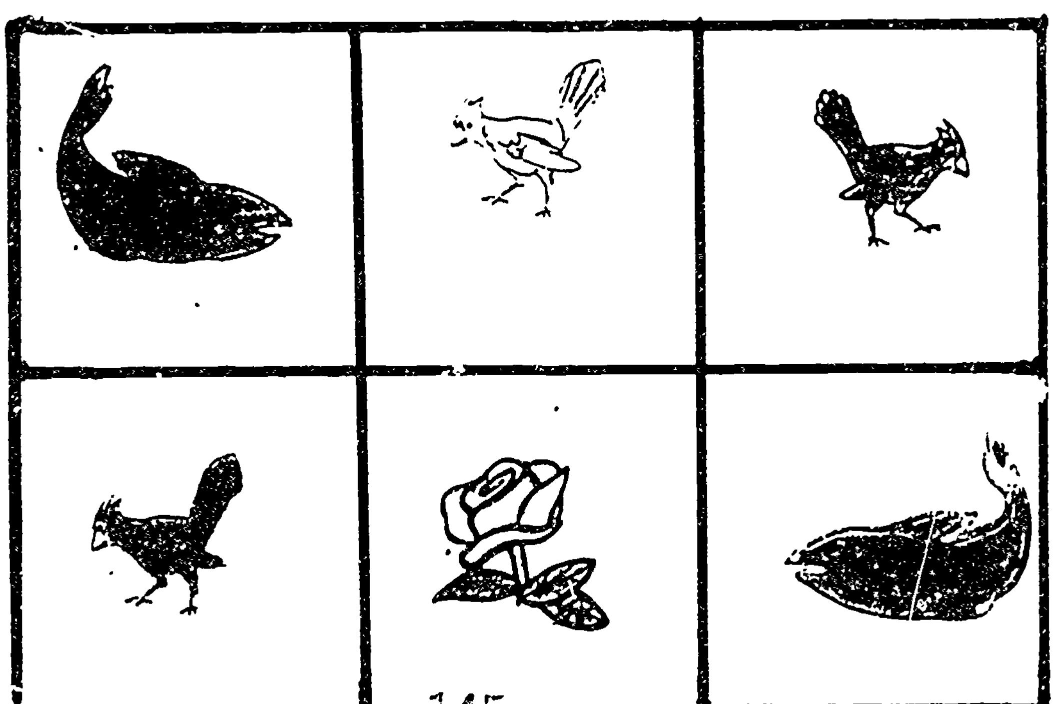




APPENDIX F

Three-way Classification Test Materials





APPENDIX G

Piagetian Tasks Scoring Sheet

PIAGETIAN BATTERY

SCORING SHEET

Name: ______________________ Number: ______ Date: __________

Task	Score	Response
1. Simple seriation	0	(a) Incorrect sequence
	1	(b) Trial and error
	2	(c) Correct sequence
2. Double seriation	0	(a) Incorrect sequence
	1	(b) Trial and Error
	2	(c) Correct sequence
3. Simple classification	0	(a) Unable to sort animals
(animals)	1	(b) Atribute sorted by: ________ ________
(blocks)	0	(a) Unable to sort blocks
	1	$(b)_1$ Sorted by shape
	1	$(b)_2$ Sorted by color
	1	$(b)_3$ Sorted by size
4. Two-way classification	0	(a) Incorrect choice
(form 1)	1	(b) Correct choice;incorrect explan
	2	(c) Correct choice;correct explan.
	0	(a) Incorrect choice
(form 2)	1	(b) Correct choice;incorrect explan
	2	(c) Correct choice;correct explan.
5. Class inclusion	0	(a) More pink/blue flowers(8 vs. 2)
(flowers)	2	(b) More flowers than pink/blue flowers (all are flowers)
		Comments: ________
(beads)	0	(a) More green beads than beads
	2	(b) More beads than green/white b.
		Comments: ________
6. Three-way classification	0	(a) Incorrect choice
	1	(b) Correct choice;incorrect e
	2	(c) Correct choice;correct exp
7. Conservation of number	0	(a) more or less
	1	(b) Same;incorrect reason ____
	2	(c) Same; correct reason

Task	Score	Reponse
8. Conservation of continuous quantity:	0	(a) more or less
	1	(b) same; incorrect reason
	2	(c) same;correct reason
9. Conservation of discontinuous quantity :	0	(a) more or less
	1	(b) same; incorrect reason
	2	(c) same; correct reason

REFERENCES

Althouse, R. (1985). The relationship between initial reading and performance on Piagetian tasks. Reading Improvement, 22, 21-28.

Anderson, R. C., & Pearson, P. D. (1984). A schema-theoretic view of basic processes in reading comprehension. In P. D. Pearson (Ed.), Handbook of reading research (pp. 255-290). New York: Longman.

Arlin, P. (1981). Piagetian tasks as predictors of reading and math readiness in grades K-1. Journal of Educational Psychology, 73, 712-721.

Ausubel, D. P. (1963). The psychology of meaningful verbal learning. New York: Grune & Stratton.

Ausubel, D. P., & Robinson, F. G. (1969). School learning. New York: Holt, Rinehart & Winston.

Balow, B. (1971). Perceptual-motor activities in the treatment of reading disabilities. The Reading Teacher, 24, 513-525, 542.

Bear, G. G., & Modlin, P. D. (1987). Gesell's developmental testing: What purpose does it serve? Psychology in the Schools, 24, 40-44.

Bender, L. (1946). Bender visual motor Gestalt test. New York: The American Orthopsychiatric Association, Inc.

Boehm, A. (1985). Review of Brigance K and 1 screen for kindergartners and first grade. In J. V. Mitchell, Jr. (Ed.), The ninth mental measurements yearbook (Vol. 1, pp. 223-225). Lincoln, NE: The University of Nebraska.

Bransford, J. D., Barclay, J. R., & Franks, J. J. (1972). Sentence memory: A constructive versus interpretive approach. Cognitive Psychology, 3, 193-209.

Bransford, J. D., & Johnson, M. K. (1972). Contextual prerequisites for understanding: Some investigations of comprehension and recall. Journal of Verbal Learning and Verbal Behavior, 11, 717-726.

Brigance, A. H. (1976). Brigance diagnostic inventory of basic skills. North Ballerica, MA: Curriculum Associates.

Brigance, A. H. (1979). Brigance inventory of early development. North Ballerica, MA: Curriculum Associates.

Brigance, A. H. (1982) Brigance K and 1 screen. North Billerica, NA: Curriculum Associates.

Buckland, P. (1969). The effect of visual perception training on reading achievement of low readiness first grade pupils. Unpublished doctoral dissertation, University of Minnesota.

Cannella, G. S. (1982). Beginning reading: The influence of cognitive development. Reading Improvement, 19, 31-38.

Casbergue, R. M., & Greene, J. F. (1988). Persistent misconceptions about sensory perception and reading disability. Journal of Reading, 32, 196-201.

Collarusso, R., & Hammill, D. (1972). Motor-free test of visual perception. Novato, CA: Academic Therapy Publications.

Copeland, R. (1984). How children learn mathematics. New York: Macmillan.

Duckworth, E. (1964). Piaget rediscovered. Journal of Research in Science Teaching, 2, 172-175.

Durost W., Bixler, H., Wrightstone, J. W., Hildreth, G., & Lund, K. (1958). Metropolitan achievement test. New York: Harcourt, Brace, Jovanovich.

Flavell, J. H. (1963). The developmental psychology of Jean Piaget. Princeton, N.J.: D. Van Nostrand.

Freyburg. P. S. (1966). Concept development in Piagetian terms in relation to school attainment. Journal of Educational Psychology, 57, 164-168.

Frostig, M. (1961). Marianne Frostig developmental test of visual perception (3rd ed.). Palo Alto, CA: Consulting Psycholgists Press.

Frostig, M., & Horne, D. (1964). The Frostig program for the development of visual perception: Teacher's guide. Chicago: Follett.

Furth, H. G. (1969). Piaget and knowledge: Theoretical foundations. Englewood Cliffs, NJ: Prentice-Hall.

Gesell Institute, (1987). The Gesell Institute responds. Young Children, 42(2), 7-8.

Getman, G. N. (1981). Vision: Its role and integrations in learning processes. Journal of Learning Disabilities, 14, 577-580.

Goodman, K. S. (1984). Unity in reading. In A. C. Purves & O. N. Niles (Eds.), Becoming Readers in a Complex Society, (pp. 79-114). Chicago: University of Chicago Press.

Goodman, K. S., & Goodman, Y. M. (1977). Learning about psycholinguistic processes by analyzing oral reading. Harvard Educational Review, 47(3), 317-333.

Goodman, L., & Hammill, D. (1973). The effectiveness of Kephart-Getman activities in developing perceptual-motor and cognitive skills. Focus on Exceptional Children, 4, 1-9.

Hammill, D. (1972). Training visual perceptual processes. Journal of Learning Disabilities, 5, 552-559.

Hammill, D., Goodman, L., & Weiderholt, J. L. (1974). Visual-motor processes: Can we train them? The Reading Teacher, 27, 469-478.

Helfeldt, J. P. (1984). Test review: The Brigance K and 1 screen for kindergarten and first grade. The Reading Teacher, 37, 820-824.

Hirsh, E. D. (1988). Cultural literacy. New York: Vintage Books.

Ilg, F. L., & Ames, L. B. (1964). Gesell behavior tests as predictive of later grade placement. Perceptual and Motor Skills, 19, 719-722.

Ilg, F. L. & Ames, L. B. (1965). School readiness. New York: Harper & Row.

Ilg, F.L., Ames, L.B., Harris, J., & Gillespie, C. (1982). Gesell school readiness test. New York: Programs for Education, Inc.

Jacob, S. (1982). Piaget and education: Aspects of a theory. The Educational Forum, 46, 265-281.

Jacobs, J. N., Wirthlin, L. D., & Miller, C. B. (1968). A follow-up evaluation of the Frostig-Horne perceptual training program. Educational Leadership, 26, 169-175.

Kaufman, A. S. (1971). Piaget and Gesell: A psychometric analysis of tests built from their tasks. Child Development, 42, 1341-1360.

Kaufman, A. S., & Kaufman, N. L. (1972). Tests built from Piaget's and Gessell's tasks as predictors of first-grade achievement. Child Development, 43, 521-535.

Kavale, K. (1982). Meta-analysis of the relationship between visual perceptual skills and reading achievement. Journal of Learning Disabilities, 15(1), 42-51.

Kephart, N. C. (1960). The slow learner in the classroom. Columbus, OH: Charles E. Merrill.

Kirk, S., McCarthy, J., & Dirk, W. (1968). Illinois test of psycholinguistic abilities. Champaign, IL: University of Illinois Press.

Kirkland, E. R. (1978). A Piagetian interpretation of beginning reading instruction. The Reading Teacher, 31, 497-503.

Klesius, S. (1972). Perceptual motor development and reading--A closer look. In R. Aukerman (Ed.), Some persistent questions on beginning reading (pp. 151-159). Newark, DE: International Reading Association.

Kulberg, J. M., & Gershman, E. S. (1973). School readiness: Studies assessment procedures and comparison of three different types of programming for immature 5-year-olds. Psychology in Schools, 10, 410-419.

Levine, M. D. (1984). Reading disability: Do the eyes have it? Pediatrics, 73, 869-870.

Litchfield, T. B. (1970). A program of visual-perceptual-motor training to determine the effects upon primary level children with learning deficiencies. Suffern, New York: Ramapo Central School District. (ERIC Document Reproduction Service No. ED 043 994.)

Lorge, I., Thorndike, R., & Hagen, E. (1966). Lorge-Thorndike intelligence test. Chicago: Riverside Publishing Co.

Lunzer, E.A., Dolan, T., & Wilkinson, J.E. (1976). The effectiveness of measures of operativity, language and short-term memory in the prediction of reading and mathematical understanding. British Journal of Educational Psychology, 46, 295-305.

Lunzer, E. A., Wilkinson, J. E. & Dolan, T. (1976). The distictiveness of operativity as a measure of cognitive functioning in five-year-old children. British Journal of Educational Psychology, 46, 288-294.

MacGinitie, W. H., Kamons, J., Kawalski, R. L., & MacGinitie, R. K. (1970). Gates-MacGinitie reading test. Chicago: Riverside Publishing Co.

Madden, R., & Gardner, E. F. (1964). Stanford early school achievement test. New York: Harcourt, Brace, Jovanovich.

McQuarrie, C., Sutphin, F., & Curry, G. (1964). Perceptual forms test. Winter Haven, FL: Winter Haven Lions Research Foundation.

Meisels, S. J. (1986). Testing four-and-five-year-olds: Response to Salzer and to Shepard and Smith. Educational Leadership, 44(3), 90-92.

Meisels, S. J. (1987). Uses and abuses of developmental screening and school readiness testing. Young Children, 42(2), 4-6, 68-73.

Metzger, R., & Werner, D. (1984). Use of visual training for learning disabilities: A review. Pediatrics, 73, 824-829.

O'Connor, C. (1969). Effects of selected physical activities upon motor performance and academic achievement of first graders. Perceptual Motor Skills, 29, 703-709.

Pearson, P. D., Hanson, J., & Gordon, C. (1979). The effect of background knowledge on young children's comprehension of explicit and implicit information. Journal of Reading Behavior, 11, 201-209.

Piaget, J. (1952). The origins of intelligence in children (M. Cook, Trans.). New York: International Universities Press.

Piaget, J. (1964). Development and learning. Journal of Research in Science Teaching, 2, 176-186.

Piaget, J. (1967). Six psychological studies (A. Tenzer, Trans.) D. Elkind, (Ed.). New York: Random House. (Original work published 1964).

Piaget, J., & Inhelder, B (1969). The psychology of the child (H. Weaver, Trans.). New York: Basic Books.

Randel, M., Fry, M., & Ralls, E. (1977). Two readiness measures as predictors of first- and third-grade achievement. Psychology in the Schools, 14(1), 37-40.

Robinson, H. (1972). Perceptual Training--Does it result in reading improvement? In R. Aukerman (Ed.), Some persistent questions on beginning reading (pp. 135-150). Newark, DE: International Reading Association.

Rosen, C. L. (1966). An experimental study of visual perceptual training and reading achievement in first grade. Perceptual and Motor Skills, 22, 979-986.

Rowland, G. T., & McGuire, J. C. (1971). The mind of man: Some views and a theory of cognitive development. Englewood Cliffs, NJ: Prentice-Hall.

Rude, R. (1973). Readiness tests: Implications for early childhood education. The Reading Teacher, 26, 572-580.

Rumelhart, D. E. (1977). Toward an interactive model of reading. In H. Singer & R. B. Ruddell (Eds.), Theoretical models and processes in reading, (pp. 722-750). Newark, DE: International Reading Association.

Rumelhart, C. E. (1980). Schemata: The building blocks of cognition. In R. J. Spiro, B. C. Bruce, & W. F. Brewer (Eds.), Theoretical issues in reading comprehension, (pp. 33-58).

Rumelhart, D. E., & Ortony, A. (1977). The representation of knowledge in memory. In R. C. Anderson, R. J. Spiro, & W. E. Montague (Eds.), Schooling and the acquisition of knowledge, (pp. 99-13⌣). Hillsdale, NJ: Lawrence Erlbaum.

Saphier, J. D. (1973). The relation of perceptual-motor skills to learning and school success. Journal of Learning Disabilities, 6, 583-592.

Scott, R. (1969). Social class, race, seriating, and reading readiness: A study of their relationship at the kindergarten level. Journal of Genetic Psychology, 115, 87-96.

Solan, H. A., Mozlin, R., & Rumpf, D. (1985). The relationship of perceptual-motor development to learning readiness in kindergarten: A multivariate analysis. Journal of Learning Disabilities, 18, 337-334.

Spiro, R. J. (1980). Constructive processes in prose comprehension and recall. In R. J. Spiro, B. C. Bruce, & W. F. Brewer (Eds.), Theoretical issues in reading comprehension, (pp. 245-278). Hillsdale, NJ: Lawrence Erlbaum.

Telegdy, G. A. (1974). A factor analysis of four school readiness tests. Psychology in the schools, 11, 127-133.

Wadsworth, B. J. (1989). Piaget's theory of cognitive and affective development (4th ed.). White Plains, NY: Longman.

Waller, T. G. (1977). Think first, read later: Piagetian prerequisites for reading. Newark, DE: International ding Association.

Wanat, S. (1976). Reading readiness. Visible Language, 10(2), 101-127.

Wechsler, D. (1974). Wechs · intelligence scales. New York: The Psychological Corporation

Wendt, R. N. (1978). Kindergarten entrance assessment: Is it worth the effort? Psychology in the Schools, 15, 56-62.

Whitson, G. T., & Hogan, J. D. (1983). Reading effectiveness: A comparison of a Piagetian versus a perceptual model. Reading Improvement, 20, 125-129.

Wimsatt, W. R. (1967). The effects of sensory motor training on the learning disabilities of grade school children. Dissertation Abstracts, 28, 346-348.

Wong, B. (1979). The role of theory in learning disabilities research. Part one: An analysis of problems. Journal of Learning Disabilities, 12, 585-595.

Wood, C., Powell, S. & Knight, R. C. (1984). Predicting school readiness: The validity of developmental age. Journal of Learning Disabilities, 17(1), 8-11.

Wright, D. (1985). Review of Brigance K and 1 Screen for kindergarten and first grade. In J. V. Mitchell, Jr. (Ed.), The ninth mental measurements yearbook (Vol. 1, pp. 225).

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