

A PREDICTIVE VALIDITY STUDY OF THE  
VANE KINDERGARTEN TEST

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## CHAPTER I

### PRESENTATION OF THE PROBLEM

#### Introduction

An adequate estimate of the intelligence and behavior adjustment of children at an early age is of educational importance. Learning problems in young children are frequently not recognized until the second or third grade and some even later than this. By this time, frustrations and emotional problems have already developed which tend to intensify the difficulties. If school achievement could be predicted when children enter the first grade then special consideration could be given those children with potential learning problems, and later frustrations and failure avoided.

The purpose of this study was to establish a measure of predictive validity for the Vane Kindergarten Test and its individual subtests using first grade students' Stanford Achievement scores as the criterion variable. These test results were grouped according to the sex and socio-economic level of the students.

#### Need For the Study

In almost every first grade classroom are found several pupils who appear, from the very beginning of school, unable to deal satisfactorily with the learning tasks of a traditional curriculum. A small



percentage of these students may be severely handicapped, either physically or mentally, and/or emotionally and placement in a special education class may be necessary. In addition to these pupils there remains a sizeable number of children who are limited in skills that are necessary for satisfactory school performance. Traditionally, these youngsters have been called "immature," "emotionally disturbed," or "culturally deprived." These characterizations may be valid, yet they offer no help or direction to the first grade teacher, whose chief task is to promote the development of the skills necessary for decoding, assimilation, association, and retrieval of symbols necessary for reading.

If children with potential learning difficulties could be identified early then instructional procedures could be initiated early when they could be most effective. This study is concerned with investigating the predictive validity of the Vane Kindergarten Test which was designed to evaluate the intellectual and academic potential and behavior adjustment of young children.

School achievement in the first grade is closely related to perceptual motor ability and vocabulary, as well as intelligence, emotional adjustment, sex, motivation for learning and socio-economic status. As many of these factors as possible should be taken into account for a good prediction of school success.

Studies (Koppitz, 1962; Koppitz, Sullivan, Blyth and Shelton, 1959; and De Hirsch, Jansky, and Langford, 1966) have shown that school achievement in the first grade is closely related to visual motor coordination and perception as measured on the Bender Gestalt, and abilities measured on vocabulary tests are related to intelligence

and ability to succeed with academic work (Anastasi, 1954; Wechsler, 1958; Terman and Merrill, 1960). The Human Figure Drawing Test has been found to be quite sensitive as a measure of intelligence and adjustment at the preschool and primary level and an index of future achievement (Goodenough, 1926; Harris, 1963; Koppitz, 1959, 1966; Anastasi, 1954; Vane, 1962, 1964). Koppitz (1966) suggests that the diagnostic usefulness of the Human Figure Drawing Test is greatly enhanced when it is used in combination with the Bender Gestalt, or as a part of a test battery.

Julia Vane in developing the Vane Kindergarten Test has included subtests which take into account the following three areas: perceptual motor, vocabulary, and draw-a-man. Since studies have indicated that first grade school achievement is closely related to these variables included in the subtests, there is a need for a study to determine if the Vane Kindergarten Test can predict first grade school achievement.

#### Statement of the Problem

This study was an attempt to establish a measure of predictive validity for the Vane Kindergarten Test and its individual subtests using first grade students' Stanford Achievement Test scores as the criterion variable. These tests' results were grouped according to the sex and socio-economic level of the students.

#### Hypotheses

The areas of concern are defined by the following hypotheses:

- A. Can significant differences in performance on the Vane Kindergarten Test and the Stanford Achievement Test be found when students

are categorized by sex? The hypotheses to be tested in this area are stated as follows:

1. There is significant difference in performance on the Vane Kindergarten Test when students are categorized by sex.
2. There is significant difference in performance on the Stanford Achievement Test when students are categorized by sex.

B. Do students of different socio-economic levels differ significantly in their performance on the Vane Kindergarten Test and the Stanford Achievement Test? The hypotheses to be tested in this area are stated as follows:

1. There is significant difference in performance on the Vane Kindergarten Test when students are categorized by socio-economic level.
2. There is significant difference in performance on the Stanford Achievement Test when students are categorized by socio-economic level.

C. Do the perceptual motor subtest, vocabulary subtest, man subtest, or the composite test of the Vane Kindergarten Test significantly predict school achievement for the total sample? The hypotheses to be tested in this area are stated as follows:

1. The perceptual motor subtest will significantly correlate with school achievement for the total sample.
2. The vocabulary subtest will significantly correlate with school achievement for the total sample.

3. The man subtest will significantly correlate with school achievement for the total sample.
4. The composite Vane Kindergarten Test will significantly correlate with school achievement for the total sample.

#### Definition of Terms

The following are definitions and clarifications of terms as they are applied throughout this study.

Vane Kindergarten Test (April, 1968), published by Clinical Psychology Publishing Co., Incorporated. This test consists of three subtests. The areas are perceptual motor, vocabulary, and man subtest.

Stanford Achievement Test, Primary I Battery, Form X (1964), published by Harcourt, Brace, and World, Inc. This test is designed for use for the middle of Grade 1 to the middle of Grade 2. The test is composed of six parts: Word Reading, Paragraph Meaning, Vocabulary, Spelling, Word Study Skills and Arithmetic.

National Opinion Research Center Scale. This scale was developed by the National Opinion Research Center at Ohio State University. The rankings of ninety occupations are presented and they cover the range from U. S. Supreme Court Justice to a shoe shiner. The scale is called the NORC Scale in the remainder of this study.

Predictive Validity. In this study, it was the ability of an instrument to predict school achievement in the first grade. It was measured by the success of the Vane in predicting performance on the Stanford.

School Achievement. This was the total achievement as it was measured on the Stanford Achievement Test.

Perceptual Motor Subtest. This test consists of copying three geometric designs. Abilities measured by this subtest are related to basic perceptual motor skills which are developmental in nature. This test can be administered to a group of 10 to 12 children at one time.

Man Subtest. This test can be administered to a group of 10 to 12 children at one time. The children were instructed to draw a whole man. Such tests have been shown to be a measure of both intelligence and ability to succeed with academic work.

Vocabulary Subtest. This test consists of eleven vocabulary words which are given to each child individually and the child is asked to tell the examiner what they mean. Abilities measured by this subtest are related to intelligence and ability to succeed with academic work.

Socio-Economic Level. This was a level assigned to subjects by the NORC Scale. Three levels are designated as high, middle, and low.

#### Delimitations

##### Scope of this Study

This study was an analysis of the test scores of 320 first grade children. The test scores were categorized according to sex and socio-economic level. The socio-economic level was determined by the NORC scale. Each of the subjects had taken the Vane in the fall of 1969 and took the Stanford in May of 1970. The total sample of the study was 283 students on whom complete data were collected. Analysis of variance and product moment were applied to the test data to determine if significant difference in performance existed, and also to find if any of the subtests, or the total test could significantly predict school achievement.

### Controls

The term "controls" refers to restraints on research conditions. All subjects used the same basal textbooks. All teachers of the subjects were certified by the state and had earned college degrees.

### Limitations of the Study

The study is limited to all first grade students in two Oklahoma towns, with a population of 10,000 and 3,000. This study is limited since the Vane tests were administered in November instead of at the first of the school year. Only the first year of the reading program in the elementary schools was included. The population of the towns was not representative of the various socio-economic levels. The population did not necessarily include the extreme lows (poverty) and the extreme highs on the socio-economic scale. This study is further limited since it deals with group data. Any predictive validity established for the Vane is based on its correlation with the Stanford test given in the two school systems under the conditions described above.

### Assumptions of the Study

It was assumed that relatively uniform quantity and quality of school furnished reading materials were available for all subjects in this study. It was assumed that teachers in administering the Stanford Achievement Test adhered to the directions for test administration.

### Significance of the Study

This study was designed to determine if the Vane Kindergarten Test can predict first grade school achievement. If this hypothesis is valid then the Vane could be used as a screening instrument at the beginning of first grade for the detection of insipient learning problems. Of added significance, are the simple directions and the short administration time compared to that of longer intelligence tests. The findings of this study will have special relevance for those who teach the initial stages of reading.

### Organization of the Study

Chapter I has given an introduction to the investigation to be undertaken. It also included the need for the study, the statement of the problem, hypotheses, definition of terms, the delimitations of the study, assumptions of the study and significance of the study.

Chapter II will present a review of the literature which is related to the problem being investigated.

Chapter III will describe the population studied, the test instruments employed and the testing procedures, and the statistical techniques used to test the hypotheses.

Chapter IV analyzes and illustrates the test data and statistical treatment of it as necessary to the testing of the hypotheses.

Chapter V includes a summary of the study, the conclusions drawn from this research by the testing of the hypotheses, a discussion of these conclusions, and some recommendations for future research in this area.

## CHAPTER II

### REVIEW OF THE LITERATURE

The literature concerning the prediction of reading success and school achievement is extensive. However, in keeping with the nature of this study and the instruments used, only those studies were reviewed which were relevant and involving similar predictive instruments.

The subtests of the Vane are similar to existing test instruments. The perceptual motor subtest is similar to the Bender Gestalt Test which also involves copying geometric designs. The man subtest is similar to the Draw-a-Man Test developed by Goodenough, the Goodenough-Harris Drawing Test, and the Human Figure Drawing discussed by Koppitz (1968). The vocabulary subtest is similar to subtests of the intelligence tests developed by Wechsler, Terman and Merrill.

The copying of a pattern or design from the Bender Gestalt Test requires a high level of visual discrimination. This includes the integration of motor coordination and of visual discrimination. It requires discrimination of the symbol being drawn and the symbol's likeness to that which is being copied. The test has been used with children to screen for school readiness (Baldwin, 1950; Harriman and Harriman, 1950; Koppitz, Mardis, and Stephens, 1961; Smith and Keogh, 1962) to predict school achievement (Koppitz, 1966; Koppitz, Sullivan, Blyth and Shelton, 1959) to diagnose reading and learning problems



(Koppitz, 1958; Lachman, 1960) and to evaluate emotional difficulties (Clawson, 1959, 1962; Koppitz, 1960; Simpson, 1958). It has also been employed as a test of intelligence for school beginners (Keogh and Smith, 1961) and as a projective test for identifying emotional and neurological abnormalities (Greenbaum, 1955).

Keogh (1963) studied the relationship between outline form copying ability as measured by the Bender Gestalt Test and reading ability. The study was designed to evaluate the use of the Bender at the kindergarten level as a predictive measure of later reading achievement at the third grade. The Bender was found to be of limited value as a predictive tool for identification of potentially good readers.

Reed (1968), in investigating children's figure drawings, found the relation between copying and reading was considerably reduced when account was taken of the joint relation of copying and reading to IQ variables. He concluded that the ability to copy a cross, figure on the Vane, is one measure of intelligence and that it may be used with any other measure of general intelligence, size of vocabulary for example, to provide an estimate of reading potential or status of reading readiness skills.

Townsend (1951) found that performance of both reading and copying tasks is related to performance on intelligence tests. Children with severe reading problems frequently show striking deficiencies in copying simple geometric figures, and some investigators have implied directly or indirectly, that the reading disability may be an attenuated reflection of a basic space-form deficit. Similar findings were found by Critchly (1962), Money (1966), and Kinsbourne and Warrington (1966).

DeHirsch, Jansky, and Langford (1966) in their investigation attempted to identify those kindergarten tests which might be potential predictors of end-of-second grade reading achievement. Nineteen of the thirty-seven kindergarten tests were significantly related to the overall Reading Performance Index. These kindergarten tests were then screened and reduced to a Predictive Index of ten tests. The Bender Gestalt Test was one of the ten chosen.

The Draw-a-Man Test with its various interpretations has been shown to be a measure of both intelligence and adjustment at the pre-school and primary level and an index of future achievement (Ames, 1943; Goodenough, 1926; Harris, 1963; Koppitz, Sullivan, Blyth, and Shelton, 1959; Koppitz, 1966; Koppitz, 1967; Vane and Eisen, 1962; and Vane and Kessler, 1964).

Easley (1964) developed a scale for scoring the Draw-a-Man Test to be used in the evaluation of reading readiness. Drawings of kindergarten children on the test were selected as representative of the various levels of performance. A predictive correlation of .64 was found between the scale scored Draw-a-Man Test and reading achievement.

Robinson and Hanson's (1968) objective of their investigation was the identification of instruments to measure variables related to success in beginning reading for use with advantaged, average, and disadvantaged first to third graders. The Goodenough Draw-a-Man Test was found to be reliable from .72 to .92. Generally high reliabilities were obtained with Metropolitan Achievement Tests at the first and second grade levels in each socio-economic strata. Reliability coefficients ranged from .90 to .94 for the first grade.

Vocabulary tests are related to intelligence and ability to succeed in academic work (Anastasi, 1943; Terman and Merrill, 1960; and Wechsler, 1958). Neville (1965) investigated the relationship between reading skills and intelligence test scores. He concluded that the lack of reading ability does tend to negatively influence scores on verbally oriented group intelligence tests for pupils and that the Peabody Picture Vocabulary Test could be used to adequately measure intelligence instead of the longer WISC test. Ivanoff and Tempero (1965), Gage and Naumann (1965), and Hughes and Lessler (1965) found significant correlations between the PPVT and the WISC and other IQ tests (California Test of Mental Maturity and Henmon-Nelson Tests of Mental Ability). Ivanoff and Tempero found that in the reading area, the PPVT showed a significant higher relationship with Henmon-Nelson Tests of Mental Ability and the California Test of Mental Maturity than was found in the arithmetic and language subtests of the California Achievement Test Battery.

Glasser and Zimmerman (1967) report that when two subtests of the WISC are paired, correlations with the full IQ rarely reach a significant level (.90 or better). But one of the combinations rating high in the survey studies, Vocabulary and Block Design, was cross-validated for a sample of emotionally disturbed children (Simpson and Bridges, 1959). Wight and Sandry (1962) checked the same combination for children hospitalized for physical disabilities. Both studies reported fairly accurate correlations of .87 and .91 respectively. These were surpassed in a study of "exceptional children" (mean IQ 86), where the correlation reached .95 (Mumpower, 1964).

Koppitz, Sullivan, Blyth, and Shelton (1959) in their study tested the hypothesis that the Bender Gestalt Test and Human Figure Drawings together can predict first grade school achievement. Seven months after the Bender's and HFD's were administered the Metropolitan Achievement Test was administered. The results, when tests are correlated with the Metropolitan, show that the Bender ( $r=.55$ ) and the Drawings ( $r=.46$ ) both have ability to predict achievement, but this power increases when they are used together ( $r=.65$ ) as multiple predictors.

The preceding study was followed by a study by Koppitz (1966) to determine whether school achievement in the primary grades can be more accurately predicted when a brief verbal test is added to the Human Figure Drawing Test and the Bender Gestalt Test. The results of this study show that the three tests, the Bender, the HFD, and the Information subtest of the WISC are better able to predict second grade achievement than any one or two of the tests alone. Twelve different correlations were given, all of which were significant at the .001 level.

Viscek (1964) investigated whether or not mental ages and socio-economic levels are powerful variables effecting first grade pupils' reading achievement. Standardized tests and inventories to evaluate pupil intelligence, reading readiness, psychological, social and emotional maturity, family index of social position and final achievement in reading were administered. Significant differences of achievement on each of the five criterion variables between pupils from the upper socio-economic level and the lower socio-economic level were revealed. No significant interrelations were reported between mental age levels

and socio-economic levels on any of the five criterion variables.

Investigations have been made to determine the relationship between sex and achievement in reading. Significant differences in reading achievement favoring girls were found by some investigators (Samuels, 1943; Hughes, 1953; Balow, 1963). Keyser (1952) in reviewing research, cited a number of studies which substantiated the generalization that girls are superior to boys in reading achievement. Gates (1961), in a large study of the reading ability of 13,000 pupils, found that the mean raw score for the girls was higher than the mean raw score of the boys and most of these differences were significant. Hansen (1939) in a study of over one thousand Indian children found that girls achieved appreciably higher on achievement in reading than did the boys at the end of the first grade. Ilg and Ames (1950) in a longitudinal study reported girls as a group were advanced over boys as a group at every stage of the "reading gradient." Steinbeck (1953), Wattenberg (1964), Prescott (1955) and Smith (1950) reported differences in favor of girls. Pauly (1951) suggested that children should not enter first grade on the basis of chronological age alone since girls are so much more mature than boys at that age.

On the other hand, McLaren (1950) found no significant differences in scores of boys and girls on reading comprehension and word recognition. No significant sex differences in reading achievement were found by Potter (1949). Anderson, Hughes, and Dixon (1956) found no significant difference in sex as far as the rate of reading development but did find that girls tend to read sooner than boys.

Studies (Bliesmer, 1951; Powell and Parsley, 1961; Robinson and Hanson, 1968) indicate a significant relationship between reading

readiness scores and measures of early success in reading. Bagford (1968) correlated readiness tests of kindergarten and first grade children with the Iowa Tests of Basic Skills to all fourth, fifth, and sixth graders. He concluded that students who score well on readiness tests in kindergarten and first grade tend to score well on reading achievement tests in grades, four, five and six and reading readiness test scores are as related to later success in reading as they are with early success. Hanson and Robinson (1967) also found that children who are rather unsuccessful in learning to read in the early grades continue to be low achievers in reading throughout their school careers.

Research reviewed indicates there was no unanimity of opinion as to the predictive validity of individual tests similar to the subtests of the Vane Kindergarten Test and as to the effect of sex and socio-economic status on reading achievement. At this time, no research has been reported to discover whether the test is a valid predictor.

## CHAPTER III

### METHODOLOGY AND DESIGN

The purpose of this study was to establish a measure of predictive validity for the Vane Kindergarten Test (1968) and its individual subtests using first grade students' Stanford Achievement Test scores as the criterion variable. More specifically, this study was designed to test the following hypotheses:

#### Hypotheses

- A. Can significant differences in performance on the Vane Kindergarten Test and the Stanford Achievement Test be found when students are categorized by sex? The hypotheses to be tested in this area are stated as follows:
1. There is significant difference in performance on the Vane Kindergarten Test when students are categorized by sex.
  2. There is significant difference in performance on the Stanford Achievement Test when students are categorized by sex.
- B. Do students of different socio-economic levels differ significantly in their performance on the Vane Kindergarten Test? The hypotheses to be tested in this area are stated as follows:

1. There is significant difference in performance on the Vane Kindergarten Test when students are categorized by socio-economic level.
  2. There is significant difference in performance on the Stanford Achievement Test when students are categorized by socio-economic level.
- C. Do the perceptual motor subtest, vocabulary subtest, man subtest, or the composite test of the Vane Kindergarten Test significantly predict school achievement for the total sample? The hypotheses to be tested in this area are stated as follows:
1. The perceptual motor subtest will significantly correlate with school achievement for the total sample.
  2. The vocabulary subtest will significantly correlate with school achievement for the total sample.
  3. The man subtest will significantly correlate with school achievement for the total sample.
  4. The composite Vane Kindergarten Test will significantly correlate with school achievement for the total sample.

#### Methodology and Design

The design and the methodology used to test the study's hypotheses are described and organized into these sections: (1) the population of the study; (2) the testing procedures; (3) the standardized test instruments; (4) the statistical techniques.



### Population of the Study

The population for this study included all first grade children in Yukon, and Mustang, Oklahoma. The population of the towns are 10,000 and 3,000, respectively. In Yukon, the ten first grade classrooms were located in the three elementary school buildings. In Mustang, the four first grade classrooms were all located in the elementary school building. The study was explained to school personnel and permissions were obtained for the testing of all first grade students. The population was selected because of its convenience and the willingness of the school officials to permit this study.

The population included individuals from all three socio-economic levels although the extreme lows (poverty) and the extreme highs were not present.

### Testing Procedures

The Vane Kindergarten Tests were administered by the investigator during November of 1969. Each child was tested in both an individual session that included the vocabulary subtest and a group session that included the perceptual motor and man subtests. The testing was completed in well lighted and ventilated rooms. The children were informed in advance before they were taken from their classrooms, and a short period for establishing rapport was included for each subject.

The Stanford Achievement Tests were administered by the fourteen classroom teachers in May of 1970.

## Standardized Test Instruments

1964 Edition of the Stanford Achievement  
Test, Primary I Battery, Form X

The Primary I Battery was designed for use in the latter half of grade one and the first half of grade 2. The six subtests are:

1. Word Reading - a 35 item test that measures the ability of a pupil to analyze a word without the aid of context.
2. Word Meaning - consists of a series of paragraphs, graduated in difficulty, from each of which one or more words have been omitted with a total of 38 words omitted.
3. Vocabulary - consists of 39 multiple choice type of item in which the pupil is required to select from a series of three alternatives the proper answer to a question or statement read by the teacher.
4. Spelling - a 20 item test that employs a dictation type exercise.
5. Word Study Skills - a 56 multiple choice item which involves auditory perception of beginning and ending sounds, and the matching of a word he hears with one of three which he reads.
6. Arithmetic - a 63 item test in three parts: measures, problem solving, and number concepts.

NORC Scale

This scale of occupational prestige presents prestige ranking of ninety occupations. The wide range of occupations goes from a shoe shiner with a prestige of thirty-three to a U. S. Supreme Court Justice with a prestige of ninety-six.

Duncan's Socio-economic Index for Occupations in the Detailed Classification of the Bureau of Census (Reiss, 1965) was used to place occupations on the NORC Scale. Duncan's Index has over five hundred occupations and gives the NORC Score for each occupation. Greater accuracy in placement was made possible by using this index since much of the subjectivity in placing occupations on the NORC Scale was removed. The NORC Scale was divided for this study, into three levels which correspond closely to the levels discussed by Kahl (1957) and are the same as those used by Akers (1969). Those occupations whose prestige score is from 33 through 62 comprised the low socio-economic level. Occupations whose prestige score is from 63 through 73 comprised the middle socio-economic level while the prestige scores from 74 through 93 comprised the high socio-economic level. The terms "high," "middle" and "low" used to describe the socio-economic level merely indicate placement on the NORC Scale.

Information concerning the occupations of the students' fathers was obtained from school records. Also, all students took home a short questionnaire requesting the needed information for ranking on the NORC Scale.

The NORC was chosen because it was appropriate for the population. Other available tests are designed for older children.

#### Vane Kindergarten Test, 1968

Julia Vane developed the Vane Kindergarten Test in order to evaluate the intellectual and academic potential and behavior adjustment of young children. The underlying assumption of the Vane is that samples of behavior will give clues to the child's ability to function

adequately in areas related to success in school. The Vane consists of three parts:

1. Perceptual motor subtest - related to basic perceptual motor skills which are developmental in nature. The child is required to reproduce three geometric designs and scoring is based on the agreement in details to the sample figures.
2. Man subtest - similar to the Goodenough-Harris Drawing Test and measures both intelligence and adjustment at the primary level.
3. Vocabulary subtest - indicates verbal abilities by having the child define words from a prescribed list and is related to intelligence and academic success.

The number of pupils tested in the Vane standardization program was 304 children in the third grade groups and 151 children in the second grade group whereby correlations were made with measures of achievement.

#### Statistical Design

A primary hypothesis of this study was that there is a significant difference in the performance of students on the Vane according to the factors of sex and socio-economic level. A single analysis of variance was used to test for this significance.

The treatment of the data by an analysis of variance was used to identify the correlation between one dependent variable (school achievement as measured by the Stanford) and two independent variables (sex and socio-economic level as defined by the NORC Scale). The Vane scores served as the predictor variables while the scores from the

Stanford served as the criterion variable. All analysis of variance computations were derived from the basic equation reported by Kerlinger (1965).

In the remaining treatment of the data, computations were done considering the three subtests of the Vane and the composite test score as four predictive variables in their relationships with the Stanford. The purpose of this treatment was to establish predictive validity of the Vane total test and its subtests. The statistical methods used were a Pearson product moment correlation (Guilford, pp. 91-112) and a multiple correlation (Guilford, p. 409).

## CHAPTER IV

### STATISTICAL ANALYSES

The purpose of this chapter is to present a detailed description of the statistical treatment of the data and a statement of the results.

The purpose of this portion of the study is to investigate the correlation between sex and socio-economic status and the Vane Kindergarten Test and the Stanford Achievement Test.

The areas of concern are defined by the following hypotheses and the results of each hypotheses are stated.

#### Analysis by Sex

##### Hypothesis A

Can significant differences in performance on the Vane Kindergarten Tests and the Stanford Achievement Test be found when students are categorized by sex? The hypotheses to be tested in this area are stated as follows:

1. There is significant difference in performance on the Vane Kindergarten Tests when students are categorized by sex.

This hypothesis was accepted ( $p < .005$ ) with a reported eta coefficient of 0.168.

In order to test hypothesis A.1 students were categorized by sex into two groups. This results in 134 males and 142

females. A one-way analysis of variance was applied to the scores of the subjects on the Vane Kindergarten Tests to determine if there was a significant difference in performance when students were categorized due to the factor of sex. The analysis of variance was followed by an eta coefficient as suggested by Kerlinger (1965). This was done in order to determine the magnitude of the relationship between sex and Vane Kindergarten Tests scores. The resulting F values along with their level of significance are given in Table I. The cell variances were heterogeneous ( $p < .02$ ). Since the cell size was nearly equal and the F ratio was less than 4.0, the assumption of homogeneous variance should be tenable. (See Table II.)

TABLE I  
RESULTS OF A ONE-WAY ANALYSIS OF VARIANCE BY SEX

Independent Variable - Sex			Dependent Variable - <u>Vane Kindergarten Test</u>		
Source	Sum of Squares	df	Mean Square	F	P
Total	16156.91	275	--	--	--
Between	456.61	1	456.61	7.97	.005
Within	15700.29	274	57.30	--	--

Correlation ratio (eta) = 0.168

Variance ratio = 2.2177; cell variance heterogeneous at .02 level

TABLE II  
SEX MEANS AND STANDARD DEVIATIONS  
ON THE VANE KINDERGARTEN TEST

	Mean	Standard Deviation
Male	27.6940	8.9368
Female	30.2676	6.0010

2. There is significant difference in performance on the Stanford Achievement Test when students are categorized by sex.

This hypothesis was accepted ( $p < .025$ ).

In order to test hypothesis A.2, students were categorized by sex into two groups. This results in 140 males and 143 females. A one-way analysis of variance was applied to the scores of the subjects on the Stanford Achievement Test to determine if there was a significant difference in performance when students were categorized due to the factor of sex. The analysis of variance was followed by an eta coefficient ( $r = 0.137$ ). The resulting F values along with their level of significance are given in Table III. The variances of the two sexes were assumed to be homogeneous ( $p > .05$ ). (See Table IV.)



TABLE III  
RESULTS OF A ONE-WAY ANALYSIS OF VARIANCE BY SEX

Independent Variable - Sex		Dependent Variable - <u>Stanford Achievement Test</u>			
Source	Sum of Squares	df	Mean Square	F	P
Total	4203.35	282	--	--	--
Between	8135.72	1	8135.72	5.54	<.025
Within	412199.28	281	1466.90	--	--

Correlation ratio (eta) = .137

Variance ratio = 1.39; cell variance homogeneous at .05 level

TABLE IV  
SEX MEANS AND STANDARD DEVIATIONS  
ON THE STANFORD ACHIEVEMENT TEST

	Mean	Standard Deviation
Male	162.49	41.38
Female	173.22	35.02

## Analysis by Socio-Economic Level

Hypothesis B

Do students of different socio-economic levels differ significantly in their performance on the Vane Kindergarten Tests and the Stanford Achievement Tests? The hypotheses to be tested in this area are stated as follows:

1. There is significant difference in performance on the Vane Kindergarten Tests when students are categorized by socio-economic levels.

This hypothesis was rejected ( $p > .05$ ) or ( $F < 1.0$ ).

In order to test hypothesis B.1 students were categorized according to socio-economic class. There were sixty students in each level. Subjects were randomly discarded, using a table of random numbers, to equalize cell size. The reason for this was to make the assumptions of true internal level of measurement, normal kurtosis, homogeneous cell variance, and normal population distribution more tenable. A one-way analysis of variance was applied to the scores of the subjects on the Vane Kindergarten Tests to determine if there was a significant difference in performance when students were categorized due to the factor of socio-economic level. The analysis of variance was followed by an eta coefficient ( $r = 0.066$ ). The resulting F values along with their level of significance are given in Table V. Sex variances were homogeneous ( $p > .05$ ). (See Table VI.)

TABLE V  
RESULTS OF A ONE-WAY ANALYSIS OF VARIANCE  
BY SOCIO-ECONOMIC CLASS

Independent Variable - Socio-economic Class	Dependent Variable - <u>Vane Kindergarten</u> <u>Test</u>				
Source	Sum of Squares	df	Mean Square	F	P
Total	4804.55	179	--	--	--
Between	21.23	2	10.62	0.3928	N.S.
Within	4783.32	177	27.02	--	--

Correlation ratio (eta) = 0.066

Variance ratio = 1.44; cell variances homogeneous at .05 level

TABLE VI  
SOCIO-ECONOMIC MEANS AND STANDARD DEVIATIONS  
ON THE VANE KINDERGARTEN TEST

	Mean	Standard Deviation
High	30.1666	4.7981
Middle	29.5833	5.7557
Low	30.4000	4.9921

2. There is significant difference in performance on the Stanford Achievement Test when students are categorized by socio-economic level.

This hypothesis was rejected ( $p > .05$ ).

In order to test hypothesis B.2, students were categorized according to socio-economic class. Subjects were randomly discarded to equalize cell size. One hundred three subjects were dropped because variance in the original sample was heterogeneous and the ends were unequal. There were sixty students in each level. A one-way analysis of variance was applied to the scores of the subjects on the Stanford Achievement Test to determine if there was a significant difference in performance when students were categorized due to the factor of socio-economic level. The analysis of variance was followed by an eta coefficient ( $r = 0.148$ ). The resulting F values along with their level of significance are given in Table VII. (See also Table VIII.)

TABLE VII  
RESULTS OF A ONE-WAY ANALYSIS OF VARIANCE  
BY SOCIO-ECONOMIC CLASS

Independent Variable - Socio-Economic Class		Dependent Variable - <u>Stanford Achievement Test</u>			
Source	Sum of Squares	df	Mean Square	F	P
Total	263824.24	179	--	--	--
Between	5900.68	2	2950.34	2.0246	N.S.
Within	257923.57	177	1457.19	--	--

Correlation ratio ( $\eta$ ) = 0.148

Variance ratio = 1.3894; cell variances homogeneous at .05 level

TABLE VIII  
SOCIO-ECONOMIC MEANS AND STANDARD DEVIATIONS  
ON THE STANFORD ACHIEVEMENT TEST

	Mean	Standard Deviation
High	178.6166	34.3669
Middle	172.0166	40.5096
Low	164.6000	39.3632

### Analysis Using the Total Sample

The purpose of this portion of the study was to establish a measure of predictive validity for the Vane Kindergarten Test and its individual subtests in a multiple correlation using first grade students' Stanford Achievement scores as the criterion variable.

The areas of concern are defined by the following hypotheses and the results of each hypotheses are stated.

#### Hypothesis C

Do the perceptual motor subtest, vocabulary subtest, man subtest, or the composite test of the Vane Kindergarten Test significantly predict school achievement for the total sample? The hypotheses to be tested in the area are stated as follows:

1. The perceptual motor subtest will significantly correlate with school achievement for the total sample.

This hypothesis was accepted ( $r = 0.50$  with  $p < .001$ ).

In order to test hypothesis C.1 scores were obtained on all 283 subjects from the perceptual motor subtest and correlated with school achievement scores. The perceptual motor subtest scores were used as the independent variable, and the Stanford achievement total was the dependent variable. The correlational technique employed was the Pearson Product Moment technique (Guilford, pp. 91-112). Table IX presents the correlation matrix.

TABLE IX  
CORRELATION MATRIX (Pearson Product Moment)

	Vane Total	Perceptual Motor	Vocabulary	Draw-A- Man	Stanford Total
Vane Total	1.0	.58	.54	.66	.45
Perceptual Motor		1.0	.27	.37	.50
Vocabulary			1.0	.15	.34
Draw-A- Man				1.0	.27
Stanford					1.0

Beta Weight 1 = .128

Multiple Correlation Coefficient

Beta Weight 2 = .372

(R) = .554

Beta Weight 3 = .167

$R^2$  = .307

Beta Weight 4 = .023

$S_R$  = 40.2111

2. The vocabulary subtest will significantly correlate with school achievement for the total sample.

This hypothesis was accepted ( $r = 0.34$  with  $p < .001$ ).

In order to test hypothesis C.2, scores were obtained on all 283 subjects from the vocabulary subtest and correlated with school achievement scores. The vocabulary subtest scores were used as the independent variable and the Stanford Achievement total was the dependent variable. The correlational technique employed was the Pearson Product Moment

technique (Guilford, pp. 91-112). Table IX, page 32, presents the correlation matrix.

3. The man subtest will significantly correlate with school achievement for the total sample.

This hypothesis was accepted ( $r = 0.27$  and  $p < .01$ ).

In order to test hypothesis C.3, scores were obtained on all 283 subjects from the man subtest and correlated with school achievement scores. The man subtest scores were used as the independent variable and the Stanford Achievement total was the dependent variable. The correlational technique employed was the Pearson Product Moment technique. Table IX, page 32, presents the correlation matrix.

4. The composite test will significantly correlate with school achievement for the total sample.

This hypothesis was accepted ( $r = 0.45$  and  $p < .001$ ).

Hypothesis C.4 was tested by obtaining the scores on all 283 subjects from the composite test and correlating them with school achievement scores. The composite test scores were used as the independent variable and the Stanford Achievement total was the dependent variable. The correlational technique employed was the Pearson Product Moment technique. Table IX, page 32, presents the correlation matrix.

The method used for calculating the Betas and R was the "Doolittle method" (Guilford, p. 320). The Wheary shrinkage formula was used to correct the multiple standard error of estimate for bias. Correcting R for bias,  $\hat{R} = .545$ . The unbiased multiple standard error of the



estimate is  $\hat{G} \cdot M. est. = 40.2111$ . The unbiased index of forecasting efficiency is  $\hat{E} = 16.15$  per cent.

The Vane subscales were partialled with respect to each other and their total. The Beta weights after this operation gives an indication of each's predictive power. The rank order of effectiveness according to Betas are as follows: perceptual motor, vocabulary, Vane composite, and the man subtest.

A check was made on the correlation coefficients by randomly selecting 30 students, table of random numbers, and recomputing the coefficients. A Z transformation and T test were performed on the population and check population coefficients. There were no significant differences; therefore, the assumption is that the coefficients are accurate and stable.

#### Summary of Hypothesis Testing

1. The hypotheses dealing with differences in performance on the Vane Kindergarten Tests and the Stanford Achievement Test attributable to the factor of sex were accepted.
2. The hypotheses dealing with differences in performance on the Vane Kindergarten Test and the Stanford Achievement Test attributable to the factor of socio-economic level were rejected.
3. All hypotheses dealing with the predictive validity of each of the Vane subtests and the composite Vane test when the sample was whole were accepted.

## CHAPTER V

### SUMMARY AND CONCLUSIONS

#### General Summary of the Investigation

This investigation examined the predictive validity of the Vane Kindergarten Test and its subtests as well as the possible differences attributable to the factors of sex and socio-economic level, with the Stanford Achievement as a criterion variable.

The students in this study included all first graders in two towns of 10,000 and 3,000 population. These students were administered the Vane Kindergarten Test in November of 1969 and were administered the Stanford Achievement Test in May, 1970 as a post test. The total sample of the study was 283 students on whom complete data were collected. The data derived from these groups in various combinations were examined through the techniques of analysis of variance and Pearson Product Moment.

#### Summary of Results

The results of the first portion of the study which sought to identify differences in performance according to the factors of sex and socio-economic level indicate that differences do exist when students are categorized by sex but differences were not found when students were categorized by socio-economic level.

The students' scores were categorized by sex and treated by an analysis of variance to determine if there was a significant difference in performance according to the sex of the students. The obtained F values on the Vane revealed that there was a significant difference ( $p < .02$ ) in performance according to sex. On the Stanford the obtained F values were significant at the .05 level and indicated there was a significant difference in performance on this test according to sex. The differences in performance indicated that the girls surpassed the boys in performance on both the Vane and the Stanford. The following means were obtained on the Vane: girls  $\bar{X} = 30.2676$ ; boys  $\bar{X} = 27.6940$ . The mean for the girls on the Stanford was  $\bar{X} = 173.22$  while the mean for the boys was  $\bar{X} = 162.49$ .

The students' scores were also categorized by socio-economic level and treated by an analysis of variance to determine if there was a significant difference in performance according to the socio-economic level of the students. The obtained F values indicated that there was no significant difference in performance on the Vane and the Stanford when students were categorized by socio-economic level. A difference in mean scores at various socio-economic levels on the Stanford indicated a difference existed although it was not significant. The following means were obtained: high socio-economic level  $\bar{X} = 178.6166$ ; middle socio-economic level  $\bar{X} = 172.0166$ ; low socio-economic level  $\bar{X} = 164.6000$ .

It can be concluded from the results of the analysis of variance applied to the data categorized by sex that significant differences in performance do exist. These differences indicate that the sex of the students is a factor to be recognized and accounted for when testing

students of first grade level using the instruments cited in this study.

It can be concluded from the results of the analysis of variance applied to the Stanford data categorized by socio-economic level that differences in performance do exist although they were not significant. The failure of the Vane and the Stanford to significantly differentiate between students at various socio-economic levels can be accounted for by the very nature of the population. The towns studied are primarily middle class towns without the extreme lows (poverty) and the extreme highs on the socio-economic scale. For instance, the AFDC (Aid to Families with Dependent Children) in Mustang was 7% of the student population in 1969, while Yukon's AFDC was 4% and nearby El Reno's AFDC was 20%. The arbitrary division of the NORC scale into the three levels, recommended by Kahl (1957), used by Akers (1969) and used in this study, was not appropriate for the populations studied. Also, students were randomly discarded in order to equalize cell size but it would have been better if the students who fell on the borderlines between the three levels had been discarded systematically.

Pearson product moment was applied to the data when it was grouped totally together. The method used for calculating the Betas and R was the "Doolittle method." The statistical technique was used to determine if any of the Vane subtests or the total test would significantly predict school achievement. The Beta weights after this operation gives an indication of each's predictive power. The rank order of effectiveness according to Betas are as follows: motor perception, vocabulary, Vane composite, and Man subtest.

An inspection of Table IX indicates that all subtests and the composite test were significant predictors of school achievement at the .05 level. The perceptual motor subtest was the best single predictor of school achievement with the vocabulary subtest as the second best predictor of school achievement.

The man subtest was the poorest predictor of school achievement. Julie Vane (Journal of Clinical Psychology, p. 21) recommends the Goodenough scoring for older children since the simplified scoring method underestimates very bright children of 6½ and 7 years. Since many of the children in this study were older children, a higher correlation may have been obtained if the Goodenough scoring had been used.

#### Concluding Statements

All subtests and the composite Vane Kindergarten Test were significant predictors of school achievement at the .05 level. The perceptual motor subtest was the best single predictor of school achievement. The rank order of effectiveness according to Betas were as follows: perceptual motor, vocabulary, Vane composite, and draw-a-man subtest.

The results of this study are offered as an attempt to aid in the understanding of an instrument which is being used in public schools.

It is hoped that the results of this study will serve a useful purpose by benefiting those who are interested in first grade school achievement and in future studies on the relationship of sex and socioeconomic level to school achievement.

## Recommendations

The Vane Kindergarten Test is an instrument which will be subject to wide use in coming years. It is with this in mind that the following recommendations are given.

### A. Suggestions for use of the Vane.

1. Persons administering this test should be made aware that performance on this test will vary according to sex and that when possible, allowances should be made.
2. The perceptual motor subtest should be recognized as the single subtest which is the best predictor of school achievement.
3. Persons using the Vane should be aware that this study deals with group data and that predicting individual achievement, as a result of this study, would be inappropriate. The results of this test for an individual could be used to a great advantage as a beginning point for further diagnostic testing.

### B. Suggestions for future research.

1. Studies designed to establish criteria for using the Vane as a predictor of reading readiness.
2. A study following the design of this study, but using the Goodenough scoring for the man subtest.
3. A study following the design of this study, but administering the Vane Kindergarten Test at the end of the Kindergarten school year.
4. A study to determine the specific inter-correlations of the Vane with other performance scores and to determine what, if any, new variance in achievement that is identified by the Vane.

5. A study to determine the correlation of the Vane with specific subtests of the Stanford.
6. A study to determine the correlation of the Vane with other standardized achievement tests and subtests.
7. Regression and prediction tables for predicting various achievement scores from the composite and subtest scores of the Vane. This would be of great value for the teachers to obtain more useful information on individual students. The usefulness of a test is improved when subtests and even certain items are studied for their diagnostic and prediction value.

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