1986

The influence of intelligence and adaptive behavior on rote learning and social skills

Jane Ross-Reynolds
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THE INFLUENCE OF INTELLIGENCE AND ADAPTIVE BEHAVIOR ON ROTE LEARNING AND SOCIAL SKILLS

Iowa State University

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Ph.D. 1986
The influence of intelligence and adaptive behavior on rote learning and social skills

by

Jane Ross-Reynolds

A Dissertation Submitted to the Graduate Faculty in Partial Fulfillment of the Requirements for the Degree of DOCTOR OF PHILOSOPHY

Major: Psychology

Approved:

Signature was redacted for privacy.

In Charge of Major Work

Signature was redacted for privacy.

For the Major Department

Signature was redacted for privacy.

For the Graduate College

Iowa State University
Ames, Iowa
1986
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CHAPTER I.
INTRODUCTION

Mental retardation has been described on the basis of presumed etiology and levels of severity for hundreds of years. Changes in definitions, terminology, and operational criteria, however, have resulted as often from shifts in public policy as from advances in knowledge (Robinson & Robinson, 1976; Scheerenberger, 1983). For at least the last century, the mild level of retardation of undetermined etiology has been the one most susceptible to change and social influence (Scheerenberger, 1983). Variations in the conception and definition of mild mental retardation have implications for research, but more importantly, for individuals who may or may not thus be eligible for special programs and services.

In 1941, Edgar A. Doll proposed a definition of mental retardation which enjoyed wide acceptance at the time and which has exerted lasting influence (Scheerenberger, 1983). According to Doll's proposal, six criteria were essential to an adequate definition of mental retardation: 1.) social incompetence, 2.) due to mental subnormality, 3.) which has been developmentally arrested, 4.) which obtains at maturity, 5.) is of constitutional origin, and 6.) is essentially incurable (Doll, 1941).

Later in the 1940s and '50s, the terms "pseudo-feebleminded," "cultural-familial," "endogenous," and "garden-variety" retarded were coined by writers to describe those persons who did not meet one or more of the criteria specified by Doll (Robinson & Robinson,
1976). The aspect of "incurability" in Doll's conception of mental retardation had been particularly challenged by the findings of follow-up studies that significant proportions of persons who had been diagnosed in childhood as mentally retarded and treated as such through institutionalization or placement in special classes had proved to be competent adults in mental, social, and economic terms (Baller, 1936; Benton, 1955; Charles, 1953; Scheerenberger, 1983). These findings suggested that either the previous classification of these persons as retarded had been in error, or there was a need for a revision in Doll's definition of mental retardation. Benton (1955) argued forcefully that the definition should be changed. "The implications of these findings are that traditional concepts of mental deficiency, to the degree that they include a specific etiology, neuropathologic basis, or course as defining terms, should be abandoned" (Benton, 1955, p. 387).

The American Association of Mental Deficiency subsequently revised the definition (Heber, 1961). This revision discarded Doll's criteria of etiology (of constitutional origin) and prognosis (obtains at maturity and is essentially incurable) and established dual criteria of subaverage intellectual functioning and impaired adaptive behavior. The construct of adaptive behavior was developed incorporating many of Doll's ideas on social competence, the most important of which was its developmental nature. At the same time, the definition of mental retardation was more operationally tied to standardized tests of intellectual functioning by the designation of
different levels of mental retardation according to standard deviation cut-off scores (IQ scores). Finally, the developmental period was defined as extending from birth to 16 years of age. Thus, those persons who exhibited subaverage general intellectual functioning, originating in the developmental period, and associated with an impairment in adaptive behavior could be classified as mentally retarded. "The individual had to be deficient on both dimensions in order to be properly diagnosed as mentally retarded although it was recognized that intelligence would continue to be the most important and heavily weighted of the criteria" (Reschly, 1982, p. 216). This practice might have been due to widespread concern about the adequacy of available measures of adaptive behavior. Nevertheless, the revised definition enjoyed wide acceptance among theoreticians and clinical practitioners alike until the latter part of the 1960s (Reschly, 1982). At that time, concerns regarding the effects of this definition as operationalized in the public schools with minority and economically disadvantaged children and youth began to surface.

A large study, primarily sociological in perspective, was conducted by Mercer in Riverside, California (Mercer, 1971; 1973). This study dealt with the process by which persons were diagnosed as mentally retarded in the community.

The major findings of the Riverside study were that public schools were by a large margin the community agency most likely to diagnose persons as mentally retarded. In comparison to
other community agencies, the school placed more reliance on the results of individual intelligence tests and used a higher IQ cutoff (79 rather than 75 or 70). Persons classified by public schools as mentally retarded were often poor, of minority status, and situationally retarded. Most were regarded as normal by their families and had not been diagnosed as retarded prior to entering the public schools. Mercer attributed these findings, particularly the overrepresentation of minorities, to the use of a higher cutoff score by the schools, the failure of the schools to assess adaptive behavior, and the biases in IQ tests (Reschly, 1982, p. 217). Mercer called for changes not only in the definition of mental retardation, but also in conventional assessment practices. These changes primarily involved placing greater emphasis on adaptive behavior. Given the widespread consensus regarding the inadequacy of available measures of adaptive behavior, this emphasis is curious in retrospect. Nevertheless, the influence of these findings may be traced in the legislation, litigation, debates on bias in assessment, and changes in the AAMD Manual in the succeeding ten years (Reschly, 1982).

The construct of adaptive behavior was further developed and its application expanded by the passage of the Education for All Handicapped Children Act of 1975 (Public Law 94-142) (Sparrow, Balla, & Cicchetti, 1984). Public Law 94-142 required that states seeking federal financial assistance for the provision of
educational services to handicapped children meet certain guidelines. The definition of mental retardation adopted in the Rules and Regulations implementing P.L. 94-142 (Federal Register, 1977) was similar to the revised AAMD definition published in 1977 (Grossman, 1977). That revision defined mental retardation as "significantly subaverage general intellectual functioning existing concurrently with deficits in adaptive behavior" (Grossman, 1977, p. 11). Adaptive behavior was defined as the "effectiveness or degree with which the individual meets the standards of personal independence and social responsibility expected of his age and cultural group" (Grossman, 1977, p. 11). For school-age children adaptive behavior was thus conceived as including sensory-motor skills, communication skills, self-help skills, soocialization and social skills (social responsiveness and social interactive skills) as well as the application of basic academic skills in daily life activities (Grossman, 1977).

Following the enactment of the federal law, most states adopted guidelines incorporating definitions similar to the AAMD definition and mandating the assessment of adaptive behavior in cases of suspected mental retardation. However, while the assessment of adaptive behavior was required, little guidance was provided to practitioners by the states as far as criteria or procedures to be used for combining adaptive behavior and IQ data in classification decisions (Patrick & Reschly, 1982). Currently, although the assessment of adaptive behavior continues to be problematic given
the scarcity of appropriate instrumentation, in standard practice, it is accorded equal weight and importance with the assessment of intelligence in the classification of mental retardation (Reschly, 1982). Therefore, in some states such as Louisiana, those students whose scores on a measure of adaptive behavior are not within the range of two standard deviations below the mean, but whose IQ scores are within that range, would not be classified as mildly mentally retarded. Furthermore, those students would not be eligible to receive federally-funded special education services.

These practices have generated considerable controversy and debate, yet the issues are far from resolved. Clearly, research bearing upon the conception, measurement, and use of adaptive behavior data in the classification of mild mental retardation is needed. One focus of interest is the degree to which learning or academic achievement should be part of the conception of adaptive behavior for school-age children. Reschly (1982; 1985) has proposed that the construct of adaptive behavior for school-age children be conceptualized as having two separate components. One component would involve academic performance in the public school setting. The other component would include social role performance in settings outside of school such as the home, neighborhood, and community.

Of particular concern are those students whose adaptive behavior in academic settings and social role performance outside of school are discrepant. These students typically exhibit a pattern
of low intelligence, low academic performance, and normal or near-normal behavior outside of school. A major continuing dilemma in the field of school psychology is whether these persons should be classified as mentally retarded and placed in special education programs. The resolution of this dilemma is further complicated by the almost inevitable overrepresentation of minority children in special education programs which such action would entail. Merely not classifying these students and denying or ignoring their educational problems is not a solution, however. There is an urgent need, therefore, for research bearing on this question.

For many years, workers in the field of mental retardation have been aware of what Zigler referred to as the "heterogeneity of phenomena included within the rubric of intellectual retardation" (Zigler, 1967, p. 292). In a discussion of the "continuing dilemma of familial mental retardation" Zigler maintained that the use of a single continuum and arbitrary cutoff scores had led to a mistaken assumption that those persons who scored below 70 on a test constituted a homogeneous group (Zigler, 1967). Educators have long observed that children from lower socioeconomic classes, regardless of ethnic background, often appeared more mature, more capable and more effective in social interactions than middle-class children who performed similarly in school subjects such as reading and arithmetic and who obtained the same low scores on a variety of intelligence tests, both verbal and non-verbal.
These anecdotal reports of social differences among children from a variety of socioeconomic and ethnic backgrounds with similar low scores on intelligence tests led Jensen and colleagues to question whether there might be other important differences, i.e., learning differences, among them. This question prompted a series of studies with these children specifically investigating their performance on "direct learning tests" (Green & Rohwer, 1971; Jensen, 1968a, 1968b, 1969a, 1970a, 1970b, 1971, 1973, 1974, 1975; Jensen & Figueroa, 1975; Jensen & Frederiksen, 1973; Jensen & Rohwer, 1968, 1970; Rapier, 1968).

The direct learning tests consisted of measures of short term memory and rote associative learning. Conceptual learning tasks were minimized. The results encouraged Jensen to propose his Level I-Level II theory of mental abilities (Jensen, 1970a, 1970b). Briefly, this theory postulates the existence of two different types of mental abilities. Level I abilities refer to associative abilities as measured on the direct learning tests of short-term memory, paired associates, and serial rote learning. The term "cognitive ability" is reserved for Level II. Level II abilities involve "mental manipulation of sensory inputs, relating them to stored memories, and generalization, abstraction, transfer, reasoning, conceptualization and problem solving" (Jensen, 1973, p. 264). The essential difference between them may best be described "in terms of the amount and complexity of 'mental' activity--called forth in the subject in the process of his responding to the
stimulus in order to learn, retain, recall, or produce the correct response to a problem" (Jensen, 1970b, p. 53).

The studies by Jensen and others (Green & Rohwer, 1971; Jensen, 1968a, 1968b, 1969a, 1970b, 1971; Jensen & Rohwer, 1968, 1970; Rapier, 1968) produced findings which showed that children of low-socioeconomic status, especially minority children, with low scores on standardized tests of intelligence (IQs ranging from 60 to 80) were generally superior to middle-class children of similar IQs in tests of Level I associative learning ability. Similar findings were obtained with subjects ranging in age from 4 to 14, from Hispanic, Black and White groups providing evidence of the same interaction between IQ and socioeconomic status (SES). "Essentially the same results have been found so consistently with various learning tasks, different age groups, and different ethnic samples that there can be little doubt that we are studying a substantial psychological phenomenon" (Jensen, 1969a, p. 25).

The interaction of rote learning ability, socioeconomic status, and IQ thus provided evidence for the existence of two different types of ability contributing to performance on intelligence tests. On the basis of this evidence and in connection with his hypotheses regarding Level I and Level II abilities, Jensen also proposed a theory of primary and secondary familial retardation (Jensen, 1970b).

Cultural-familial or familial retardation has been one of the designations used for the etiological classification of retardation
in individuals whose intellectual development has not been prejudiced by any known disease, injury, chromosomal abnormality, or genetic defect, and who appear clinically normal with no detectable signs of neurological damage, sensory defect, or physical stigmata (Robinson & Robinson, 1976). Roughly 70 to 80% of persons with scores in the mild range of retardation on standardized intelligence tests (IQ scores from 50 to 70) have been estimated to be in this category (Heber, Dever, & Conry, 1968). Current terminology refers to this category as retardation due to psychosocial disadvantage (Robinson & Robinson, 1976).

Jensen used the term "secondary retardation" to refer to a deficiency in Level II abilities and the term "primary retardation" to refer to a deficiency in Level I abilities (Jensen, 1970b). Because of the two different underlying distributions of mental abilities, theoretically there would be three ways in which a person's functioning could be characterized as retarded: (a) low on Level I, but not on Level II, (b) low on Level II, but not on Level I, and (c) low on both Level I and Level II. Jensen suggested that the differential assessment of Level I and Level II abilities could be a "step toward the more refined diagnosis of familial retardation, and it is a diagnostic approach based on a theoretical conception of the development and structure of mental abilities" (Jensen, 1970b, p. 66).

Jensen was of the opinion that persons who were of average ability in Level I processes should not be labeled retarded although
they were quite far below average in Level II abilities (Jensen, 1970b). Nevertheless, although Jensen and colleagues extensively investigated the relationships among rote learning ability, socioeconomic status, minority status, and IQ, and although social differences among children with low IQ were cited as originally prompting the studies, the relationship between Level I abilities and adaptive behavior has never been investigated. Based upon the dual dimensions of intelligence and adaptive behavior, Mercer (1973) distinguished between the "quasi-" and "comprehensively retarded." According to Mercer's distinctions the "comprehensively retarded" are those persons who are low on both dimensions whereas the "quasi-retarded" exhibit normal social role performance outside of school. Reschly (1982) has called for a more refined classification system to better distinguish between the "quasi-" and "comprehensively retarded." The present study, therefore, proposed to utilize the differential assessment of Level I and Level II abilities offered by Jensen to investigate the current criteria for the classification of mild mental retardation in a population previously evaluated according to the dual dimensions as operationally defined in the public schools. One question addressed by this study was to what extent performance on Level I learning tasks was associated with the variables of IQ, adaptive behavior, socioeconomic status, and race. Another question addressed by the present study was whether there was a relationship between these variables and teachers' ratings of student's social skills in the
school setting. On the basis of Jensen's theory of primary and secondary retardation, it was hypothesized that higher adaptive behavior scores would be associated with better performance on Level I tasks. It was also expected that those students with higher adaptive behavior scores would exhibit better social skills in the school setting. Thus, it was predicted that those students whom Mercer would characterize as "quasi-retarded" would perform better on the Level I learning tasks and would be rated by their teachers as having better social skills in school.
CHAPTER II.

REVIEW OF LITERATURE

This section reviews the literature on the relationship between intelligence (IQ) tests and measures of learning or memory. Early studies with normal subjects as well as studies with mentally retarded subjects are reviewed. The racial and social class correlates of this relationship have also been investigated. The results of these studies led Jensen (1970a) to propose his Level I-Level II theory of mental abilities. The major aspects of this theory are summarized including the relationships of Levels I and II to intelligence tests and socioeconomic status. Later studies in support as well as criticism of Jensen's theory are reviewed. On the basis of his theory of Level I and Level II abilities, Jensen proposed a theory of primary and secondary retardation. This theory is reviewed to provide a context for the current study investigating the relationship of intelligence (IQ), race, socioeconomic status, and adaptive behavior to measures of learning and social skills.

Introduction

The nature of the connection between learning and intelligence has puzzled psychologists since James McKean Cattell and Alfred Binet developed such different mental tests. Cattell, following Galton's lead in attempting to measure individual differences in ability coined the term "mental test" to describe his battery of laboratory measures of sensory functions, reaction time, and memory. Binet, in response to the need for objective procedures to identify
those children unable to profit from instruction in regular French public schools, developed a different type of mental test with tasks such as the naming of objects, the defining of words, and the demonstration of comprehension and aesthetic appreciation. Binet emphasized a sample of different functions, but like Cattell, he also included such tasks as memory span for digits and for sentences (Brody & Brody, 1976). Binet's test became a standard for intelligence or IQ tests with its brief measures using items of age-related difficulty administered and scored according to standardized procedures.

**Early studies of the relationship between learning and intelligence tests**

Almost from the date of its translation and introduction in this country, Binet's test attracted the attention of experimental psychologists trying to determine whether laboratory measures of learning and memory had any relationship with Binet's test results (Ornstein, 1978; Rapier, 1962). Ornstein (1978) cited studies as early as 1915 directed toward studying the relationship of memory span and intelligence. Rapier (1962) reviewed studies dating from 1921. The studies reviewed employed a variety of learning tasks including those of color-naming, typewriting, digit symbols, paired-associates, and even the acquisition of Turkish-English vocabulary (Rapier, 1962). Learning was measured in one of two ways. The most frequent was the use of a gain score which was obtained by subtracting the initial score from the final score to
measure improvement. The second measure of learning used was total scores either from continuous one trial learning or from a number of trials. When these measures were used, the number of trials or errors made to a criterion were totaled and correlated with the intelligence test scores (Rapier, 1962).

The first method—the gain score—provided a measure of the amount of improvement with practice, but it presented problems in analysis, particularly in the calculation of reliability. The second method could be compared to an achievement score in learning. The use of this method permitted a more accurate measure of performance and greater reliability (Rapier, 1962).

Intelligence was usually measured by individual or group tests using a deviation IQ or mental age score. The studies yielded uniformly low correlations of intelligence with a variety of learning tasks. Little evidence was found of a general learning ability in that the correlations among a number of learning tasks, while usually positive, were very low (average correlation .10) (Rapier, 1962). Thus, no general factor explaining the rate of improvement in different tasks could be identified.

A typical study described by Rapier (1962) showed a lack of relation between gain score and the intelligence score even when the intelligence score was positively related with the initial and final learning score. Increasing the number of learning measures produced a rise in the correlation, but not enough to make an appreciable difference in the conclusions stated above.
The use of learning tests was considered by many to be a fairer and more direct method of determining capacity for improvement rather than inferring that capacity from a general ability test. Some investigations, however, also attributed gains on learning tasks to non-intellective factors such as interest, motivation, study habits, and personality traits (Rapier, 1962). The early research described by Rapier (1962) was criticized on the basis of restricted sampling, unreliability of measurement, inconsistencies and distortions in measures of learning, lack of a representative sample of learning tests, the effect of pre-experimental practice, as well as the effects of motivation and other factors which were impossible to control. Most of the early studies were carried out with college students as subjects. The use of small numbers of subjects also contributed to the charge of restricted sampling.

In the early studies, the reliability coefficients were not cited for many of the learning tests. Also the problem of the lack of reliability of gain scores contributed to the low correlation with intelligence test scores. Studies were also criticized for inconsistency and distortions in measures of learning. The same measures of learning were not always used. Some studies used gain scores; others used total practice. The number of trials were not held constant. Additionally, gain scores could produce distortions by penalizing the initially brighter subjects by not providing enough ceiling for improvement. Another criticism of the early studies pointed to a lack of representative sample of learning tests.
as far as their content and degree of complexity. However, no one could specify what a representative sample should contain. The factors of the effects of pre-experimental practice, the amount of transfer, and the differences in motivation and other non-intellective factors were identified. Variations in the number of practice trials and the amount of transfer of previous learning created differential effects. Differences in motivation and other subject variables had not been controlled.

Some researchers attempted to design experiments which corrected the faults of the early studies except for those of pre-experimental practice, the amount of transfer, and motivation, which they were unable to control. No significant differences in the results of these studies were obtained. The correlations between tests of learning and intelligence remained low (Rapier, 1962).

Woodrow (1946) summarized the results of the studies showing a lack of correlation between intelligence test scores and learning as measured by gains due to practice, although intelligence scores were positively correlated with achievement at different stages of practice. According to Woodrow, measures of learning in the laboratory and in school did not support a belief in the inherent relationship between intelligence and learning. Woodrow thus argued that intelligence tests measured achievement rather than the ability to gain with practice or ability to learn. Achievement, according to Woodrow, was partly due to maturational, hereditary, and
motivational factors and, therefore, could never be attributed solely to learning. After the publication of Woodrow's conclusions, research interest in this topic waned with the methodological problems also contributing to the unpopularity of the topic.

Studies with mentally retarded subjects

While research activity essentially halted with normal subjects, attention shifted to the measurement of learning ability among mentally retarded individuals. Rapier (1962) credited a review by McPherson (1948) with stimulating interest in studies of verbal learning, perceptual-motor learning, and problem solving with mentally retarded subjects. Normal subjects were sometimes used for comparisons. According to Rapier (1962), McPherson raised the question whether the available experimental evidence supported the hypothesis that individuals with sub-normal scores on intelligence tests could not learn as rapidly or with such a degree of complexity as individuals who scored in the normal range. "The weight of the limited evidence, as it stands, points to a lack of covariance of intellectual status and learning behavior. Reasons for this may lie in the actual lack of any such relationship above a minimum intellectual level, or in the obliteration of the real relationship by the present experimental methodology" (McPherson as quoted by Rapier, 1962, p. 11).

In these studies with mentally retarded populations, once again gain scores did not correlate with mental age or IQ. Once again, methodological weaknesses were purported to explain the lack of
correlation. But some writers were also beginning to suggest that the lack of relationship was an effect of individual differences in learning rather than a methodological artifact (Rapier, 1962).

Jensen (1963) compared the learning ability of retarded, average, and gifted children. The most impressive feature of the results was the within-group variability in the retarded group. The retarded group had the greatest variability in their learning scores. The gifted group had the least.

The index scores of the fast and slow learners in the retarded group were compared. The retarded group showed a surprising degree of heterogeneity in that the mean of the fast learners in the retarded group was above the mean of the gifted group on all of the tests. The two fastest learners in the study had scores on the Stanford Binet of 147 and 65.

No subject in the average group had a score as low as the mean of the retarded group, but some of the subjects in the retarded group were above the mean of the gifted group.

Reviewing the literature on retardate-normal performance on serial and paired-associate rote learning tasks, Jensen identified those variables which had been hypothesized to account for the failure to find significant differences in the performance of retarded and normal subjects matched on mental age. Those variables were: (a) lack of a sufficient difference in IQ in that most studies had used retarded subjects in the IQ range of 70 to 80; (b) the pacing of the learning tasks had been too fast to permit normal
subjects to use verbal mediation or other cognitive processes which would distinguish them from retardates; and (c) the use of nonsense syllables in the task did not arouse facilitating verbal mediators in the normal subjects.

Jensen (1965) designed a study which attempted to incorporate some of these variables in comparing retardate and normal performance on serial and paired-associate tasks. The mean IQ of the retarded subjects in this study was 58. The average for the normal subjects was 105. These tasks were subject-paced and compared the performance of the subjects on a task using meaningful stimuli under conditions of non-mediation and experimenter-given mediation. The subjects in this study (Jensen, 1965) were 40 normal young children from a public elementary school and 40 retarded young adults from a large state institution. No retardates with signs of emotional instability, sensorimotor handicaps, or gross motor speech defects were included. The groups were matched on mental age, but not on IQ or chronological age. The two groups did not differ significantly on mental age. Within each group the subjects were ranked on IQ and then randomly assigned to one of four experimental conditions by Task (serial vs. paired-associate) and by Instructions (mediation vs. non-mediation). The paired-associate list consisted of 8 pairs of pictures. The serial list consisted of the 8 response terms of the PA list. In the non-mediation condition, the subject was asked on the first trial to name the stimulus and response terms of the serial or PA list and thereafter to supply the subsequent
items according to the usual methods of presenting these tasks. In the mediation condition, however, the subject was supplied with phrases as a mediating context by the experimenter. The phrases used were the same for all subjects and consisted of simple sentences made from the stimulus and response terms of the PA list or each successive pair of items in the serial list. The mediating sentence was said aloud by the experimenter (E) only on the first presentation of the list. The subject was not allowed to say the mediating sentences aloud after the third trial.

All subjects received 20 trials. The tasks were S-paced, and the E recorded the total time and errors for the 20 trials. Because the normal subjects were very fast learners, particularly under the mediation condition, the task was discontinued after the S had completed 10 errorless trials. The total time for 20 trials was then prorated for these subjects. The time scores were not considered good measures due to these prorated time scores and to the fact that the tasks were S-paced. The error scores were analyzed in an analysis of variance. The results revealed that the normal subjects were significantly superior to retardates in all four conditions. Paired-associate learning was facilitated by verbal mediation for both retarded and normal subjects but mediation did not facilitate serial learning for either group. For both groups, the non-mediated PA task was more difficult than the corresponding serial task, but the serial task was more difficult than the PA task in the mediated condition. The heterogeneity of
the learning ability of the retarded subjects was again noteworthy. In every condition, the standard deviations were significantly greater for the retarded than for the normal groups. The MA scores had been selected for their homogeneity. The mediation condition in paired-associate learning greatly decreased the heterogeneity, while the opposite was the case for serial learning.

**Racial and social class correlates**

After 1968, the major thrust of Jensen's research program was the investigation of the racial and social class correlates of the relationship between learning and intelligence (Jensen, 1968a, 1968b, 1969a, 1969b, 1970b, 1971, 1973, 1974, 1975; Jensen & Figueroa, 1975; Jensen & Frederiksen, 1973; Jensen and Rohwer, 1968; Rapier, 1968; Rohwer & Lynch, 1968; Rohwer, Lynch, Levin & Suzuki, 1968; Green & Rohwer, 1971; Rohwer, 1971). Jensen (1968a, 1969a, 1970b) summarized the results of a number of early studies as showing an interaction between learning ability as measured by serial and paired-associates tasks, selective trial and error learning, and free recall, intelligence as measured by an IQ score, and socioeconomic status (SES). The essential finding was that the learning tests clearly differentiated between high and low IQs within groups of middle- and upper-SES children, but in groups of low-SES children, the learning tests did not differentiate markedly between high and low IQs.

The learning test scores correlated with IQ scores among middle-SES children about as well as IQ tests correlate in this
group—in the range of .60 to .80. In other words, learning tests could substitute for IQ tests with this group. In the low-SES group, however, the correlations between learning tests and IQ were in the range of .10 to .20 (Jensen, 1969a). Jensen apparently ruled out the psychometric artifacts of SES differences in the variances of the learning or the IQ tests and thus differences in reliability, but these statistics were not reported. The most striking findings, however, were that in groups of children of middle- and low-socioeconomic status carefully matched on IQ, the middle-SES groups were invariably poorer on the tasks of learning ability (Jensen, 1968a; Jensen & Rohwer, 1968; Rohwer & Lynch, 1968; Rohwer, Lynch, Levin, & Suzuki, 1968).

Rapier (1968) compared serial and paired-associate learning of non-institutionalized retarded and normal children from different social classes. The subjects were 80 white children (males and females) ranging in age from 91 to 154 months equally representing upper- and lower-socioeconomic classes in California public elementary schools. Socioeconomic status (SES) was determined by father's occupation and education. The subjects also were divided according to two IQ levels in each SES group. The normal IQ group was selected on the basis of a score of 100-110 on a group test (the Kuhlman-Anderson Intelligence Test) and on average achievement for grade placement on the Stanford Achievement Test. The retarded IQ group was selected on the basis of a score of 63-78 on the Stanford-Binet Intelligence Test (an individual test) and placement
in a special class. Although different tests were used, one could be reasonably confident, for example, that the scores of the normal group would have been comparable if they had been tested individually. Additionally, the Peabody Picture Vocabulary Test was administered to all subjects. There was a significant difference between the high-SES and the low-SES groups on this test.

The subjects were divided into four groups with a ratio of 15 boys to 5 girls maintained approximately in each group. The groups were: High-SES normal IQ; Low-SES normal IQ; High-SES retarded IQ; and Low-SES retarded IQ. Mean chronological age (CA), mental age (MA), and IQ were quite comparable for the two SES levels in the retarded and normal groups. For the retarded group, the mean CA was roughly 124 months; mean MA was 8-7; and mean IQ was 70. The subjects were tested individually. The criterion of learning for all tasks was eight out of nine correct responses on any one trial. All tasks were subject-paced. A total of 15 trials was administered.

The data were collected on three different days. On the first day, all subjects were given a serial learning task and a paired-associate task. The order was counterbalanced for fatigue and practice effects. A different serial order was used for each subject, but the same 20 orders were repeated for each group. The order of the paired-associate pairs was changed from trial to trial by shuffling the cards between trials. The serial task consisted of 9 black and white pictures of common objects from a preprimer
workbook mounted on 4x4-inch cards. The paired-associate task consisted of nine pairs of pictures such as those just described mounted on 5x5-inch cards. On one side, there was a single picture, and on the other side there was the picture paired with the stimulus picture. Obvious associations or relations between picture were avoided.

In a second testing session, the following day, the subjects were assigned to an experimental group and a control group. Both groups learned a new paired-associates list. The experimental group did so with instruction in the use of verbal mediators (mediation) while the control group did not receive any instruction (nonmediation). There was a significant effect for mediation in the results. Mediation reduced trials to criterion, but the effect was not the same for all groups. Both ability groups improved under the mediation condition, but the normal group profited more. Thus, the IQ x instructions interaction was significant. Furthermore, the SES x IQ interaction was significant revealing that high-SES normals and retardates differed greatly in performance, but the low-SES retardates were not so different from low-SES normals in their performance. Further, there was a significant SES x IQ x Treatment interaction. The high-SES retardeds' performance was noticeably different from the other three groups. The low-SES retarded group did not appear to have performed appreciably differently from the two normal groups.
On Day 3, all subjects learned a third paired-associate list under the same non-mediation condition. The results revealed no significant difference between the groups who had received instruction in verbal mediation in the second session and those who had not. The normal group performed significantly better than the retarded group, and the low-SES group was significantly better than the high-SES group. There was a significant SES x IQ interaction in that the low-SES retarded group required significantly fewer trials to reach criterion than the high-SES retarded group. The high-SES retarded group took twice as many trials to reach criterion as the other groups. The low-SES retarded group did not differ appreciably from the normal groups in performance.

Intercorrelations among MA, IQ, and learning tasks were calculated. The correlations were significant between IQ and learning tasks for the high-SES groups, but not for the low-SES groups.

According to Rapier (1968), the most significant findings from this study were that there was a difference in the learning ability of high-SES and low-SES retardates and that the IQ score was thus a better predictor of learning ability in high- than in low-SES groups. The mediation facilitated the paired-associate learning, with the normal group maintaining their superiority, but the low-SES retardates appeared to benefit most from the mediation condition.

Jensen (1968b) reported further evidence of an interaction between learning, IQ, and SES utilizing a digit span measure with a

The results of these investigations led Jensen to propose his hypothesis concerning Level I and Level II abilities in order to account for consistent findings of substantial differences on a variety of learning tests among groups differing in socioeconomic status.

Level I–Level II theory of mental abilities

A discussion of Jensen's theory must first be placed in the context of another theory of intelligence, the two-factor theory of Spearman. Spearman, according to Jensen (1980), was the first to discover that all measurements of individual differences in complex mental performances were positively intercorrelated to which he gave the label of "g" for general factor. Utilizing methods of factor analysis which he developed, Spearman measured the extent to which any given mental test correlated with "g" or the general factor. Spearman concluded that the "observed facts indicate that all branches of intellectual activity have in common one fundamental function (or group of functions) (the general or "g" factor), whereas the remaining of specific elements of the activity (the specific or "s" factors) seem in every case to be wholly different from that in all others" (Robinson & Robinson, 1976, p. 8). Spearman characterized "g" as the "combination of noegenesis with abstractness" (Jensen, 1980, p. 229). Noegenesis referred to Spearman's definition of intelligence as the process required for
the "education of relations and correlates" (Jensen, 1980, p. 229). This education was to be contrasted with reproductive or rule-applying behavior. The term abstractness referred to ideas, relationships, and concepts in contrast to properties that could be directly perceived by the senses. Thus, the most highly "g-loaded" tests were those requiring both noegenesis and abstractness (Jensen, 1980).

The genesis of Jensen's theory of Level I and Level II abilities may be traced to Spearman's "g". It is Jensen's contention that cognitive tasks can be placed along a continuum according to the degree of processing, transformation, or elaboration of the informational input required. At one end of the continuum, the stimulus-response correspondence is relatively simple and direct. One hypothetical ordering suggested by Jensen was: "simple reaction time, Pavlovian conditioning, instrumental conditioning, complex reaction time, pursuit-rotor learning, discrimination learning, immediate memory span for digits (forward), immediate memory span for digits (backward), memory span for digits after a brief delay, verbal analogies, arithmetic 'thought' problems, Raven's Progressive Matrices" (Jensen, 1970b, p. 52). Jensen posited, however, that the continuum reflected two different types of abilities. Level I ability referred to an associative ability. It involved the "simple registration, storage, and recall of sensory inputs and is most prominent in short-term memory and rote learning. Individual differences in Level I ability have been
measured by short-term memory, such as digit span, and by paired
associate and serial rote learning, free recall of random familiar
objects, pictures, or words, and trial-and-error selective learning" (Jensen, 1973, p. 264). Level II ability was referred to as "cognitive" ability (Jensen, 1970a, p. 53). "Level II involves mental manipulation of sensory inputs, relating them to stored memories, and generalization, abstraction, transfer, reasoning, conceptualization, and problem solving. It is much like Spearman's "g". Individual differences in Level II ability have been measured by standard tests of intelligence, especially tests of fluid intelligence, and by experimental conceptual learning tasks" (Jensen, 1973, p. 264). Arranging the aforementioned cognitive tasks along a Level I-Level II continuum "would also correspond closely to their arrangement along the continuum of 'g' loadings in the Spearman sense" (Jensen, 1980, p. 549).

Jensen's theory, thus, not only distinguishes between two broad classes of abilities, but also between the tasks used to measure them. Rote learning and short-term memory abilities are represented by tests such as digit-span and tasks such as serial and paired-associate learning on the Level I pole. "Level I involves the registration and consolidation of stimulus inputs and the formation of simple associations. There is little transformation of the input and thus a high degree of correspondence between the form of the stimulus input and the form of the response output" (Jensen, 1980, p. 549). Reasoning, problem-solving, and the use of concepts as
measured by tests of general intelligence "and especially verbal and
figural analogies, number series, and progressive matrices" (Jensen,
1980, p. 549) constitute Level II. Level II ability "involves
self-initiated elaboration and transformation in the stimulus input
before it eventuates in an overt response. The person must
consciously manipulate the input to arrive at the correct output.
Thus, the crucial distinction between Levels I and II involves a
difference in the complexity of the transformations and mental
manipulations required between the presentation of a given mental
task to the person and his or her end response to it" (Jensen, 1980,
p. 549).

Jensen suggested that Level I and Level II ability stood in a
hierarchical relationship with one another (Jensen, 1970b). In this
suggestion, Jensen reflected the beliefs of British psychologists
such as Burt and Vernon in a hierarchical structure of mental
abilities (Das, 1973). In their hierarchies, reasoning and
abstraction were always placed above memory (Das, 1973). Jensen's
conceptualization of Level I and Level II ability also bore a
resemblance to White's hierarchical arrangement of learning
processes in associative and cognitive levels (White, 1965). White
suggested that data on temporal contingencies in discrimination
learning and various documented shifts in children's behavior in the
age period from 5 to 7 might offer a model of the structure of adult
mental processes. According to White, "Adults may have available an
'associative level,' laid down early in development, relatively fast
acting, followed (sic) conventional associative principles, and in
the normal adult relatively often existing as a potential, but
inhibited, determinant of behavior. The 'cognitive layer', laid
down after the associative mode of response, is taken to be
relatively slower in action and to process information in ways which
are only beginning to be understood" (White, 1965, pp. 215-216).

Jensen further proposed that the hierarchical relationship
represented a functional relationship. The development of Level II
ability as well as Level II performance, was seen as having a
functional dependence on Level I ability, but the reverse was not
postulated. For example, performance on a test such as digit-span
memory, considered a relatively pure Level I test was not seen as
depending upon the processes of abstraction, generalization, and
conceptualization that are called for in Level II tests. In other
words, Level I is necessary but not sufficient for the development
and operation of Level II ability. A consequence of this
hierarchical formulation would be that one would seldom, if ever,
find individuals with very high Level II ability who have very low
Level I ability. The reverse, however, would not be uncommon, that
is, persons with high Level I ability but low Level II ability.

Level I and Level II abilities are theoretically distinct, but
practically no test or task is completely pure. Indeed, different
tests may have different loadings on each level. Measures of Level
I and Level II functions may thus be correlated in a given
population because (a) assortative mating tends to produce
individuals high or low in both abilities although essentially independent genetic factors are believed by Jensen to determine individual differences in Level I and Level II, (b) the functional dependence of Level II processes on Level I implies that some threshold amount of Level I ability may have to develop before Level II functions, (c) the speed and thoroughness of the acquisition of certain prerequisite skills involved in Level II ability depend on Level I (Jensen, 1970b; Robinson & Robinson, 1976). Thus, although individual differences in Levels I and II may be correlated, these correlations do not reflect the existence of the same underlying structures or processes. Rather these levels are viewed as existing concurrently, but being qualitatively different (Jensen, 1970b).

Levels I and II are viewed as having different developmental rates. Level I abilities are hypothesized to rapidly approach their asymptote in childhood and soon level off whereas Level II abilities increase more slowly throughout childhood and into early adulthood. **Relationship of Levels I and II to intelligence tests**

Most standard intelligence tests are made up of tasks that are mixtures of Level I and Level II functions. "The net effect is that these tests order individuals along a general crude continuum of intellectual ability, somewhat more heavily weighted with Level II ability, but without making any clear distinction between individuals' relative strength or weakness in Level I and in Level II" (Jensen, 1970b, p. 55).
The measurement of Level I and Level II abilities was thus intended as a refinement on the relationship between psychometric intelligence and basic learning abilities, particularly with reference to the interpretation of the differences in the distribution of IQ scores as a function of SES. Threats to the validity of IQ scores of economically disadvantaged children have included allegations of cultural bias in the test items on the basis of equal opportunity for familiarity with the item content and the common observation that low-SES children with low IQs appeared brighter in some ways than middle-class children of the same IQ. According to Jensen, the theory of Level I and Level II abilities served to localize the nature of the intellectual deficit of disadvantaged children. Further, Jensen suggested that two dimensions were necessary for explaining social-class differences in performance on tests of intelligence, learning ability, and scholastic achievement. These dimensions were cultural loading and complexity of learning tasks (Jensen, 1969a, 1969b, 1970a, 1970b).

**The relationship of socioeconomic status to Levels I and II**

Individual differences in Level I and Level II abilities were hypothesized to have different distributions as a function of socioeconomic status (SES).

In answer to the question as to why Level I was hypothesized as having little, if any, relationship to SES, Jensen referred to the occupational and educational indices of SES. Educational attainments under traditional methods of instruction were heavily
dependent on Level II abilities which influenced one's occupational choice and success. "Level I abilities, however, are required to succeed in many manual occupations, and others' perception of the individual's 'wits' is based largely on his Level I ability when indices of scholastic attainments are lacking, are not valued, or are more or less uniformly meager among members of the group" (Jensen, 1970b, p. 59).

The major portion of this discussion of Jensen's theory has been summarized from his articles published in 1970 (Jensen, 1970a, 1970b). These papers represent his most extensive and detailed exposition of the theory. Since 1970, much of Jensen's research has been devoted to determining the population parameters of the theory. The theory, itself, has remained largely unchanged (Jarman, 1978).

Later studies in support

Jensen (1971, 1973, 1974) reported on large-scale studies conducted in California school districts. Jensen (1973) analyzed the same data set as in the 1971 article, but he employed a different method of factor analysis. In this study, an oblique rotation using the promax method was utilized rather than an orthogonal rotation using a varimax rotation. The socioeconomic status variables were not analyzed.

A total of 6,619 children comprised the sample of kindergarten through the eighth grade. The sample was not in proportion to the population in that there were 2,453 Anglo, 2,263 Hispanic, and 1,853 Black. Approximately equal numbers were selected at each grade.
A comprehensive battery of measures was administered. Those measures characterized as ability tests included the Lorge-Thorndike Intelligence Test, the Gesell Figure Copying Test, Raven's Progressive Matrices, a listening attention test, and a memory for numbers test. Measures characterized as motivational and personality tests were a speed and persistence test, the Eysenck Personality Inventory-Junior, and a student self-concept inventory. Home background variables were assessed on the Home Index—a home environment questionnaire. Scholastic achievement in spelling, reading comprehension, language, and mathematics was measured by the Stanford Achievement Tests.

An oblique rotation yields correlated factors as opposed to the uncorrelated, "pure" factors from an orthogonal rotation. On the basis of the 1973 analysis of the data, three factors emerged. Jensen labeled two of them as fluid and crystallized intelligence (Cattell, 1971) representing two aspects of a general intelligence factor. Jensen regarded these two factors also as types of Level II ability. The third factor was labeled memory and designated to correspond to Level I ability.

Mean factor scores were computed and compared for grades 4, 5, and 6. An analysis of variance was then performed within each grade level. The main effects for ethnic groups and for the interaction of groups and abilities were significant beyond p < .001.

The pattern of the factor scores for the three ethnic groups was extraordinarily similar in every grade. The familiar
interaction also was found. In these results, however, Jensen emphasized the ethnic group differences as opposed to the SES differences. The white groups scored substantially higher than both the black and Hispanic groups on the crystallized factor. The whites and blacks were even further apart on the fluid factor with Hispanics in between. On the memory factor, however, blacks exceeded Hispanics and were somewhat below whites. Jensen (1973) interpreted these results to indicate that Level II abilities (the fluid and crystallized factors) "show much greater ethnic group differences (particularly white-Negro differences) than is found on Level I ability, in which the white and Negro groups come especially close together" (Jensen, 1973, p. 269).

On the basis of the Hispanic results, Jensen concluded that the hypothesis of Level I-Level II interaction applied more to racial differences than to an SES difference. The Hispanics were the most disadvantaged according to a number of SES criteria, but their scores on the three factors followed the same pattern as the white scores at a lower score level. The pattern was altered by the black group, however.

Jensen tested the hypothesis that the pattern of abilities for the three ethnic groups was attributable more to SES than to ethnicity. First, the variance associated with the SES variables in the data set was partialled out of the matrix of intercorrelations. Second, the principal components were orthogonally rotated as in Jensen (1971). According to Jensen, this permitted an examination
of group differences on each factor independently of their differences on the other two.

Scheffe contrasts following an analysis of variance of the factor scores showed no significant differences between whites and Hispanics on the fluid factor and none between blacks and whites on the memory factor. Jensen's reasoning, then, was that if the fluid factor were accepted as a more culture-free measure of Level II, "it would appear that the Mexican group differs hardly at all from the white group with respect to the hypothesis, despite the fact that it differs most in cultural and SES background. Thus the interaction of Level I-Level II with population groups must be regarded as mainly a difference between whites and Negroes, rather than a difference in SES" (Jensen, 1973, p. 270).

Jensen (1974) continued the use of the factor score methodology instead of the 2 x 2 analysis of variance design of the earlier studies which had been criticized (Humphreys & Dachler, 1969a). This article was the first to proclaim its data openly as a test of the Level I-Level II theory of mental abilities" (Jensen, 1974, p. 99). It was also billed as Jensen's first test with a total school population rather than with selected samples from the population.

The hypotheses were stated in terms of the terminology and methodology of regression. Three hypotheses were proposed to test the Level I-Level II theory. These were (a) social classes differ in Level II ability but not in Level I ability, (b) the regression of Level I upon Level II ability is greater (or the slope of the
regression line is steeper) in upper- and middle-socioeconomic-status populations than in low-socioeconomic-status populations, and (c) Level I and Level II abilities stand in a hierarchical relationship such that Level I is necessary but not sufficient for the development and function of Level II. The latter would be inferred if there were a larger dispersion of Level II scores in the lower range of Level I scores than in the higher range.

The subjects participating in the 1974 study consisted of virtually all of the white (n=1,489) and black (n=1,123) children enrolled in regular fourth, fifth, and sixth grade classes in the Berkeley Unified School District of Berkeley, California. The measures administered were a listening attention test and a speed and persistence test to rule out attentional and motivational factors. The Level I measure was Jensen's Memory for Numbers test. The Level II measure was the Lorge-Thorndike, a group-administered test of general intelligence yielding verbal and non-verbal scores. The Memory for Numbers test which was also group-administered, had three parts. Each part consisted of 6 series of digits ranging from 4 digits to 9 digits in a series. The digit series were presented by tape recording at the rate of approximately one digit per second. At the end of each series signaled by a bong, the subjects were instructed to write down as many digits as they could recall. Each part was preceded by a short practice test with three digits to familiarize the subjects with the procedures of each of the three subjects. The first subtest required the subject to recall the
series immediately. The second subtest required the subject to recall the series after a delay of 10 seconds. The third subtest was a repeated series test in which the series was presented three times prior to requiring the subject to recall the series immediately. Thus, the measure of Level I in this study was restricted to a measure of digit span, albeit three different forms of the task.

A questionnaire was sent home for every subject to obtain recent information as to parent occupation and education. School records supplemented the data obtained from the questionnaire. The size of the sample for socioeconomic status analysis was reduced by the percentage of non-returns of the questionnaire and inadequate responses on the questions. Further, this sample was self-selected due to answering the questionnaire. Parental occupations were coded into three categories within each racial group. The means of the socioeconomic samples were not significantly different from the total population values suggesting that the subjects who were classified according to socioeconomic status were fairly representative. However, the whites and blacks were not perfectly matched for occupations within the three broad categories of High, Middle, and Low.

The results of the control tests revealed no significant differences between the black and white groups of any grade. On the speed and persistence test, however, the blacks scored significantly higher than the white group in all three grades. The relation
between the control tests and the Lorge-Thorndike was non-significant in both racial groups.

Although Jensen stated his hypotheses in terms of social class differences, he discussed the results first in terms of racial differences. There were highly significant differences between the black and white groups on both the Level I and Level II tests. Although the difference between the groups on the intelligence tests was more than twice the difference on the memory tests, this result did not support a hypothesis of no differences on Level I ability.

According to Jensen, a second hypothesis would be that the slope of the regression line of Level I (memory) scores upon Level II (intelligence) scores would be steeper in the white group than in the black group, or in other words, the correlation would be higher in the white group than in the black group. This hypothesis was strongly supported.

Jensen interpreted the result of the regression of intelligence scores upon memory as consistent with the hypothesis that Level I is necessary but not sufficient for the development and functioning of Level II. The slopes for the regression lines were parallel and separated by approximately 1.6 sigmas. As Jensen saw it, "In other words, it appears that if subjects have the intelligence, they have the memory; while if they have the memory, they do not necessarily have the intelligence" (Jensen, 1974, p. 109). This prediction was borne out more by the non-verbal as opposed to the verbal tests, however. Jensen called for further study on this point.
Jensen then examined the differences in performance according to socioeconomic differences within each racial group. Within both racial groups, the high-low socioeconomic-status difference was almost twice as great for the intelligence tests as for the memory tests. Jensen claimed that the data were in accord with the direction of his prediction but his prediction was not supported. Neither did the data support his contention of higher correlations between Level I and Level II measures in upper- than in lower-SES groups, although the black group showed a trend in that respect.

The 15 possible contrasts of regression coefficients within and between levels of socioeconomic status and racial groups were tested for significance. Only three tests were significant beyond the p <.05 level using two-tailed tests. All involved the non-verbal test and the low-socioeconomic-status-black group. "The difference in regressions, therefore, appears to involve race more than socioeconomic status, or a combination of race and socio-economic status effects, since the low-socioeconomic-status black group is undoubtedly somewhat below the low-socioeconomic status white group in socioeconomic status. The regressions of the high- and middle-socioeconomic-status-black groups do not differ significantly from those of the white group" (Jensen, 1974, p. 109).

Jensen and Frederiksen (1973) investigated racial differences only on a task of free recall of categorized and uncategorized lists. The previous studies had utilized the associative learning tasks of memory span, serial, and paired-associate learning. The
task of free recall had not yet been utilized as a measure of Level I ability. Jensen and Frederiksen went further and made a distinction between Level I and Level II ability within the same task, free recall. Level I ability was operationalized as uncategorized lists; Level II as categorized lists.

The confounding of race and socioeconomic status was clearly acknowledged in the sample. The rationale was that their interest was in studying Level I-Level II differences in samples typical of population groups of current national concern.

Ten white and ten black children from each of two grades (2nd and 4th) were randomly assigned to one of three conditions: (a) an uncategorized list, (b) a random categorized list, and (c) a block-categorized list. Each subject received only one list.

The lists were presented as objects. Each object was removed after it was presented. When all 20 items had been presented, each subject was given 90 seconds to recall all of the objects he could. Five trials were given. The blocked categorized and the random categorized lists consisted of the same items in four categories: clothing, tableware, furniture, and animals. In the random condition, the objects were presented in a different random order on each trial. The items on the blocked list were always presented in categories, but the order of the categories and the order within the categories were varied on each trial.

According to Jensen and Frederiksen, statisticians had "assured" them that a factorial analysis of variance model was
inappropriate for the variables and hypotheses of this study. Thus, a nested design with race nested in grades and treatments was utilized. The number of items recalled on the five trials were treated as repeated measures and analyzed by multivariate analysis.

The results were significant for treatment, race, and grade, but of main interest were the race and grade comparisons within treatments. In the uncategorized condition, the black and white students did not differ significantly in their performance in either grade. This finding was interpreted as supporting the hypothesis that the uncategorized list represented a Level I task showing little difference between black and white groups. There is a difference, however, between second and fourth grades across groups. Jensen and Frederiksen interpreted this finding as consistent with growth in Level I ability.

The two grades did not differ on the categorized list, however. The white group showed an increase in performance as expected with increasing age, but the black group did not. The white and black groups did not differ in grade 2, but there was a significant difference in grade 4. Jensen and Frederiksen interpreted this finding as suggesting that the black groups learned these two lists in the same way, i.e., through the use of Level I ability. At the same time, they acknowledged that actually there was no way of adequately comparing the difficulty of the two lists in Level I learning. In the blocked condition, there was no difference in
grade 2 or grade 4. While the blocking appeared to facilitate black performance more than white, the effect fell short of significance.

The results were interpreted as supporting the hypotheses that black and white (or low and middle socioeconomic status) groups would not differ on the Level I task (uncategorized list). Support was also found for the hypothesis that a small difference would be found in the younger group and a larger difference would be found in the older group on the Level II task (categorized list). The blocking condition was used to test whether Level II processes could be evoked. The mention of Level II processes as involved in a memory task leaves Jensen open to criticism regarding the original distinction that he made regarding Level I and Level II abilities (Jarman, 1978).

The same criticism could also be made of the study by Jensen and Figueroa (1975). The digit span task was reputed by Jensen to be the "purest" measure of Level I, with backward digit span a "less pure" measure (Jensen, 1970a). In 1975, Jensen hypothesized that backward digit span depended upon "the Level I ability involved in forward digit span, but also includes a small but essential element of Level II-transformation of the input prior to the output" (Jensen & Figueroa, 1975, p. 883). The hypotheses were that Backward Digit Span (BDS) would be more highly correlated with IQ than Forward Digit Span (FDS), that the mean black-white differences would be greater on BDS than FDS, that FDS and BDS interact with
chronological age in such a way that the difference between the two
decreases with age, that there would be a greater black-white
difference between FDS and BDS with increasing age and finally, that
there would be an overall Race x Age interaction.

The results analyzed were from a large sample of black and
white children from the ages of 5 to 15. There were 669 white
children and 622 black children. Analyzed was their performance on
the forward and backward digit span tests of the Wechsler
Intelligence Scale for Children-Revised. All of the hypotheses
except for the last two were supported. While the results of this
study were in accordance with the hypotheses generated from Jensen's
theory, the original distinctions which Jensen had made regarding
Level I versus Level II tasks were blurred.

Criticisms of Jensen's theory

Jensen's theory of Level I-Level II mental abilities has not
been critically scrutinized as much as it has been ignored (Jarman,
1978). (For a recent interesting example of the omission of
Jensen's theory, the reader is referred to Kaufman & Kaufman, 1983.)
Nevertheless, there were some studies which presented some
conflicting findings and some criticism of Jensen's formulations.

Green and Rohwer (1971) reported on a study in which SES
differences among black subjects were investigated in relation to
Level I and Level II measures. The subjects were black
fourth-graders with an SES distribution ranging from low through
middle class. SES status was determined using an Index of Status
Characteristics with ratings of occupation, house type, and dwelling area. Twenty subjects were selected in each of three SES categories: Low, Lower-middle, and Middle. The groups differed on teacher-assigned reading grades, math grades, total reading scores on the Stanford Achievement Test, and scores on the Lorge-Thorndike Intelligence Test. The differences were in the direction of higher scores associated with higher SES ratings, but no mention of statistically significant differences were made.

The subjects were administered a paired-associate task, a digit-span task, and the Raven Coloured Progressive Matrices. The PA task and the digit span task were characterized as Level I tasks, and the Raven's was considered a Level II task as in previous studies. The paired-associate task consisted of pairs of 20 familiar objects presented in a standardized fashion on film. The digit-span task was E-administered rather than taped. The task consisted of seven series of digits ranging in length from 3 to 9 digits. The subjects were to recall the digits immediately. The PA task was administered for two complete trials, each consisting of a study and a test portion. The presentation rate for both was 5 seconds.

Performance on the PA task was measured in terms of the number of correct responses on the two test trials. The digit-span score was the total number of digits recalled in the correct position over the seven series of digits.
The results were analyzed in three separate analyses of variance. The main effect for SES was not significant on the PA task, as expected, but surprisingly there was a difference on the digit-span task. The low-SES group performed significantly below the lower-middle and middle-SES groups. The two latter groups did not differ significantly. The main effect for SES was also significant as expected on the Raven's. The pattern of performance was the same as that described for the digit-span task.

Thus, two tasks considered Level I tasks by Jensen yielded different patterns of performance in a racially homogeneous sample. Green and Rohwer (1971) suggested that Jensen's model might hold for SES differences in white, but not black populations or that the model itself was inadequate. They also suggested that differences in the manner of task presentation may have contributed to the anomalous findings.

Rohwer (1971), however, was harsher and more direct in his attack on the model itself. It was his contention that SES differences failed to emerge consistently on paired-associate tasks regardless of the racial composition of the sample. Rohwer also took issue with (a) the classification of tasks into an associative/conceptual dichotomy, (b) the conclusion that the available empirical evidence did not show SES differences in associative abilities, and (c) the assessment of the available empirical evidence as demonstrating higher correlations between
Level I and Level II abilities for middle- than for low-SES children.

With respect to his first charge, Rohwer asserted that in order to evaluate the evidence for two classes of abilities, one had to realize that the results of the experiments cited as evidence depended not only on SES and the type of task but also on the age of the subjects. Rohwer referred to results in which SES differences appeared at some ages and not others. Most importantly, Rohwer disputed the characterization of paired-associates tasks as requiring little, if any, transformation of the input. "The clear preponderance of evidence presently available indicates that persons who perform well on such a task engage vigorously in processes of transforming the input in order to learn efficiently" (Rohwer, 1971, p. 201).

In support of his second charge, Rohwer invoked the finding of Green and Rohwer (1971) with regard to digit-span performance. Finally, Rohwer contended that the results were not clearcut in support of Jensen's hypothesis that Level I abilities were more correlated with Level II abilities in high- than in low-SES populations.

Rohwer lastly speculated that the differences between high-SES and low-SES learners were due to the lack of spontaneous conceptual elaboration on the part of the low-SES children. Rohwer, in anticipation of Feuerstein (1979), suggested that it might be advised to try to train lower-class children in elaborative learning.
techniques. Rohwer reported the results of a study which did just that and demonstrated that elaboration training boosted the performance of black children to the performance level of the white children in the control conditions.

Rohwer's criticism was strongest on his first point regarding the classification of tasks along the associative-conceptual continuum and the degree of manipulation of the input. These criticisms were to be picked up later by Das (1972, 1973), Lawson and Jarman (1977), and Jarman (1978).

Humphreys and Dachler (1969a) checked the generalizability of Jensen's theory on the data from Project TALENT. They were critical of Jensen's use of a 2 x 2 orthogonal experimental design in violation of the assumption of a lack of correlation among the independent variables of IQ and SES. They argued that the use of equal numbers of subjects in the cells assigned equal weights in the analysis of variance and this alone could account for the results obtained. Humphreys and Dachler maintained that the appropriate design would weight the means in proportion to the size of their population. They also criticized Jensen's sampling of children in special classes in the public schools to form low intelligence groups for both extremes of SES as a biased sample in that "It is reasonable to assume that low-intelligence high-SES children in such classes have been much more carefully screened than have low-intelligence low-SES children" (Humphreys & Dachler, 1969a).
Humphreys' and Dachler's design differed from Jensen's in the following respects:

1. They restricted their sample to males.
2. Their subjects were older (ninth graders) as opposed to preschool and grade school children.
3. The differences in the racial composition of their sample were not specified.
4. They compared the results obtained using an orthogonal design and one using means weighted by their respective Ns.

Humphreys and Dachler used the Project TALENT measures of intelligence and SES obtained on ninth-grade boys and defined four criterion groups: High IQ-High SES, High IQ-Low SES, Low IQ-High SES, and Low IQ-Low SES. The measures designated as measures of rote learning were Memory for Sentences and Memory for Words. When the four criterion groups were equally weighted, the results showed a large main effect for IQ and a small main effect for SES consistent with Jensen's previous findings. That is, the Low-SES groups were higher than the High-SES groups. The interaction between intelligence and SES was much smaller and in the opposite direction from the interaction reported in Jensen's research. The effect of intelligence was slightly greater for the low-SES groups than for the high-SES groups.

The analysis using weighted means yielded results which showed that the main effect of SES and the interaction of SES with intelligence were wiped out. Thus, Humphreys and Dachler charged
that methodological differences could account for Jensen's results. They were particularly critical of Jensen's use of his results to support a general theory of intelligence and actually went so far as to say that "Unless and until new evidence is brought forward that avoids the design and sampling defects of earlier data, Jensen's published results can be disregarded" (Humphreys & Dachler, 1969a, p. 425).

Jensen's change in methodology discussed earlier can be interpreted as a response to Humphreys' and Dachler's criticism of his previous methodology in regard to sample selection and analyses. Jensen abandoned the use of small samples selected from special classes in public schools and began using regression analyses with large samples from regular classes.

Humphreys and Dachler (1969a) made a telling methodological point regarding the relationship of Jensen's correlational data and analysis of variance comparisons. However, their data showed no quarrel with the finding that SES had lower correlations with rote learning than with intelligence (Humphreys & Dachler, 1969b).

Horn (1976) repeated the methodological criticism that Jensen had cross-classified his samples with respect to IQ and SES to insure equal Ns in the four resulting cells (High IQ-Low SES, High IQ-High SES, Low IQ-High SES, Low IQ-Low SES) as though IQ and SES were independent controlled treatments in an orthogonal 2 x 2 analysis of variance, when, in fact, IQ and SES were sampled
variables which were correlated. The appropriate correction, Horn agreed, was to have sample sizes proportional to the population Ns.

Given proportional Ns, Horn argued, Humphreys and Dachler's results showed that the interactions were small relative to the main effect of IQ and SES. Further, he argued that there were interactions for abilities that Jensen had classified Level I or Level II and, in some instances, interactions for abilities Jensen had classified as Level II. Thus, Horn questioned the notion that Level I abilities were necessary but not sufficient for the functioning of Level II abilities.

Horn (1976) reviewed Jensen's (1974) results and claimed that Jensen had yielded on the aspect of functional dependence. Horn also questioned Jensen's reformulation of the interaction hypothesis in terms of regression. His major points were that other ability variables had shown similar differential regressions on "g" and that different regression slopes alone could not be considered evidence for different abilities since "regression slopes depend upon variable standard deviations and reliabilities, which in turn depend upon the difficulty levels, variances, and the extent of homogeneity of the particular item samples involved" (Horn, 1976, p. 453). In other words, in order to be convinced, Horn would have to be shown that Level I measures were unique in their regression on Level II measures.

Ginsberg and Koslowski (1976) criticized Jensen from the standpoint of conceptual frameworks emerging from the study of
cognitive development. They were critical of his definitions of Level I and Level II as inadequate and imprecise. On the one hand, they accused him of not specifying the processes involved in the tasks and then they condemned him for using the total number of correct responses as an indication of process. Lastly, they found fault with his assumption that stimulus identity assures stimulus equivalence in all populations.

Lawson and Jarman (1977) and Jarman (1978) also criticized Jensen's theory in the context of contemporary developments in memory research in cognitive psychology. They based their criticisms on both experimental and correlational findings. As Lawson and Jarman (1977) stated it, "A curious lack of correspondence is evident between Jensen's theory of Level I ability and the current thrust of experimental and correlational research on memory" (Lawson & Jarman, 1977, p. 93). The incongruities were so great, in fact, as to lead them to call for a complete reformulation of the Level I-Level II theory.

The change which they identified in the field of memory research had to do with the increasing emphasis on the nature of the transforming process in the information processing approaches to the study of memory and cognition (Carroll, 1974; Ornstein, 1978). This change strikes at the heart of Jensen's distinction between Level I and Level II processes on the basis of the degree of transformation of the input. In other words, memory cannot be characterized on the basis of a lack of transformation of the input as in Jensen's
formulation, in the light of studies which have specifically been
focused on the strategies and transformations that subjects use in
memory tasks.

Jensen's theory also appears antiquated with respect to
distinguishing memory ability from other cognitive abilities.
Current models do not distinguish mnemonic processes from other
cognitive processes (Kail & Hagen, 1982). The distinction, if made,
is recognized as an artificial one (Lawson & Jarman, 1977; Jarman,
1978).

If Level I ability requires registration, storage, and
retrieval of information, then experimental evidence can be adduced
to indicate that it indeed requires some transformation of the input
(Lawson & Jarman, 1977). Further "recognition or recall with a high
degree of fidelity does not necessarily imply an absence of

Jensen, himself, has investigated the hypothesis that some
subjects use Level II abilities to perform memory tasks. Jensen and
Frederiksen (1973) and Jensen and Figueroa (1975) made distinctions
in Level I tasks on the basis of the degree of possible utilization

Since the role of control processes such as coding, imagery,
organization, and rehearsal, has not been addressed by Jensen, he
has also neglected research regarding subject-initiated processing
strategies (Jarman, 1978). Jensen's theory is clearly inadequate in
this regard.
Just as current experimental research challenged Jensen's formulation and definition of Level I ability, current factor analytic results challenged the definition of Level II (Jarman, 1978). Das (1972) found disparate loadings for some tests for retarded and non-retarded children. For example, one test, Memory for Designs, had a high loading on memory for the nonretarded group but a high loading on reasoning for the retarded group. "If one wishes to retain the memory-reasoning interpretation, one could say that the retarded subjects used reasoning to reproduce the designs whereas the non-retarded subjects used memory. In visual short-term memory, on the other hand, the non-retarded subjects seem to be using reasoning predominantly, but the retarded subjects use both. However, in both these tests, one would expect associative memory to predominate irrespective of subject samples" (Das, 1972, p. 10).

A final criticism leveled by Jarman (1978) dealt with the aspects of the functional dependence and hierarchical relationship between Level I and Level II. The evidence for functional dependence had been tenuous, at best (Horn, 1976; Rohwer, 1971). Jensen (1974) himself stated, "In any case, there does not appear to be evidence of any strong degree of functional dependence between the abilities; quite low or high scores on the one ability are not incompatible with a high or low score on the other, though there is a tendency for low intelligence-high memory to be more frequent than the opposite combination of abilities, especially for non-verbal intelligence" (Jensen, 1974, p. 111).
Das (1973) suggested that the hierarchy between the two levels might be an artifact of the degree of complexity of the tasks due to the fact that most rote memory tasks are too easy to yield any difference between low- and high-IQ groups, and most reasoning tasks are too difficult and complex to manifest similarities between low- and high-IQ groups matched for MA. Das (1972, 1973) suggested the need to vary task complexity within each level.

Jarman (1978) once again pointed to factor analytic results to refute the functional dependence and hierarchical relationship between Level I and Level II theory. Since the factor structures had been best obtained through orthogonal rotations, Jarman argued that these abilities were independent. He further pointed out that Jensen (1971, 1973a) applied oblique and orthogonal rotations to the same data and came out with essentially the same factors.

Das and Jarman were motivated to criticize Jensen's theory in order to establish the basis for their own (Das, Kirby, & Jarman, 1975). What they have suggested is that Jensen's Level I and Level II may be "limiting instances of successive and simultaneous modes of processing information (Das, 1972, p. 11). Their model of successive and simultaneous methods of processing information was openly borrowed from Luria's clinical research (Luria, 1966). They believe that their model, in contrast to Jensen's, better reflects recent memory research and attempts to deal with the processes underlying cognitive abilities and their measures (Jarman, 1978).
Feuerstein (1979) criticized Jensen's theory on the basis of its "static" nature, Jensen's emphasis on genetic and hereditary aspects, and the implications that Jensen drew for education. Feuerstein advocated a dynamic approach to the measurement of abilities utilizing his Learning Potential Assessment Device. Jensen, according to Feuerstein, purported to measure learning, but he did so in a static paradigm that represents an internal contradiction in terms. Feuerstein further interpreted Jensen as maintaining that Level II abilities were "essentially untrainable, and for individuals who function primarily on Level I the inculcations of higher and more complex types of cognition is nearly impossible" (Feuerstein, 1979, p. 78). In contrast, Feuerstein has specifically intervened with planned modifications of cognitive impairments of culturally deprived adolescents (Feuerstein, 1980).

Feuerstein's response to Jensen may be interpreted as an example of the perhaps faulty assumption that genetically-linked behaviors are more immutable and resistant to change than environmentally-induced behaviors. The nature-nurture controversy is far from resolved, however, and the varying contributions of heredity and environment and their interactions far from calculated. Jensen has represented the heredity side, and his work may be taken to insinuate racially biased beliefs, or at least to provide indirect support for racially biased policies (Voyat, 1971).

Nevertheless, one approach to the deficits in performance noted in lower-class and racial groups would be a direct training approach
as advocated by Feuerstein (1980). Another approach would be a search for Aptitude by Instruction interactions as advocated by Jensen (1970a). Neither approach, however, is mutually exclusive.

Jensen has considered the research and findings leading to his theory of Level I-Level I mental abilities as important because "they help to localize the nature of the intellectual deficits of many children called culturally disadvantaged; they bring a sharper focus to the nature-nurture problem as it relates to social class and racial differences in mental ability; they show that environmental deprivation does not have an equal effect on all mental abilities; and they emphasize the need for standard tests to assess a broader spectrum of mental abilities than is sampled by current tests of intelligence" (Jensen, 1969a, p. 33). Jensen's work may thus be appreciated as pioneering in what Glaser (1981) has referred to as "the future of testing: A research agenda for cognitive psychology and psychometrics."

Theory of primary and secondary retardation

Jensen (1970b) proposed a theory of primary and secondary familial mental retardation based upon his findings of an interaction between rote learning ability, socioeconomic status, and IQ. The diagnostic criteria for the category of cultural-familial retardation traditionally required an IQ score in the range of 50 to 70 or 75 and some assessment of social competence. For school-aged persons, this was principally based upon the student's academic and social performance in the school setting (Reschly, 1982).
Additionally, this category presumed the absence of any identifiable etiology, such as any known disease, injury, chromosomal abnormality, or genetic defect, with no detectable signs of neurological damage, sensory defect, or physical stigmata (Robinson & Robinson, 1976). Roughly 70 to 80% of persons with scores in the mild range of retardation on standardized intelligence tests (IQ scores from 50 to 70) were estimated to be in this category (Heber, Dever, & Conry, 1968). Current terminology refers to this category as retardation due to psychosocial disadvantage (Robinson & Robinson, 1976). This designation recognizes the relationship of this type of retardation and social class. Persons of lower socioeconomic status predominate in this category.

Jensen offered his theory of primary and secondary familial mental retardation as a means of refining or reformulating the category of familial mental retardation. He considered this refinement necessary in order to account for differences in social competence among children with low IQs and poor scholastic performance who had been classified as retarded in the public schools. This social competence was manifested in two ways. First, teachers had observed that many children who were retarded on IQ tests and in academic performance appeared to be normal in a variety of non-academic situations; they particularly appeared "more mature and capable in social interactions" (Jensen, 1970b, p. 66). Second, they differed in their social and occupational competence after leaving school. In these cases, many reasoned, these persons were
retarded only when they were in school, and their mental retardation was interpreted as a condition that resulted from the imposition of middle class standards and values by schools.

Jensen's theory suggested that more than one condition could be subsumed under the category of familial or psychosocial retardation. Utilizing his differential assessment of Level I and Level II abilities, Jensen postulated three ways that an individual could be diagnosed as retarded: (a) low on Level I, but not on Level II, (b) low on Level II, but not on Level I, or (c) low on both Level I and Level II abilities. Jensen was of the opinion, however, that those persons who were not low on Level I should not be diagnosed as retarded. Although Jensen originally cited social differences or differences in social competence among children with low IQs as stimulating his studies and necessitating a reformulation of the conception of cultural-familial retardation, the relationships among social competence, IQ, socioeconomic status, race, and learning abilities have not been systematically investigated.

Jensen (1970b) did refer to one study (Cooper, York, Daston, & Adams, 1967) which examined social differences among southern black adolescents committed to a state institution for the mentally retarded. An inventory of eight questions was developed to describe each subject's behavior. Three judges rated whether or not the adolescent was socially alert, socially effective, mentioned more often, had sports ability, had a good physical appearance, had accurate social judgment, had a high general level of activity, and
had a high vocational ability. Only those subjects who all judges agreed met six or more of these criteria were included in a behaviorally non-retarded group. Twenty-nine adolescents were so selected. An equal comparison group was formed of those subjects who all three judges agreed did not meet six or more of these criteria.

Each subject was then tested individually using the Ammon Picture Vocabulary Test, Form A and the revised Porteus Maze Test. The Wechsler and revised Beta evaluations given to all subjects prior to commitment were also reviewed. On the basis of this review, it was determined that all subjects had scores of 84 or less.

The primary purpose of this study was to ascertain whether the Porteus Test would accurately discriminate between those subjects categorized as behaviorally non-retarded and retarded by the judges and the behavior inventory. The results indicated that the Porteus discriminated perfectly, whereas the Ammons functioned just as the Beta and Wechsler had previously. All the subjects in the behaviorally non-retarded group received scores of 100 or better on the Porteus Test. All of the subjects in the behaviorally retarded category received scores on the Porteus Test below 84. "It was concluded that of the various tests of intelligence used with this population, only the Porteus assessed functions which were related to the social and vocational criteria used for establishing behavior non-retardation..." (Cooper, York, Daston, & Adams, 1967,
Jensen has further asserted (Jensen, 1970b; Jensen, 1980) that he believes the Porteus Maze Test to be a measure of Level I ability, but this has never been empirically validated.

Greenspan (1979) in a review of the literature on social intelligence in the retarded stated that social class factors have largely been overlooked. Greenspan commented that this neglect was unfortunate in light of Jensen's suggestions that low-SES children with low IQs appeared to have better social skills than middle-class children with similar IQs. Greenspan suggested that this would be a fruitful area of research particularly in the context of Mercer's arguments about the connection between SES and "quasi-retardation" (Mercer, 1973). According to Greenspan, one might expect social intelligence or social skills and IQ score to be discrepant for lower-class children, but consistent for higher-SES children. Further, "One might attribute this finding, if established, to differentiate (sic) role of organicity in mild retardation, as well as differential likelihood of parental overprotection and peer isolation in children of low IQ coming from different social class backgrounds" (Greenspan, 1979, p. 514).

The study by Cooper, York, Daston, and Adams (1967) would lead one to expect that the Porteus Maze Test (PMT) would correlate well with measures of social competence such as measures of adaptive behavior and social skills. Given Jensen's characterization of the PMT as a measure of Level I ability, one would also expect the PMT to correlate well with other measures of Level I abilities.
Finally, according to Greenspan (1979), one might expect social competence or social skills and IQ to be discrepant particularly for lower-class children.

**Summary**

This chapter has reviewed the literature on the relationship between intelligence as measured by IQ tests and measures of learning or memory. Also reviewed were studies of the racial and social class correlates of this relationship. The finding of an apparent interaction among IQ, socioeconomic status, and particular measures of learning led Jensen (1970a, 1970b) to articulate his theory of Level I and Level II abilities and to apply this theory in formulating a theory of primary and secondary familial mental retardation. In doing so, Jensen implied that social competence or social skill differences were related to differences in Level I and Level II abilities, but these relationships have never been systematically investigated.

This study, therefore, was undertaken to investigate the relationships among social competence, IQ, socioeconomic status, race, and learning abilities characterized by Jensen (1970b) as Level I abilities. On the basis of Jensen's theory of primary and secondary retardation, it was hypothesized that secondary retardation (low on Level II, but not on Level I) would be characteristic of students with better social competence. Social competence was further conceptualized as consisting of two dimensions—adaptive behavior and social skills. Thus, it was
expected that higher adaptive behavior scores would be associated with better performance on Level I tasks. It was also expected that those students with higher adaptive behavior scores would exhibit better social skills in the school setting. Lastly, it was expected that better teacher ratings of social skills would also be associated with better performance on Level I tasks.
CHAPTER III.

METHODS

This study was designed to ascertain to what degree performance on rote learning tasks characterized as Level I tasks by Jensen (1970a, 1970b) was related to the variables of IQ, adaptive behavior, socioeconomic status, and race in a population that had previously been evaluated according to the dual criteria of mental retardation as operationally defined by the public schools of Louisiana. Another question addressed by the present study was whether there was a relationship between the variables of IQ, adaptive behavior, socioeconomic status, and race and teachers' ratings of students' social skills in the school setting.

Subjects

The subjects for this study were selected from a population defined by a series of procedures. First, the class rosters for all students in special education programs in Terrebonne Parish, Houma, Louisiana were reviewed. All black and white males between the ages of 9 and 13 with exceptionalities of Mentally Retarded (Mild) and Educationally Handicapped/Slow Learner were listed. Only males were selected in order to eliminate sex differences in social skills. These students had been evaluated by multidisciplinary teams certified by the Louisiana State Department of Education according to procedures and criteria specified by the state (Louisiana Bulletin 1508, 1982) and federal regulations (Federal Register, 1977).
The students' confidential folders were then reviewed to obtain the most recent multidisciplinary evaluation results and to eliminate those students whose files were incomplete or whose evaluations reported a history of seizures or other specific neurological or physical disorders.

Next, for those students remaining on the list, the most recent score on a measure of adaptive behavior and the most recent intelligence test scores were obtained. Those students whose adaptive behavior scores were below three standard deviations below the mean were eliminated. Those students whose intelligence test scores were higher than 78 and lower than 50 were eliminated.

Parent permission was then sought for all students meeting these criteria. The parent's occupation and educational attainment were also obtained from the file, and a rating of socioeconomic status (SES) was calculated according to the method reported by Hollingshead (Hollingshead, 1957).

Sample attrition was due to parental refusal (6 whites, 1 black), to students having moved or being absent on the dates scheduled for data collection (1 white), and teachers not completing the teacher ratings for the subjects (1 white and 2 blacks). As a result of these factors, the same procedures were followed in the schools of Lafourche Parish, a parish immediately adjacent to Terrebonne Parish in order to obtain sufficient subjects. Data were obtained on 5 white and 6 black students from Lafourche Parish.
Method

The following tasks were individually administered to all subjects by an examiner who was employed specifically for this study. The examiner was given an orientation and detailed administration and scoring instructions. The examiner, a white female, possessed a master's degree in education and had received previous training in the administration and scoring of tests. Research on sex and race of examiners have not shown any particular effects (Sattler, 1974).

Tasks and procedures

1. The Digit Span subtest of the Wechsler Intelligence Scale for Children-Revised (WISC-R) (Wechsler, 1974) was administered with the aid of a tape recorder to standardize the presentation of the digits at the rate of one per second. Both the Forward and Backward Digit Span tests were administered. The examiner recorded the number of digits recalled in the correct position on each of two trials.

2. The serial learning task consisted of ten colored pictures of common objects taken from a preprimer workbook, for example, ball, dog, knife. The selection of the items from a preprimer workbook was a means of controlling and measuring the level of vocabulary difficulty. Each picture was mounted on 5 x 7-inch cards and laminated. The following instructions were given:

We are going to play a short game. (The examiner placed all ten cards face down in two rows in front of the subject.) See these
cards in a row? When I turn the card over, there is a picture on
the other side. Tell me what the name of each picture is as I turn
it over. (The subject named each picture as the examiner turned
over the card. The examiner accepted the name given by the subject.
The examiner named the object for the subject if the subject had not
responded after a count of ten.) Now I want you to learn the names
of all the pictures on these cards. (The examiner turned over all
of the cards face down once again.) When I point to the card, you
tell me what you think is on the other side. Then I will turn the
card over and you can see if you are right. (The examiner pointed
to each card in sequence. The cards were turned over face down at
the end of each trial in preparation for the next trial.)
A total of fifteen trials were administered. The task was
subject-paced. The examiner recorded the total number correct on
each trial.

3. The paired-associate (PA) learning task was administered
immediately following the serial learning task. The materials
consisted of ten pairs of colored pictures of common objects also
taken from a preprimer workbook. These were mounted on 5 x 7-inch
cards and laminated. On one side the stimulus picture appeared. On
the other side, the same picture was paired with another picture.
The pairs were made at random, avoiding obvious associations between
the members of each pair. Different pictures of objects from those
used in the serial learning task were employed. The following
instructions were given:
Now I am going to show pictures like this. (The examiner showed the side with one stimulus picture.) Then I'll turn the card over like this, and you'll see the same picture with another one next to it like this. (Examiner turned over the card.) I want you to say the names of the pictures. (The examiner presented the series of cards first showing the side with one stimulus picture and then the side with the stimulus and response pictures. The subject was asked to name the stimulus and response picture in each case.) Now I want you to say the name of the picture next to the first one to show me that you have learned which pictures go together.

On subsequent trials, the subject was only required to name the response when he saw the stimulus picture. Whether the subject made a correct response or not, the card was turned over so that the subject could see the stimulus and response pictures side by side. If the subject made no response, the examiner waited for a count of ten before turning over the card. The examiner recorded the total number of correct responses per trial for fifteen trials. The cards were shuffled after each trial.

4. The final task was the completion of the Porteus Maze Test (Vineland Revision) consisting of a series of 12 mazes: years 3-12, year 14, and adult. The mazes were administered and scored in accordance with the procedures detailed by Porteus (Porteus, 1965).

5. Other measures obtained were the regular homeroom and special education teachers' ratings of the students' social behavior. The teachers were asked to complete the 136-item
inventory, Social Behavior Assessment (SBA) (Stephens, 1980). The teachers were asked to rate the students on a scale of 1 to 3. The rating of 0 corresponded to "Behavior not observed or not applicable for the student." The rating of 1 corresponded to "Behavior is exhibited at an acceptable level." The rating of 3 corresponded to "Behavior is never exhibited". Therefore, a low score would indicate that the student exhibited an acceptable level of social behavior in the school setting as reflected by teacher judgment.

**Digit Span**

The Digit Span subtest needs relatively little introduction. A supplementary verbal subtest on the WICS-R, it is not calculated as part of the Verbal score if the five standard subtests are administered. It is the fifth most reliable subtest of the 12 subtests on the WISC-R (Sattler, 1974). Digit Span does not correlate well with a general factor ("g"). With a median loading of .49, it is the third lowest subtest in its loading on the first principal factor (Sattler, 1974). It has a median loading of .56 on the Freedom from Distractibility factor made up of the subtests of Digit Span, Arithmentic, and Coding (Sattler, 1974). The Digit Span subtest is considered a measure of attention and short-term memory (Sattler, 1974). Digits Backward is believed to require not only memory but also a more active mental process of transformation and reorganization (Sattler, 1974; Taylor, 1961; Jensen & Figueroa, 1975). Some form of a digit span task has been utilized as a measure of Level I abilities in studies of dual processes (Jensen,
Serial and paired-associates tasks

Some type of serial learning and/or paired-associates learning task was included in the early studies as measures of Level I abilities (Jensen, 1968b, 1969a, 1970b; Jensen & Rohwer, 1968, 1970; Green & Rohwer, 1971; Rapier, 1968; Rohwer, 1971). Serial tasks frequently have been used in research comparing normal subjects with retardates. These studies have yielded consistent results of normals as superior to retardates even when groups are matched on mental age (Goulet, 1968). There has been a suggestion that shorter lists (less than 8 to 10 items) decrease the retardate-normal difference, but the factors responsible for the retardate deficit have not been isolated (Goulet, 1968).

Paired-associate tasks have not shown the same consistent results of normals superior to retardates. The major variables in the studies have been the number of pairs, the type of pairs (whether pairs of words, pictures, or concrete objects), presentation rate, mode of presentation (live or filmed), response meaningfulness, and whether the subjects have been institutionalized or not (Goulet, 1968). The number of pairs varied from 3 to 10, but the number of pairs interacted with other variables. Most of the studies used picture pairs, but generally retarded subjects performed better with more concrete stimuli (Jensen, 1970b). The performance of the retarded subjects was also better with longer
presentation rates (four to seven seconds) (Jensen, 1970b). Non-institutionalized subjects also usually performed better (Jensen, 1970b). Response meaningfulness was the last variable mentioned. This variable was often confounded with others in the studies reviewed (Goulet, 1968). Nevertheless, studies with retarded subjects have typically used highly familiar or equally unfamiliar stimuli (Jensen, 1970b). Jensen (1970b) suggested that some of the confusion in the findings could be attributed to the failure to distinguish between the subjects on the basis of primary and secondary retardation and the degree of abstraction in the tasks.

**Porteus Maze Test**

The Porteus Maze Test (PMT) has never been used in a study by Jensen or others as a measure of Level I abilities. Nevertheless, Jensen (1970b, 1980) has specifically stated that he considers the PMT a measure of Level I abilities due to its lack of loading on "g," its correlation of .75 with the Knox Cube Test which also has a low "g" loading, and due to the findings such as those by Cooper, York, Daston, and Adams (1967) that the PMT "discriminated reliably between 'mentally retarded' persons who become more or less self-sufficient in the community and those in constant need of care and supervision, even when both these groups have about the same Binet IQs" (Jensen, 1980, p. 658). D. A. Worcester in Buros (1953) mentioned this aspect of the maze test. He referred to several "accounts of instances in which persons of low IQs have not
exhibited feeblemindedness in the sense of being unable to get along acceptably in their social and economic environments" and stated that "The Maze is most helpful in the identification of such individuals" (Buros, 1953, p. 461). Thus, two secondary questions in the present study are whether the PMT correlates with other measures of Level I ability and whether the PMT correlates well with measures of adaptive behavior and the ratings of social skills.

The Porteus Maze Test rivals the Raven's Progressive Matrices in its reported use in cross-cultural studies. As a matter of fact, "Probably no other test has been given to more remotely different cultural groups all around the world" (Jensen, 1980, p. 657). The volume and extent of the literature on the PMT may be contrasted with the lack of standardization data recommended in the Standards for educational and psychological tests (American Psychological Association, 1974) and needed by test users. There is no reliability information, no description of what subject samples were used in the establishment of norms, and other psychometric essentials (Buros, 1972).

Traditional methods of establishing reliability are questionable with the Maze Test due to its special features of administration and scoring. Administration and scoring permit three trials and allow the subject to realize his own errors. Thus, test-retest correlations would be expected to be high because of some learning factor rather than the consistency of test measurement. Split-half methods of estimating reliability would
also be inappropriate because all subjects do not receive the same
test due to different entry and discontinue points (Buros, 1953).

Porteus defined intelligence as the "capacity for making
planned responses to an increasing range of relevant stimuli"
(Porteus, 1950, p. 1). He believed that the PMT measured the
capacity to plan, to use prudence and foresight and mental alertness
in a new, concrete situation (Porteus, 1924). He also suggested
that the test was valuable as a "Socio-industrial index" (Porteus,
1955, p. 16), measuring a social or practical competence and
adaptive capacity not tapped by conventional tests of general
intelligence. Porteus originally suggested that the Maze Test be
used in conjunction with the Binet (Porteus, 1924).

The PMT correlates with the Stanford-Binet IQ about .60
(Jensen, 1980). It correlated with the Binet in the range of .60 to
.70 (Porteus, 1924). There are no reported correlations for any of
the Wechsler scales, but it is instructive to note that Wechsler
included mazes subtests on both the Wechsler Intelligence Scale for
Children (WISC), the revised version (WISC-R), and the Wechsler
Preschool and Primary Scale of Intelligence (WPPSI).

Methods of validation of the PMT have included correlations
with scores from other tests such as the Binet and Stanford-Binet,
correlations with judgments and ratings of educational and social
sufficiency and quality of adjustment in the community among
borderline and retarded groups, and the effects of psychosurgery
suggesting that it measures some function of the frontal lobes of
the brain (Porteus, 1955). The difficulty with the validation studies reported by Porteus is that they often suffer limitations of design (Buros, 1972). Another criticism has been the lack of focused validation research particularly for typical groups with which the PMT might be useful (Buros, 1972; Jensen, 1980).

The Maze Test is "disarming in its simplicity" (Buros, 1972), requiring no language on the part of the examiner or the subject and quickly engaging the subject's interest and effort (Jensen, 1980). The problem with the Maze Test is not its lack of promise, but its lack of modern standardization. "Thus, sadly, after over 50 years of research on the Maze test, it must be concluded that the test can be recommended only for research purposes and applied work that is based upon additional research appropriate to a particular setting. Yet, paradoxical though it may seem, the evidence supports the hypothesis that the test measures an important attribute not measured by other popular devices and thus is one of the more interesting and promising tests now known to psychology" (Buros, 1972, p. 756).

**Teachers' ratings of social skills**

The Social Behavior Assessment (SBA) inventory (Stephens, 1980) has been used successfully for the assessment of children's classroom and school-related social skills in research (Stumme, Gresham, & Scott, 1982). Its technical adequacy is in the process of being established. The content validity appears adequately established, interrater reliabilities are quite high, and
preliminary evidence for the construct validity of the instrument is beginning to appear (Stephens, 1983).

The 136 items are grouped into four categories: environmental behaviors (ER); interpersonal behaviors (IP); self-related behaviors (SR); and task related behaviors (TR). Within each category are subcategories. There are different numbers of items in each subcategory and different numbers of subcategories in each major category.

The content of the inventory was developed from a content analysis of published checklists and rating scales and a review of the literature which focused upon the identification of those social behaviors which had been shown in empirical studies to correlate with school success or to be regarded by teachers as important for school success (Milburn, 1974). The checklists or rating scales analyzed had to meet the criteria of being in print, listed in Buros' Personality Tests and Reviews (1970) or in The Seventh Mental Measurements Yearbook (Buros, 1972), designed for ratings by teachers, and ratings for elementary school children.

Three graduate students in education served as raters and independently examined the items on twelve behavior rating instruments selected according to the criteria just described. The raters first had to judge whether the item represented a behavior which could appear in the school environment. The items so chosen by two of the three raters were then categorized and restated as
positive behaviors to be taught rather than as problem behaviors to be eliminated (Milburn, 1974).

A total of 138 behaviors were chosen by this process. Twenty-one teachers in a pilot study rated each item on a six-point scale on three statements: This behavior is important for success in my class; this behavior is important for school success for children in special education classes in general; and this behavior is important for school success for children in regular classes in general. Their responses resulted in the elimination of two items, the change in some wording, and the finding that there were no differences in responses to the three questions. The final study required the teacher subjects to respond only to "This behavior is important for success in my class." The final version of 136 items was administered to a random sample of 200 special education teachers and an equal number of regular education teachers. The scale ranged from strong agreement to strong disagreement (Milburn, 1974).

Means and standard deviations were obtained for the responses on each item of the entire sample of teachers. Only three items had mean score responses in the direction of the Probably Disagree rating. Smaller standard deviations were associated with means around 1 (Strongly Agree) and larger standard deviations were associated with higher ratings. Items with mean scores above 3 (Disagree) were examined as well as those with larger variances to determine whether to retain the item. All items were retained.
A factor analysis was also carried out on the responses. In the original factor structure, employing an orthogonal rotation, 70 of the 136 items loaded .50 or above, with a loading of at least .25 for every one of the items. These results suggest a high degree of internal consistency for the items (Milburn, 1974). In this analysis, four factors were identified: Social Initiative, On-Task Behaviors, Relationship Rules, and skills related to personal hygiene (Milburn, 1974).

A factor structure of the SBA was also identified in a study by Stodden (Stodden, 1981; Stumme, Gresham, & Scott, 1983). One hundred eighty-four children from a midwestern metropolitan population of 23,321 in grades kindergarten through ninth grade were selected as subjects. Ninety-two children who had been identified and were receiving special education services in programs for the emotionally disabled in which they were integrated into an academic subject formed one sample. Ninety-two children matched on age, grade, and sex who were not receiving special education services were randomly selected to form a normal group. The sample consisted of 142 males and 42 females for a proportion of 77% males and 23% females in the total sample. Regular classroom teachers rated the social skills of both an ED student and a same-sex classroom peer who was not receiving special education services utilizing the Social Behavior Assessment rating instrument.

The results of a factor analysis using an oblique rotation suggested that an orthogonal rotation of the extracted factors would
be more appropriate. A principal components analysis using a Varimax rotation thus produced six independent factors in contrast to the four categories which Stephens (1980) had originally established on the basis of item content. The six factors accounted for two-thirds of the variance in teacher ratings of ED and non-ED students on the SBA. Furthermore, the six factors appeared to cut across the four categories created by Stephens.

Two factors, Academic Responsibility and Social Responsibility, accounted for over half of the variance explained by the six factors. The six factors accounted for 67% of the variance. Together, Academic Responsibility and Social Responsibility accounted for 38% of the variance.

The factor of Academic Responsibility accounted for 17% of the variance in the teacher ratings of ED and non-ED children. Those items loading on this factor were those of asking and answering questions, on-task behavior, completing tasks independently, and attending behavior. The factor of Social Responsibility explained 21% of the variance and was defined by behaviors involved with peers and teachers. The remaining four factors accounted for considerably less variance, but each factor appeared to define an independent dimension of social behavior (Stodden, 1981; Stumme, Gresham, & Scott, 1983).

Another facet of the Stodden study was evaluating the utility of the SBA in discriminating children identified as ED from children not identified as ED (Stodden, 1981; Stumme, Gresham, & Scott, 1982).
The results of the discriminant analyses performed in the study demonstrated that the SBA was quite effective in correctly discriminating ED from non-ED students. The linear discriminant function derived from the thirty SBA categories was used to correctly classify 83% of the subjects in this study. The SBA ratings proved to be highly effective in achieving a significant separation between groups of socially skilled and socially unskilled children (Stephens, 1983).

Stephens (1983) reported a study by K. K. Prichard, F. H. Wallbrown, and H. L. Maxwell on the inter-rater reliability of the SBA. Two teachers in each of three classes were given the SBA and asked to complete them independently for every child in the class. Pearson product moment correlation coefficients were computed between the ratings of both teachers of each classroom. For the four large categories, average coefficients ranged from .89 to .96. For the thirty subcategory scores average coefficients ranged from .76 to .97. All coefficients attained significance at the .01 level. Stumme, Gresham, and Scott (1983) reported test-retest reliabilities as adequate (r = .89).

The comprehensive sampling of social skills offered by the SBA and the careful content validation makes the SBA a potentially useful instrument. Its technical adequacy is receiving attention, but much more needs to be done. The SBA appears to deserve the effort (Stumme, Gresham, & Scott, 1982, 1983).
Summary

Subjects were selected according to a series of procedures from the public schools in Lafourche and Terrebonne parishes, two neighboring parishes in southern Louisiana. The criteria for selection included race (black or white), sex (males only), and age (between 9 and 13), current placement in special education, having received a multidisciplinary evaluation in accordance with state and federal regulations, no known neurological or physical disorders, an IQ score in the range of 50 to 78, and an adaptive behavior score of 55 or above. The following information was gathered from the students' confidential records: most recent IQ score, most recent score on a measure of adaptive behavior transformed to a scale with the mean of 100 and a standard deviation of 15, and parent's occupation and educational attainment. A measure of social index was then calculated using parent's occupation and educational attainment according to Hollingshead (1957).

The following tasks were individually administered in the following order for each subject by a trained examiner: Forward and Backward Digit Span, a serial learning task, a paired-associates learning task, and the Porteus Maze Test. These tasks were selected and structured on the basis of the review of previous studies. In addition, the regular and special education teachers of each subject were asked to complete the 136-item Social Behavior Assessment inventory (Stephens, 1980) as a measure of classroom and
school-related social skills. A total sum of each teacher's ratings was calculated for each subject.
CHAPTER IV.

RESULTS

The results which will be presented in this section include a description of the subject characteristics, the simple bivariate correlations among the variables of IQ, race, adaptive behavior, and socioeconomic status, and the simple bivariate correlations among the measures of learning and teachers' ratings of social skills. The canonical correlation procedure also yields simple bivariate correlations between each of the variables of IQ, race, adaptive behavior, and socioeconomic status and each of the measures of learning and the teachers' ratings of social skills. The results of the canonical correlation analysis performed on the intervariable correlation matrix are presented including the canonical function, canonical structure, and canonical redundancy coefficients. All of the IQ scores obtained from the files were scores on the Wechsler Intelligence Scale for Children-Revised (WISC-R). All of the adaptive behavior scores, except for three, were scores on the Vineland Social Maturity Scale (Doll, 1965). The other three adaptive behavior scores were obtained from the Adaptive Behavior Inventory for Children (Mercer & Lewis, 1978).

Sample characteristics

Complete data were obtained on 60 males (30 blacks and 30 whites). The final sample had a mean age of 136.5 months with a standard deviation of 19.45 months (roughly 10 to 13 years). The mean IQ score was 66 (SD = 7.12). The mean adaptive behavior score
was 79.25 (SD = 14.79). The social index mean was 62.53 (SD = 12.54) which corresponds to the lowest social class according to Hollingshead's Index (Hollingshead, 1957). Table 1 presents the sample means and standard deviations by race.

Table 1 indicates that the black and white students in the sample had extremely comparable IQ and adaptive behavior scores. The black students were higher in social index (indicating lower socioeconomic status), but the variation was smaller in the black social index.

**Simple bivariate correlations**

Using the CANCORR procedure of the Statistical Analysis System (SAS Institute, 1979), a canonical correlation analysis was performed. The predictor or independent variables were defined as IQ, Race, Adaptive Behavior (AB) and Social Index (SI). The criterion or dependent variables were Total Digit Span (TDS), Digits Forward (DF), Digits Backward (DB), Serial Trials to Criterion (STC), Total Serial Task (ST), Paired Associates Trials to Criterion (PAC), Paired Associates Task Total (PAT), Porteus Maze Quotient (PQ), Special Teacher Social Behavior Assessment (SBS) and Regular Teacher Social Behavior Assessment (SBR).
Table 1

Sample Means and Standard Deviations by Race

<table>
<thead>
<tr>
<th></th>
<th>IQ</th>
<th>AB</th>
<th>SI</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
</tr>
<tr>
<td>M</td>
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<td>77.80</td>
<td>66.33</td>
</tr>
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<td>13.68</td>
<td>8.44</td>
</tr>
<tr>
<td>White</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>66.23</td>
<td>80.70</td>
<td>58.73</td>
</tr>
<tr>
<td>SD</td>
<td>7.13</td>
<td>15.92</td>
<td>14.79</td>
</tr>
</tbody>
</table>

Note. Adaptive Behavior (AB); Social Index (SI).
The intervariable correlation matrices are presented in Tables 2, 3, 4, 5 and 6. Table 2 presents the correlations among the predictor variables of IQ, Race, Adaptive Behavior, and Social Index.

Insert Table 2 about here

Adaptive behavior scores were moderately correlated with IQ, and social class was somewhat correlated with race (with blacks tending to be lower). Race and IQ and race and adaptive behavior were not correlated to any notable degree, however.

The correlations among the criterion or dependent variables are presented in Tables 3 and 4.

Insert Table 3 about here

Forward and Backward Digit Span correlated equally well with the Total Digit Span Score. The Serial Task and Porteus Maze Quotient correlated better with Total Digit Span than did the Paired-Associates Task. The Paired-Associates Task correlated as well with the Serial Task as the Porteus Maze Quotient correlated with the Total Digit Span offering some support for Jensen's characterization of these tasks as all representing Level I abilities.
Table 2

**Correlations among Predictor Variables**

<table>
<thead>
<tr>
<th></th>
<th>IQ</th>
<th>RACE</th>
<th>AB</th>
<th>SI</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RACE</td>
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<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AB</td>
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<td>-0.10</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>SI</td>
<td>0.02</td>
<td>0.31*</td>
<td>0.03</td>
<td>1.00</td>
</tr>
</tbody>
</table>

*Note.* Adaptive Behavior (AB); Social Index (SI).

*p* < .05, **p** < .01.
Table 3

Correlations among Criterion Variables of Learning

<table>
<thead>
<tr>
<th></th>
<th>TDS</th>
<th>DF</th>
<th>DB</th>
<th>STC</th>
<th>ST</th>
<th>PAC</th>
<th>PAT</th>
<th>PQ</th>
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</thead>
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<tr>
<td>TDS</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DF</td>
<td>.82**</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DB</td>
<td>.79**</td>
<td>.31*</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STC</td>
<td>-.15</td>
<td>0.00</td>
<td>-.25</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ST</td>
<td>.31*</td>
<td>.14</td>
<td>.36**</td>
<td>-.75**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAC</td>
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<td>-.04</td>
<td>-.03</td>
<td>.45**</td>
<td>-.26*</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAT</td>
<td>.18</td>
<td>.08</td>
<td>.21</td>
<td>-.56**</td>
<td>.40**</td>
<td>-.92**</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>PQ</td>
<td>.37**</td>
<td>.17</td>
<td>.43**</td>
<td>-.16</td>
<td>.20</td>
<td>.16</td>
<td>-.02</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Note. Total Digit Span (TDS); Digits Forward (DF); Digits Backward (DB); Serial Trials to Criterion (STC); Total Serial Task (ST); Paired-Associates Trials to Criterion (PAC); Paired-Associates Task Total (PAT); Porteus Maze Quotient (PQ).

*p<.05. **p<.01.
The correlations with special and regular teacher ratings are presented in Table 4.

The special teacher and regular teacher social behavior ratings are not noticeably correlated with each other. Higher ratings on the Social Behavior Assessment indicate poorer performance, thus the negative correlations between the special teacher ratings and the Total Digit Span, Backward Digit Span, and Serial Task scores suggest that those who obtained higher scores on these tasks received lower (better) social skill ratings from their special education teachers. The same was true, but to a lesser degree for the Paired Associates Task and the Porteus Mazes. The regular teachers were similar to the special teachers in the correlations with the Serial and Paired Associates Tasks, but they differed on Digit Span and the Porteus Mazes. There was essentially no correlation between performance on the Digit Span Task and the regular teachers' ratings of social behavior. There was a slight indication that those who scored higher on the Porteus Mazes were rated as lower on social behavior by the regular teachers.
Table 4

Correlations with Teacher Ratings of Social Skills

<table>
<thead>
<tr>
<th></th>
<th>SBS</th>
<th>SBR</th>
</tr>
</thead>
<tbody>
<tr>
<td>TDS</td>
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</tr>
<tr>
<td>DF</td>
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<td>-.04</td>
</tr>
<tr>
<td>DB</td>
<td>-.41**</td>
<td>.06</td>
</tr>
<tr>
<td>STC</td>
<td>.26*</td>
<td>.14</td>
</tr>
<tr>
<td>ST</td>
<td>-.40**</td>
<td>-.21</td>
</tr>
<tr>
<td>PAC</td>
<td>.08</td>
<td>.15</td>
</tr>
<tr>
<td>PAT</td>
<td>-.17</td>
<td>-.18</td>
</tr>
<tr>
<td>PQ</td>
<td>-.19</td>
<td>.18</td>
</tr>
<tr>
<td>SBS</td>
<td>1.00</td>
<td>.03</td>
</tr>
<tr>
<td>SBR</td>
<td>.03</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Note. Total Digit Span (TDS); Digits Forward (DF); Digits Backward (DB); Serial Trials to Criterion (STC); Total Serial Task (ST); Paired-Associates Trials to Criterion (PAC); Paired-Associates Task Total (PAT); Porteus Maze Quotient (PQ); Special Teacher Social Behavior Assessment (SBS); Regular Teacher Social Behavior Assessment (SBR).

*p<.05. **p<.01.
The canonical procedure also provides the simple bivariate correlation of each independent or predictor variable with each criterion variable. These correlations are presented in Tables 5 and 6. Table 5 presents the correlations of the predictor variables with the criterion variables of learning. Table 6 presents the correlations of the predictor variables with the criterion variables of social skills.

In this sample, IQ correlated well with Total Digit Span. This was accounted for primarily by the correlation between Digits Backward and IQ. IQ correlated almost as well with the Porteus Maze Quotient, however. IQ also correlated to a noticeable degree with the Serial Task and Paired-Associate Task performance of the subjects, but better with the Serial Task than the Paired-Associate. The correlation coefficients between adaptive behavior and the criterion variables were about half those with the IQ scores. The negative correlations with the trials to criterion measures indicate that those higher in adaptive behavior as in IQ tended to require fewer trials to criterion performance on these tasks. There were low positive correlations with race suggesting that blacks performed better on the Digit, Serial, and Paired-Associates Tasks. The slight negative correlation with the Porteus Maze Quotient suggests that whites may have performed somewhat better on this task.
Table 5

Bivariate Correlations between Predictor Variables and Criterion Variables of Learning

<table>
<thead>
<tr>
<th></th>
<th>TDS</th>
<th>DF</th>
<th>DB</th>
<th>STC</th>
<th>ST</th>
<th>PAC</th>
<th>PAT</th>
<th>PQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>IQ</td>
<td>.51**</td>
<td>.32*</td>
<td>.50**</td>
<td>-.23</td>
<td>.35**</td>
<td>-.15</td>
<td>.29*</td>
<td>.49**</td>
</tr>
<tr>
<td>RACE</td>
<td>.10</td>
<td>.11</td>
<td>.04</td>
<td>-.09</td>
<td>.13</td>
<td>-.07</td>
<td>.10</td>
<td>-.07</td>
</tr>
<tr>
<td>AB</td>
<td>.23</td>
<td>.09</td>
<td>.28*</td>
<td>-.23</td>
<td>.24</td>
<td>-.02</td>
<td>.14</td>
<td>.20</td>
</tr>
<tr>
<td>SI</td>
<td>.01</td>
<td>-.02</td>
<td>.04</td>
<td>-.12</td>
<td>.24</td>
<td>.11</td>
<td>-.06</td>
<td>-.08</td>
</tr>
</tbody>
</table>

Note. Adaptive Behavior (AB); Social Index (SI); Total Digit Span (TDS); Digits Forward (DF); Digits Backward (DB); Serial Trials to Criterion (STC); Total Serial Task (ST); Paired-Associates Trials to Criterion (PAC); Paired-Associates Task Total (PAT); Porteus Maze Quotient (PQ).
*p<.05. **p<.01.
There was essentially no correlation between the social index measure, Digit Span performance, and the Porteus Maze Quotient, but there was a low positive correlation between the social index and the Paired-Associate Task. There was an even stronger correlation between the social index and the Serial Task performance. This would indicate that the students with lower social status performed better on these tasks.

In this study, IQ was the better predictor of performance on Level I tasks among students of low socioeconomic status. Jensen analyzed his results in a 2 x 2 analysis of variance design treating IQ and SES as independent variables. The present results lead one to wonder about differences in variances associated with the arbitrary groupings into high and low IQ and the characteristics of the students chosen to represent high IQ-low SES and low IQ-high SES upon which Jensen's conclusions were reached.

Table 6 presents the correlations of the predictor variables with the criterion variables of social skills.

Insert Table 6 about here

With reference to IQ, the teacher ratings were discrepant in that the regular teachers tended to rate those who had higher IQ scores as having poorer social skills whereas the special teachers tended to rate those with higher IQs as having better behavior. In terms of adaptive behavior, however, there was greater agreement
between the special and regular teacher ratings in that there was little to no correlation between adaptive behavior scores and teacher ratings of social skills in the school setting. When considering race, the teacher ratings, particularly by the special teachers, tended to indicate that whites had poorer social skills in the school setting. The most notable result, however, involved the correlation of the social index measure with the teacher ratings of social skills. The special teacher ratings essentially paralleled the results of no correlation with social status found with the Digit Span and Porteus Mazes. The regular teachers, however, tended to rate those students who were lower in social status as having better social skills. The analysis of this finding must be tempered by the fact that the regular teachers rated more items as "Behavior not observed or not applicable for the student." According to the scoring procedures of the Social Behavior Assessment instrument (Stephens, 1980), "Behavior not observed or not applicable for the student" is assigned a score of zero. Since a lower score is indicative of better behavior, this tends to bias the ratings in a positive direction. This positive bias is again noteworthy when the correlations with IQ are considered. The results of the ratings by the regular teachers tended to indicate that those students who were higher in IQ were perceived by the regular teachers as having poorer behavior in spite of the positive bias in the scoring procedures.
Table 6

Bivariate Correlations between Predictor Variables and Criterion Variables of Social Skills

<table>
<thead>
<tr>
<th></th>
<th>SBS</th>
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</tr>
</thead>
<tbody>
<tr>
<td>IQ</td>
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</tr>
<tr>
<td>RACE</td>
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<td>-.04</td>
</tr>
<tr>
<td>AB</td>
<td>-.09</td>
<td>-.03</td>
</tr>
<tr>
<td>SI</td>
<td>.05</td>
<td>-.30*</td>
</tr>
</tbody>
</table>

Note. Adaptive Behavior (AB); Social Index (SI); Special Teacher Social Behavior Assessment (SBS); Regular Teacher Social Behavior Assessment (SBR).

*p<.05.
Canonical correlation

The correlations presented in Tables 2, 3, 4, 5 and 6 form an intervariable correlation matrix upon which the canonical correlation analysis is performed. A canonical correlation takes into account the relationships in Rxx and Ryy in order to evaluate the interrelationship between the two variable sets, Rxy. Canonical correlation analysis "identifies the 'components' of one set of variables that are most highly related (linearly) to the 'components' of the other set of variables" (Thompson, 1984, p.13). The canonical correlation is a bivariate correlation between the two composite scores - one for each of the variable sets. The number of correlation coefficients which can be calculated is equal to the smaller number of variables in the two sets - in this instance, four. These coefficients are reported in Table 7.

| Insert Table 7 about here |

The first two correlation coefficients accounted for 75% of the variance as indicated by the canonical $R^2$. Only the first one was significant, however, at the $p<.01$ level. This one set of linear composites accounted for 51% of the variance between the two variable sets.
Table 7
Canonical Correlation Coefficients between Linear Composites of Predictor and Criterion Variable Sets

<table>
<thead>
<tr>
<th>CANONICAL CORR</th>
<th>APPROX STD ERR</th>
<th>CANONICAL R-SQUARED</th>
<th>F</th>
<th>DF</th>
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<tr>
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</table>

* p<.01.
There are several ways to interpret the canonical correlations to determine the extent to which various variables contributed to the relationship between the two composites. Both the canonical function coefficients and the canonical structure coefficients can be interpreted as well as the canonical redundancy coefficients (Thompson, 1984).

Canonical function coefficients are the weights assigned to scores in the calculation of the composite scores. The weights are designed to maximize the relationship between the two variable sets. The weights can be either positive or negative numbers and are simply multiplied times the scores for each person. These weights are similar to beta weights in a regression analysis or pattern coefficients in a factor analysis (Thompson, 1984).

The standardized canonical function coefficients for the two variables sets are given in Table 8.

Insert Table 8 about here
Table 8

Canonical Function Coefficients indicating Independent Contribution of each Variable to their respective Linear Composites

<table>
<thead>
<tr>
<th></th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
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</thead>
<tbody>
<tr>
<td>IQ</td>
<td>.95</td>
<td>.12</td>
<td>-.25</td>
<td>.43</td>
</tr>
<tr>
<td>RACE</td>
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<td>-.33</td>
<td>.97</td>
<td>.10</td>
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<tr>
<td>AB</td>
<td>.03</td>
<td>.37</td>
<td>.35</td>
<td>-.96</td>
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<tr>
<td>SI</td>
<td>-.31</td>
<td>.92</td>
<td>-.02</td>
<td>.41</td>
</tr>
<tr>
<td>TDS</td>
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<td>DF</td>
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<td>-.65</td>
<td>.73</td>
<td>.43</td>
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<td>DB</td>
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<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>STC</td>
<td>.26</td>
<td>-.01</td>
<td>-.29</td>
<td>1.13</td>
</tr>
<tr>
<td>ST</td>
<td>.23</td>
<td>.70</td>
<td>-.04</td>
<td>1.19</td>
</tr>
<tr>
<td>PAC</td>
<td>.18</td>
<td>.50</td>
<td>.94</td>
<td>-1.44</td>
</tr>
<tr>
<td>PAT</td>
<td>.66</td>
<td>.09</td>
<td>.85</td>
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<tr>
<td>PQ</td>
<td>.43</td>
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<td>-.60</td>
<td>.08</td>
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<td>SBS</td>
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<tr>
<td>SBR</td>
<td>.40</td>
<td>-.46</td>
<td>-.08</td>
<td>-.04</td>
</tr>
</tbody>
</table>

Note. Adaptive Behavior (AB); Social Index (SI); Total Digit Span (TDS); Digits Forward (DF); Digits Backward (DB); Serial Trials to Criterion (STC); Total Serial Task (ST); Paired-Associates Trials to Criterion (PAC); Paired-Associates Task Total (PAT); Porteus Maze Quotient (PQ); Special Teacher Social Behavior Assessment (SBS); Regular Teacher Social Behavior Assessment (SBR).
These coefficients indicate the independent contribution of each variable to the variance of the composites of the predictor and criterion variable sets. The variable which made the largest independent contribution to the first predictor composite was IQ. Race made a modest contribution. The variable which made the largest contribution to the first composite of the criterion variables was the Paired-Associates Total Score. The Porteus Maze Quotient and the Regular Teachers' Ratings of Social Skills were the next largest contributors on the criterion side. Adaptive Behavior and Backward Digit Span made essentially no contribution to the first composite of their variable sets. Negative weights were assigned to Social Index and to the social skills ratings by special education teachers.

In order to obtain a clearer picture of the relevance of each variable, it is also desirable to interpret the canonical structure coefficients. These coefficients when squared represent the proportion of variance linearly shared by a variable with the variable's canonical composite. Canonical structure coefficients are "directly analogous to factor structure coefficients" (Thompson, 1984, p. 23). Table 9 presents the canonical structure coefficients.

Insert Table 9 about here

Insert Table 9 about here
Table 9
Canonical Structure Coefficients indicating Correlation with Canonical Composite

<table>
<thead>
<tr>
<th></th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
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</thead>
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<tr>
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<td>.28</td>
<td>-.13</td>
<td>.09</td>
</tr>
<tr>
<td>RACE</td>
<td>.11</td>
<td>-.09</td>
<td>.94</td>
<td>.32</td>
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<td>DF</td>
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<td>.03</td>
<td>-.15</td>
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<td>STC</td>
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<td>.35</td>
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<td>ST</td>
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<td>.62</td>
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<td>.19</td>
</tr>
<tr>
<td>PAC</td>
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<td>.19</td>
<td>-.13</td>
<td>-.02</td>
</tr>
<tr>
<td>PAT</td>
<td>.44</td>
<td>0.00</td>
<td>.24</td>
<td>-.18</td>
</tr>
<tr>
<td>PQ</td>
<td>.67</td>
<td>.16</td>
<td>-.39</td>
<td>-.09</td>
</tr>
<tr>
<td>SBS</td>
<td>-.40</td>
<td>.13</td>
<td>-.65</td>
<td>-.06</td>
</tr>
<tr>
<td>SBR</td>
<td>.37</td>
<td>-.51</td>
<td>-.29</td>
<td>-.11</td>
</tr>
</tbody>
</table>

Note. Adaptive Behavior (AB); Social Index (SI); Total Digit Span (TDS); Digits Forward (DF); Digits Backward (DB); Serial Trials to Criterion (STC); Total Serial Task (ST); Paired-Associates Trials to Criterion (PAC); Paired-Associates Task Total (PAT); Porteus Maze Quotient (PQ); Special Teacher Social Behavior Assessment (SES); Regular Teacher Social Behavior Assessment (SBR).
These coefficients indicate the degree to which each variable correlated with the composite of the variable set to which it belonged. IQ shared 90% of the variance of the first predictor composite. Adaptive behavior shared 12%. Race shared 1%. Three variables shared between 45 and 50% of the first composite of the criterion variables – Total Digit Span, Digits Backward, and the Porteus Mazes. The Serial and Paired-Associates Tasks both shared roughly 17% of the variance. The teacher ratings shared about the same portion of variance (about 14%), but the special teacher ratings were negatively correlated with the composite.

Another measure of the degree to which each variable contributed to the canonical solution may be obtained from the correlation of each variable with the canonical composite of the other variable set. Table 10 presents the correlations of the predictor variables with the criterion composite.

Insert Table 10 about here

IQ shared 46% of the variance with the criterion composite. Adaptive Behavior shared 6%. Social Index was negatively correlated with the criterion composite.
Table 10

Correlations between the Predictor Variables and the Criterion Composite

<table>
<thead>
<tr>
<th></th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
</tr>
</thead>
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<td>IQ</td>
<td>.68</td>
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<td>.01</td>
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<td>RACE</td>
<td>.08</td>
<td>-.04</td>
<td>.28</td>
<td>.05</td>
</tr>
<tr>
<td>AB</td>
<td>.25</td>
<td>.23</td>
<td>.05</td>
<td>-.13</td>
</tr>
<tr>
<td>SI</td>
<td>-.16</td>
<td>.41</td>
<td>.09</td>
<td>.07</td>
</tr>
</tbody>
</table>

Note. Adaptive Behavior (AB); Social Index (SI).
Table 11 presents the correlations between the criterion variables and the predictor composite.

Insert Table 11 about here

Total Digit Span, Digits Backward, and the Porteus Maze Quotient shared about 25% of the variance of the Predictor Composite. Digits Forward, Serial Task and Paired Associates Task Totals were next in importance. They shared similar portions of variance with the Predictor Composite. The teacher ratings were about equally correlated, but in opposite directions again.

The correlations between each variable and the canonical composite of the other variable set are helpful in canonical redundancy analysis to rule out the possibility of obtaining highly correlated but unimportant factors. One wishes to avoid the case in which the two linear composites do not extract significant portions of variance from their respective batteries, but may correlate reasonably well with one another contributing to a relatively strong canonical correlation. Table 12 presents the amount of variance of the predictor variables explained by the predictor composite and by the criterion composite.

Insert Table 12 about here
### Table 11

Correlations between the Criterion Variables and the Predictor Composite

<table>
<thead>
<tr>
<th></th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>TDS</td>
<td>.50</td>
<td>.13</td>
<td>.05</td>
<td>.02</td>
</tr>
<tr>
<td>DF</td>
<td>.34</td>
<td>.02</td>
<td>.06</td>
<td>.05</td>
</tr>
<tr>
<td>DB</td>
<td>.48</td>
<td>.19</td>
<td>0.00</td>
<td>-.02</td>
</tr>
<tr>
<td>STC</td>
<td>-.20</td>
<td>.19</td>
<td>-.11</td>
<td>.06</td>
</tr>
<tr>
<td>ST</td>
<td>.29</td>
<td>.30</td>
<td>.12</td>
<td>.03</td>
</tr>
<tr>
<td>PAC</td>
<td>-.19</td>
<td>.09</td>
<td>-.04</td>
<td>0.00</td>
</tr>
<tr>
<td>PAT</td>
<td>.32</td>
<td>0.00</td>
<td>.07</td>
<td>-.03</td>
</tr>
<tr>
<td>PQ</td>
<td>.48</td>
<td>.08</td>
<td>-.12</td>
<td>-.02</td>
</tr>
<tr>
<td>SBS</td>
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<td>.06</td>
<td>-.20</td>
<td>-.01</td>
</tr>
<tr>
<td>SBR</td>
<td>.27</td>
<td>-.25</td>
<td>-.09</td>
<td>-.02</td>
</tr>
</tbody>
</table>

**Note.** Total Digit Span (TDS); Digits Forward (DF); Digits Backward (DB); Serial Trials to Criterion (STC); Total Serial Task (ST); Paired-Associates Trials to Criterion (PAC); Paired-Associates Task Total (PAT); Porteus Maze Quotient (PQ); Special Teacher Social Behavior Assessment (SBS); Regular Teacher Social Behavior Assessment (SBR).
The correlations between each variable and the canonical composite of the other variable set are helpful in canonical redundancy analysis to rule out the possibility of obtaining highly correlated but unimportant factors. One wishes to avoid the case in which the two linear composites do not extract significant portions of variance from their respective batteries, but may correlate reasonably well with one another contributing to a relatively strong canonical correlation. Table 12 presents the amount of variance of the predictor variables explained by the predictor composite and by the criterion composite.

Insert Table 12 about here

This table indicates that the predictor composites extracted reasonable proportions of the variance from the predictor variables. The predictor variables are moderately correlated with one another.

Table 13 presents the amount of variance of the criterion variables explained by the predictor composite and by the criterion composite.

Insert Table 13 about here
### Table 12
**Predictor Variance Explained**

<table>
<thead>
<tr>
<th>Predictor Composites</th>
<th>Canonical R-Squared</th>
<th>By Criterion Composites</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>.27</td>
<td>.51</td>
</tr>
<tr>
<td>II</td>
<td>.25</td>
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<td>III</td>
<td>.25</td>
<td>.09</td>
</tr>
<tr>
<td>IV</td>
<td>.23</td>
<td>.03</td>
</tr>
</tbody>
</table>

### Table 13
**Criterion Variance Explained**

<table>
<thead>
<tr>
<th>Criterion Composites</th>
<th>Canonical R-Squared</th>
<th>By Predictor Composites</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>.24</td>
<td>.51</td>
</tr>
<tr>
<td>II</td>
<td>.11</td>
<td>.24</td>
</tr>
<tr>
<td>III</td>
<td>.11</td>
<td>.09</td>
</tr>
<tr>
<td>IV</td>
<td>.04</td>
<td>.03</td>
</tr>
</tbody>
</table>
Only the first criterion composite extracted a reasonable portion of the variance of the criterion variables. The criterion variance explained by the first predictor composite was only 12%, however. The significant canonical correlation was based upon composites which extracted reasonable portions of variance from their respective variable sets.

Insert Table 13 about here

Table 14 presents the amount of variance in each of the criterion variables explained by the predictor composite.

Insert Table 14 about here

The first predictor canonical composite was able to account for between 23 and 25% of the variance of the Total Digit Span, Backward Digit Span, and the Porteus Maze performance. It accounted for just under 10% of the variance of the Serial and Paired Associate Tasks and the teacher ratings of social skills. The four predictor canonical composites accounted for very similar portions of the variance of the criterion variables.
Table 14

Criterion Variance Explained by Predictor Composite

<table>
<thead>
<tr>
<th></th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
</tr>
</thead>
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<tr>
<td>TDS</td>
<td>.25</td>
<td>.27</td>
<td>.27</td>
<td>.27</td>
</tr>
<tr>
<td>DF</td>
<td>.11</td>
<td>.11</td>
<td>.12</td>
<td>.12</td>
</tr>
<tr>
<td>DB</td>
<td>.23</td>
<td>.27</td>
<td>.27</td>
<td>.26</td>
</tr>
<tr>
<td>STC</td>
<td>.04</td>
<td>.08</td>
<td>.09</td>
<td>.09</td>
</tr>
<tr>
<td>ST</td>
<td>.08</td>
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<td>.19</td>
<td>.19</td>
</tr>
<tr>
<td>PAC</td>
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<td>.05</td>
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<td>PAT</td>
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<td>PQ</td>
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<td>.24</td>
<td>.25</td>
<td>.25</td>
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<td>SBS</td>
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<td>SBR</td>
<td>.07</td>
<td>.13</td>
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<td>.14</td>
</tr>
</tbody>
</table>

Note. Total Digit Span (TDS); Digits Forward (DF); Digits Backward (DB); Serial Trials to Criterion (STC); Total Serial Task (ST); Paired-Associates Trials to Criterion (PAC); Paired-Associates Task Total (PAT); Porteus Maze Quotient (PQ); Special Teacher Social Behavior Assessment (SBS); Regular Teacher Social Behavior Assessment (SBR).
Summary

These results did not confirm the prediction that those students who had higher adaptive behavior would perform better on the Level I tasks. Likewise, social competence as measured by adaptive behavior did not correlate to any noticeable degree with teachers' ratings of classroom or school social skills. However, better teacher ratings of social skills, particularly on the part of the special education teachers, were associated with better performance on the Level I tasks. The Porteus Maze Test correlated with the measures of Level I abilities and the teacher ratings of social skills in a pattern and degree sufficient to support Jensen’s characterization of it as a measure of Level I ability. Performance on the Porteus Maze Test was not significantly correlated with adaptive behavior. Finally, IQ and social competence as measured by adaptive behavior and teachers' ratings of social skills were not discrepant in this predominantly lower-class sample. IQ correlated significantly with the measures of adaptive behavior and approached significance with the teachers' ratings of social skills. In terms of the bivariate correlation, IQ correlated well with the measures of Level I abilities, but in terms of the canonical composite, the variables of IQ, Race, Adaptive Behavior, and Social Index together accounted for only 12% of the variance in performance on the Level I tasks. This result is viewed as largely supportive of Jensen's findings of an interaction between IQ and socioeconomic status, and rote learning ability (Jensen, 1969a; Rapier, 1968). In this
sample, race and socioeconomic status were correlated, but their correlations were virtually zero with IQ or adaptive behavior. Likewise, race and socioeconomic status were not correlated with performance on the Level I tasks. In terms of teachers' ratings of social skills, however, the special education teachers tended to rate black students as having better social skills, and the regular teachers rated those students with lower social status as having better social skills confirming anecdotal observations and teacher judgments reported by Jensen (1969a, 1970b) of these skills among ethnic minority children.
CHAPTER V.
DISCUSSION

The canonical correlation analysis permitted the investigation of the relationships among the variables of IQ, Adaptive Behavior, Race, Social Index, performance on the learning tasks, and the teachers' judgments of social skills as well as the correlations among the variables themselves. The correlation between race and socioeconomic status (SES) with blacks having lower status is well-established. Also well-established are correlations between socioeconomic status and IQ and between race and IQ. Multiple correlations in the range of the .30s and .40s have been reported between WISC-R IQs and race and between WISC-R IQs and SES (Reynolds & Gutkin, 1979). The IQ scores obtained from the files in this sample were all WISC-R scores. The low correlations obtained in these results may have been due to a restriction of range in the variables of IQ and the Social Index in this study.

The moderate correlation between IQ and Adaptive Behavior is consistent with previous findings that traditional adaptive behavior measures such as the Vineland Social Maturity Scale (VSMS) are correlated with intelligence to a moderate degree (Reschly, 1982). Vineland Social Maturity Scale scores constituted 90% of the scores obtained from the files in this sample. Future research, theoretical formulation, and instrument development will be needed to address the relationship between the constructs of adaptive behavior and intelligence.
The correlations among the various learning tasks are moderate to poor suggesting that Jensen's characterization of all as Level I particularly the Paired-Associates Task, may be questionable. These findings are consistent with those of several of the studies reviewed in which the results from the Paired-Associates Task failed to follow the expected pattern (Jensen, 1965; Rohwer, Lynch, Levin, & Suzuki, 1968; Rohwer, 1971). Goulet (1968) also reported that paired-associates tasks have not shown consistent results in studies comparing normal and retarded subjects. Jensen (1970b) suggested that some of the confusion in the findings with the paired-associates tasks could be attributed to the failure to differentiate between subjects on the basis of primary and secondary retardation. The Paired-Associates results in this study correlated significantly (at the p<.05 level) with IQ, but not with adaptive behavior or teachers' ratings of social skills. On the other hand, the Porteus Maze Quotient correlated as well with Total Digit Span as did the Serial Task and better than Paired-Associates lending support to Jensen's suggestion that the Porteus Maze Quotient could be considered a measure of Level I abilities (Jensen, 1970b; 1980). The correlations obtained in this sample among the learning tasks may also have been attenuated due to a restriction of range. The correlations might well have been higher if subjects with IQs in the normal range had been included as in many of the Jensen studies.

The most striking result of the correlations between the learning tasks and teacher ratings was the direction of the
correlations rather than their size. The correlations with the special education teachers' ratings of social skills were negative. Given the nature of the rating scale used by the teachers, these correlations should be interpreted as indicating that the students who performed better on the learning tasks demonstrated better social skills. The correlations were poorer for the Paired-Associates Task and the Mazes. As a matter of fact, for the regular teachers, higher performance on the Porteus Mazes was associated with a lower rating on social skills. The other correlations with the regular teacher ratings were generally in the same direction but weaker than the correlations with the special teacher ratings. Another striking result was the lack of correlation between regular and special education teacher ratings. In contrast, Milburn (1974) found no differences between regular and special education teachers in the behaviors they identified as important for success in their classrooms as part of the development of the rating instrument used in this study. An inspection of the rating scales completed by the teachers suggested that one explanation for the lack of correlation in these results might be that the regular teachers rated more items as "Behavior not observed or not applicable for the student." This rating is assigned a score of zero according to the scoring procedures; thus, the student's overall score is biased in a positive direction. Nevertheless, the regular teacher ratings were generally in the same direction as the
special teacher ratings, suggesting that the biasing effect in the scoring did not unduly affect the overall results.

The bivariate correlations between the variables of IQ, Race, Socioeconomic Status, and Adaptive Behavior and the learning tasks revealed that Adaptive Behavior was not a good predictor, whereas IQ was a reasonably good one. In this predominantly lower socioeconomic status group, the correlation between IQ and performance on these tasks was in the range of .30 to .50. Jensen (1969a) reported correlations between IQ and learning task scores among middle-SES children as in the range of .60 to .80. In the low-SES group, however, he reported correlations between IQ and scores on learning tasks such as those employed in the study in the range of .10 to .20 (Jensen, 1969b). In this study, Adaptive Behavior correlated in the range of .10 to .20, or in other words, as IQ had in the Jensen studies. Adaptive behavior was also essentially uncorrelated with either the special or regular teachers' ratings of social skills. In the case of IQ, there was a slight tendency on the part of the special teachers to rate those having higher IQs as better behaved. There was a disagreement between regular and special teachers, however, with the regular teachers having a correspondingly slight tendency to rate those having a higher IQ score as poorer in classroom behavior. As was mentioned earlier, the results of the teachers' ratings revealed differential contact with the students on the part of the special and regular teachers. The regular teachers rated more items as
"Behavior not observed or not applicable for the student."

According to the scoring procedures for the Social Behavior Assessment instrument (Stephens, 1980), a score of zero is entered for this rating. This has the effect of biasing the score for the student in a positive direction, since a lower score indicates better behavior on this instrument. Thus, the regular teachers' rating of those students who were higher in IQ as having poorer behavior occurred in the presence of a positive bias in the scoring system employed with the instrument.

Race and socioeconomic status had no notable relation with performance on the learning tasks in this study, but there was something to note in relation to teacher ratings of social skills. The special teacher ratings suggested that there was a tendency for Blacks to be rated as having better social skills in the school setting, and while the correlation with race was negligible for the ratings by regular teachers, nevertheless, it was in the same direction. The opposite was true with respect to the Social Index measure, however. There was virtually no correlation with the special teacher ratings, but a negative correlation with the regular teacher ratings. This negative correlation indicates that the regular homeroom teachers tended to rate those students who were lower in social status as having better social skills. These results may be somewhat spurious, given the positive bias in the scoring procedures described earlier and the differential contact which the regular teachers reported with the students. These
findings, however, would be consistent with anecdotal reports of school personnel that lower SES minority children are viewed as having better social skills (Jensen, 1969a; 1970b). These findings also suggest the need for further research regarding the social class correlates of social intelligence (Greenspan, 1979).

Reschly (1982; 1985) proposed that adaptive behavior for school-age children be conceptualized as having two components, Adaptive Behavior-School (AB-S) and Adaptive Behavior-Outside School (AB-OS). The adaptive behavior measures obtained in this study are primarily measures of Adaptive Behavior-Outside School (AB-OS). The results suggest that Adaptive Behavior-Outside School has little to no relationship with these important school-related variables. Furthermore, in this sample IQ was indeed associated with both variables, most notably with learning, but also with teachers' ratings of social skills. The correlation between WISC-R IQs and the Porteus Maze Quotient in this study was .47. Although no reported correlations with WISC-R IQs could be located, the Porteus has been reported to correlate with the Stanford-Binet about .60 (Jensen, 1980).

Porteus (1950) had suggested that the Mazes measured a social or practical competence and adaptive capacity not tapped by conventional tests of general intelligence such as the Stanford-Binet. Several studies yielded sufficient correlations with judgments and ratings of educational and social sufficiency and quality of adjustment in the community among borderline and retarded
groups to lend credence to this claim (Buros, 1953). One would, therefore, have predicted that the Porteus Maze Quotient would correlate better with measures of adaptive behavior than with a measure of intelligence. The present results do not confirm this predicted relationship. Instead, the Porteus correlated better with IQ and the learning tasks than with the Adaptive Behavior measure or the teachers' ratings of social skills.

These data yielded one significant canonical correlation coefficient indicating a relationship between two sets of composites, one representing the predictor variables and one the criterion. The correlation between these two composites accounted for 51% of the variation between the two variable sets. The variable which contributed the most was IQ. This is quite remarkable given the restricted variability of IQ in this sample. On the criterion side, the next variables which contributed most to the relationship between the two variable sets were Total Digit Span (most represented by Backward Digit Span) and the Porteus Maze Quotient. The variables representing adaptive behavior outside of school and social skills within the school setting did not contribute to this correlation. The lack of contribution on the part of Adaptive Behavior is noteworthy since the range of this variable was not restricted in this sample. At the same time, the first predictor composite explained only 12% of the criterion variance suggesting that the four variables of IQ, Race, Adaptive Behavior, and Social Index are not that useful as predictors of
performance on learning tasks by predominantly lower class students. The point, however, is that Adaptive Behavior is an even poorer one.

These results are viewed as largely supportive of Jensen's findings that among children of low-socioeconomic status, IQ is not a good predictor of performance on "direct learning tests" (Jensen, 1969; Rapier, 1968). These studies presented evidence that IQ was a better predictor of performance in high- than in low-SES groups. Further research is needed to identify the correlates of learning task performance among low-SES students. Another question that needs to be addressed is whether performance on these learning tasks is related to academic performance.

The primary cautions which must be sounded with reference to these data involve the reliability and generalizability of these results. The number of subjects is small for the analytic techniques employed. The reliability of the coefficients is particularly suspect as a result. The subjects who participated in this study did so only after written parent permission was obtained. Although no differences were apparent among those who were selected who ultimately participated and those who were selected and did not participate, there may have been subtle differences which were undetected. This study shares all of the difficulties inherent in research utilizing intact groups.

In summary, the results of this study revealed that those students who had higher adaptive behavior scores did not perform better on the Level I tasks. Likewise, social competence as
measured by adaptive behavior did not correlate to any noticeable degree with teachers' ratings of classroom or school social skills. However, better teacher ratings of social skills, particularly on the part of the special education teachers, were associated with better performance on the Level I tasks. Thus, the hypothesis that secondary retardation (low on Level II, but not on Level I) would be characteristic of students with better social competence was not supported on the dimension represented by adaptive behavior, but was supported on the dimension of classroom social skills.

The Porteus Maze Test correlated with the measures of Level I abilities and the teacher ratings of social skills in a pattern and degree sufficient to support Jensen's characterization of it as a measure of Level I ability. Performance on the Porteus Maze Test was not significantly correlated with adaptive behavior, however.

Finally, IQ and social competence as measured by adaptive behavior and teachers' ratings of social skills were not discrepant in this predominantly lower-class sample. IQ correlated significantly with the measures of adaptive behavior and approached significance with the teachers' ratings of social skills. IQ also correlated well with the measures of Level I abilities.

In this sample, race and socioeconomic status were correlated, but their correlations were virtually zero with IQ or adaptive behavior. Likewise, race and socioeconomic status were not correlated with performance on the Level I tasks. In terms of teachers' ratings of social skills, however, the special education
teachers tended to rate black students as having better social skills, and the regular teachers rated those students with lower social status as having better social skills confirming observation and teacher judgments reported by Jensen. Although IQ correlated better than the adaptive behavior measure with the measures of Level I abilities and the teachers' ratings of social skills, a linear composite of the variables of IQ, Race, Adaptive Behavior, and Socioeconomic status was not highly predictive of the performance of the predominantly lower-class students.

While these results cannot be overgeneralized, they point to important implications for the diagnostic construct of adaptive behavior and its application in the classification of mild mental retardation. As such, these findings also have serious implications for current practice. The definition of mild mental retardation adopted by the American Association of Mental Deficiency (AAMD) (Grossman, 1977) and incorporated in the rules and regulations implementing Public Law 94-142 (Federal Register, 1977) stipulated "significantly subaverage general intellectual functioning existing concurrently with deficits in adaptive behavior" (Grossman, 1977, p. 11). The most recent AAMD revision maintained the dual dimensions but permitted the IQ score to range as high as 75 (Grossman, 1983). According to the findings of the present study, adaptive behavior, particularly Adaptive Behavior-Outside School, bears little relationship to important school-related behaviors such as learning and teachers' ratings of social skills. In other words, it would
not be possible to discriminate the "comprehensively retarded"
(persons who are low on both dimensions) from the "quasi-retarded"
(persons who obtain low scores on IQ tests, but whose adaptive
behavior scores are within the average range) on the basis of these
measures. At the present time, however, crucial educational
decisions are being made as though it were possible to discriminate
between these two groups, and the so-called "quasi-retarded" are
being denied access to needed remediation through special education
services. An apparent decline in school system prevalence of mild
mental retardation is believed to have been related to the use of
quite narrow and rigid concepts of adaptive behavior in making
classification decisions (Reschly, 1985).

At a minimum, then, in terms of current practice, the
comprehensive assessment of a student's adaptive behavior in cases
of suspected retardation should include the aspects of sensory-motor
skills, communication skills, socialization and social skills, and
the application of basic academic skills in everyday life identified
in the AAMD definition (Grossman, 1977, 1983). Reschly has also
recommended that the component of Adaptive Behavior-School be
assessed through an observation in the classroom, examination of
work samples, teacher interview, and the results of
individually-administered standardized achievement tests.

While the distinction between "quasi-" and "comprehensive" is
apparently not clearcut or relevant for school-related behaviors on
the basis of these data, nevertheless, its social and political
implications are important to consider. The overrepresentation of poor and ethnic-minority children among the "quasi-retarded" cannot easily be dismissed. Discussions of adaptive behavior have played a prominent role in placement bias litigation during the last fifteen years (Reschly, 1985). One solution which has been offered by Reschly (1982) as a means of resolving the dilemma of determining eligibility for services without labeling these children as mentally retarded would be to refine the classification system by using terms such as "educational retardation," "educationally handicapped," or some other term as behaviorally-descriptive as possible. Although the results of this study did not reveal any consistent relationships between better adaptive behavior outside of school and performance on the learning tasks or between better adaptive behavior and teachers' ratings of social skills, the social and political implications of the distinction suggest the need to consider less perjorative labels such as those recommended by Reschly (1982). The results of this study suggest that his recommendation deserves serious consideration to insure the provision of remedial services to students referred due to limited academic progress.

Written over one hundred years ago, the following quote speaks to issues that are still current with reference to mild mental retardation. "The term idiocy, however, is a very wide one, including conditions differing remarkably from each other, both in kind and in degree, while not seldom it is misapplied to cases in
which there is more backwardness of the intellectual powers....
When the time comes for positive instruction, their (backward children's) slowness almost wears out everyone's patience; and among the poor, indeed, the attempt at teaching such children is at length given up in despair, and growing up in absolute ignorance, it is no wonder that they would be regarded as idiots. Still, dull as such children may be, and dullest still they must needs become if allowed to grow up untaught to manhood, there is a difference between them and idiots..." (Charles West, 1868 as quoted in Scheerenberger, 1983). Although the terminology has changed, the heterogeneity of conditions subsumed under this label continues to concern researchers and educators. Differentiating the condition from "backwardness of the intellectual powers" and seeking ways to minimize mislabeling continue to concern practitioners and diagnosticians. The connection with poverty and the need to provide access to needed educational programs and services continue to concern policymakers and advocates.

The primary difference between "them and idiots" has long been presumed to be some sort of adaptability or social competence which is predictive of a better adult adjustment once schooling has been completed. In the meantime, a crucial educational question involves deciding upon the most appropriate means of delivering educational services to both groups. Some have suggested that two separate categories of mental subnormality should be recognized rather than conceptualizing different levels of a single, continuous
distribution (Jensen, 1970b; Reschly, 1982; Robinson & Robinson, 1976;). As a matter of fact, in 1930 the White House Conference on Handicapped Children suggested that the term mental deficiency refer to retarded intellectual and social competence and the term feeblemindedness refer to adequate social competence with retarded intellectual functioning (Scheerenberger, 1983). Instead, during the 1940s mental deficiency replaced feeblemindedness as the generic term (Scheerenberger, 1983). The current AAMD definition has gone further and excluded those persons demonstrating adequate adaptive behavior or social competence. The results of the present study suggest that the dimension of adaptive behavior might better serve to differentiate between two types of mental subnormality rather than retardation and normality.
REFERENCES


Baller, W. (1936). A study of the present social status of a group of adults, who when they were in elementary schools were classified as mentally deficient. Genetic Psychology Monographs, 18, 165-244.


ACKNOWLEDGMENTS

I wish to acknowledge gratefully the assistance and support of many people in the completion of this project: my family, the members of my committee, the administrators and teachers of Terrebonne and Lafourche Parish, and the students and their parents who participated. Deserving of special mention are Jeff Grimes for assistance with the data analysis, Linda Schaff for collecting the data and for clerical assistance, and Mrs. Dena Yarbrough, Director of Special Education in Terrebonne Parish for logistical and administrative support.
APPENDIX.

CORRESPONDENCE AND CONSENT DOCUMENTS
March 26, 1984

To: Principals at Delegated Schools

I am hereby granting Mrs. Jane Ross-Reynolds my permission to conduct the necessary research to accomplish the writing of a thesis for her doctoral degree. I am asking that the principals involved in this research allow Mrs. Ross-Reynolds to peruse any records necessary, and to set up a specific time for testing of the control group of students. The information gathered through this research will be a valuable source for the Terrebonne Parish School System.

Thanking you for your understanding in this most important matter, I remain

Respectfully yours,

Paul W. Fournier
Superintendent

cc: Dr. Daniel J. Reschly
    Iowa State University
    Ames, Iowa
Mr. Chris Wilmoth, Psychologist
Lafourche Parish Pupil Appraisal Center
P. O. Box 708
Thibodaux, LA 70302

Dear Mr. Wilmoth:

Mrs. Jane Ross-Reynolds is presently doing doctoral research and seeks information that our system is able to provide. Please permit Mrs. Ross-Reynolds to have access to confidential files for this purpose. It is understood that Mrs. Ross-Reynolds is obtaining this information for statistical and comparative purposes and will not identify any student in the information obtained from the confidential records.

Cordially yours,

Jeffrey J. LeBlanc
Superintendent of Schools

JJLeB:bb

cc: Mrs. Jane Ross-Reynolds
    1-B Audubon Court
    Thibodaux, LA 70301
Mr. Rudy Guidroz, Principal, Cut Off Elementary School
Mr. Roland Cheramie, Principal, Golden Meadow Lower Elementary School
Mr. Curt Boudreaux, Principal, Golden Meadow Upper Elementary School
Mr. O'Neil F. Andras, Principal, W. S. Lafargue Elementary School
Mrs. Velda Rogers, Principal, Larose Lower Elementary School
Mr. Ray Bernard, Principal, Larose Middle School
Mr. Malcolm Foret, Principal, Raceland Lower Elementary School
Mr. Alden Foret, Principal, Raceland Upper Elementary School
Mr. George Babin, Principal, Thibodaux Elementary School

Dear Principals:

This letter will introduce to you Mrs. Jane Ross-Reynolds, who is conducting a study dealing with special students.

After reviewing Mrs. Ross-Reynolds' project, I have granted her permission to contact you (as per her request) in this connection. Please give her your full cooperation.

With sincere personal regards, I remain

Cordially yours,

Jeffrey J. LeBlanc
Superintendent of Schools

JJLeB:bb

cc: Mrs. Jane Ross-Reynolds
    Mr. Chris Wilmoth
Dear Principal,

Students from your school have been randomly selected as subjects in my study investigating whether there are learning and social skills differences between mildly retarded and slow learner students. The purpose of this letter is to inform you about the study and to thank you for your cooperation and support in carrying it out.

I have tried to anticipate and answer some of your questions in this letter, but I would like to speak with you personally about any of your concerns. I will be calling to find out when it would be convenient for me to meet with you.

What is the purpose of the study? The purpose is to investigate whether there are learning and social skills differences between the two groups of students mentioned earlier. The results will be useful in determining whether there are legitimate differences between the two groups to justify separate classifications. Another useful application will be in operationalizing the requirement in Bulletin 1508 that evaluations demonstrate whether or not a student learns like a handicapped student. Finally, the results are potentially useful in providing recommendations for materials and instructional techniques to use in the regular classroom with those students who are no longer eligible for special education.

What will be needed at the school level? The students selected as subjects will be administered some individual learning tasks. These will require about an hour to complete. Parent permission will be obtained. The students will be paid $.30 cents each for their participation in the study.

Because I will be using the data obtained for my dissertation, I have arranged for a trained person, Mrs. Linda Schaff, to administer the learning tasks at my expense. Mrs. Schaff has her Master's degree and reading specialist certification.

In order to obtain the data on social skills differences, the students' special education teacher and regular homeroom teacher will be asked to complete a short questionnaire. It is estimated that the questionnaire will take about 15 minutes to complete. All results will be confidential.

I will call you in the coming week to arrange a convenient time for us to meet so that I can answer any questions you may have and discuss further details as well as schedule Mrs. Schaff's visit to your school. Thank you for your attention to this matter. I am looking forward to working with you.

Sincerely,

Jane Ross-Reynolds
School Psychologist

cc: Mr. Steve Lafleur,  
Assistant Superintendent  
Mrs. Dena Yarbrough,  
Director of Special Education
Dear Principal,

Students from your school have been randomly selected as subjects in my study investigating whether there are learning and social skills differences between mildly retarded and slow learner students. The purpose of this letter is to inform you about the study and to thank you for your cooperation and support in carrying it out.

I have tried to anticipate and answer some of your questions in this letter, but I would be happy to respond personally to any of your questions.

What is the purpose of the study? The purpose is to investigate whether there are learning and social skills differences between the two groups of students mentioned earlier. The results will be useful in determining whether there are legitimate differences between the two groups to justify separate classifications. Another useful application will be in operationalizing the requirement in Bulletin 1508 that evaluations demonstrate whether or not a student learns like a handicapped student. Finally, the results are potentially useful in providing recommendations for materials and instructional techniques of use in the regular classroom with those students who are no longer eligible for special education.

What will be needed at the school level? The students selected as subjects will be administered some individual learning tasks by a trained person, Mrs. Linda Schaff. These will require about an hour to complete. Parent permission must be obtained, and I will need your assistance in doing so. The students will be paid $.50 cents each for their participation in the study.

In order to obtain the data on social skills differences, the student’s special education teacher and regular homeroom teacher will be asked to complete a short questionnaire. It is estimated that the questionnaire will take about 15 minutes to complete. All results will be confidential.

I will call you in the near future to answer any questions you may have and to schedule Mrs. Schaff's visit to your school. Thank you for your attention to this matter. I am looking forward to working with you.

Sincerely,

Jane Ross-Reynolds
School Psychologist

cc: Mr. Jeffrey LeBlanc,
Superintendent
Dear teacher,

Thank you for your cooperation and efforts in helping me carry out this research study. It is designed to investigate learning and social skills characteristics of mildly retarded and slow learner students.

Please tell your students selected for this study that they will receive a payment of $0.50. They will receive $0.25 for their permission forms and $0.25 for the tasks.

Please ask your students to return their signed permission forms as soon as possible to the special education teacher or to the principal.

A trained examiner, Mrs. Linda Schaff, will administer the learning tasks at your school. All of her expenses will be paid by me.

You are kindly requested to complete the Social Behavior Assessments on the students named. Your part in this project is greatly appreciated. Please return all completed forms (parent permission and Social Behavior Assessments) to the building principal by the date he indicates.

With sincere thanks,

Jane Ross-Reynolds, School Psychologist
Dear Parent,

Your son has been selected to participate in a research study at his school. The purpose of this study is to find out more about how students learn and behave in school. Your son will be asked to take four short tests. He will be out of class for about an hour. At another time, your son's teacher will be asked to fill out a questionnaire about his behavior. All of the results will be confidential. Your son's teacher will not be given the results. They will be coded by numbers. The results will be reported by groups, not by individuals.

In addition, we ask your permission to take the following information from the student's cumulative record and/or confidential file: exceptionality and test scores. You may be asked to supply your occupation and educational level. If you would like a summary of the results of the study, please check the box. If you would like for your son to participate in this study, please sign below and give the date.

PLEASE RETURN THIS LETTER TO YOUR SON'S SCHOOL WITH YOUR DECISION.

Sincerely,

Jane Ross-Reynolds

I GIVE MY PERMISSION. Parent's Signature Date

I DO NOT GIVE MY PERMISSION. Parent's Signature Date

PLEASE SEND ME A SUMMARY OF THE RESULTS OF THIS STUDY.