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A theoretical and pragmatic application of paradigmatic behaviorism: Screening and identification of high potential/underachievers currently in regular education

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A THEORETICAL AND PRAGMATIC APPLICATION OF PARADIGMATIC BEHAVIORISM: SCREENING AND IDENTIFICATION OF HIGH POTENTIAL/UNDERACHIEVERS CURRENTLY IN REGULAR EDUCATION

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By

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ABSTRACT

The purposes of the present investigation were (1) to provide the field of high potential/underachievers with a unified theory that is heuristic in its manner of explaining current phenomena and in anticipating potential problems, (2) to suggest a practical device for screening of the low-incidence, high potential/underachieving population with the goal of better serving these individuals, and (3) to delineate important ramifications of the present analysis.

As a result of the application of a paradigmatic-behavioral approach (Staats, 1963, 1975) to the underidentification problem of high potential/underachievers, an experiment was conducted with the purpose of developing a screening strategy and device.

The investigation involved comparing three groups of subjects: (1) high potential/underachievement, (2) high potential, and (3) regular education. These groups were contrasted on four psychometric measures of "achievement" based on the Stanford Achievement Test series: (1) Total Listening Comprehension, (2) Total Reading, (3) Total Language, and (4) Total Math. In addition, a discriminant analysis was conducted on the subjects with high potential/underachievement and those in regular education.

The results of these analyses were consistent and supportive of the paradigmatic-behavioral predictions: (1) High potential/underachievers scored higher on the Total Listening Comprehension composite as compared to an average of the Total Reading,

Total Language, and Total Math scores; the reverse relationship existed for the students who were high potential and those from regular education. (2) On the Total Listening Comprehension measure, children from regular education scored significantly lower than the high potential/underachievers and the high potential. (3) In contrast, for the average of the Total Reading, Total Language, and Total Math scores, the high-potential group performed significantly higher than both the high-potential/underachieving and regular-education samples. (4) Overall, the high-potential group scored significantly higher than the high-potential/underachievers and the subjects from regular education. (5) Of the four Total tests, the discriminant analysis revealed that the Total Listening Comprehension composite contributed the most to predicting group affiliation. A 88% "hit rate" was obtained.

The analysis concluded with the implications and advantages of unified positivism and paradigmatic behaviorism. Specific to this investigation was the development of a practical screening device. Broader ramifications were discussed.

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CHAPTER I

INTRODUCTION

Levels of analysis

Why study students with high potential/underachievement (HPU)? Aside from a global reason such as personal and professional interest, the topic of HPU is intriguing on at least two levels from the present view. First, on a philosophical-theoretical level, education, as a sub-field of psychology, has many of the characteristics of a what has been referred to as a preparadigmatic or preunified science (Staats, 1983, 1987c). Some of these preunified attributes have been evidenced in the field of study related to students with HPU, although overlooked by most. The combined application of the theoretical framework of paradigmatic behaviorism (PB) (Evans & Eifert, in press; Staats, 1963, 1968, 1971, 1975, 1977, 1981) and the philosophy of science called unified positivism (Staats, 1983, 1986a, 1986b, 1987a, 1987c, 1987d, 1987e, 1988a) can provide needed integration and unification in this area. The resulting benefits to this seemingly confined and isolated educational area will be discussed and elaborated upon with the intent to address both specific and broad issues.

One such advantage relates to the second level, namely the empirical-pragmatic level. Based on the philosophical-theoretical analysis, viable, feasible and testable hypotheses are derived that may have societal benefits by screening for yet-to-be identified students with HPU currently in regular education, and by providing practical,

cost-effective methods for such identification procedures. In addition, while the present investigation will focus its efforts and resources on the screening and identification of children with HPU, peripheral discussions will be alluded to that will have direct relevance to other related issues such as instruction and programming.

High potential/underachiever: An overview

High potential: History, definitions, attributes, identification, prevalence. The study of the gifted, talented and creative has had a very long history. Major advances were made in the nineteenth century with significant contributions from Sir Francis Galton, Karl Pearson, James McKeen Cattell, Emil Kraepelin, H. Ebbinghaus, Alfred Binet, Victor Henri, and Theodore Simon (see Sattler, 1988). The study of the gifted in the twentieth century was dominated primarily by two central figures: Lewis Terman for his adaptation of the Binet-Simon intelligence scale for the United States, and David Wechsler for his series of intelligence tests (Sattler, 1988). While the twentieth century has a decade remaining, other prominent individuals who have already made significant impacts include Yerkes, Otis, Porteus, Goodenough, Thurstone, Piaget, Bender, Buros, P. Cattell, Guilford, Vernon, Kirk and J. J. McCarthy, R. B. Cattell, Bayley, D. McCarthy, R. L. Thorndike, Hagen, and Sattler (Sattler, 1988). With regard to creativity, Torrance (e.g., 1962, 1963, 1965, 1966, 1971, 1972, 1977, 1984) has played a major role as well as Renzulli (1978, 1986). In addition, with the cognitive revolution have emerged many information-processing theories of intelligence and giftedness (e.g.,

Gardner, 1983, 1987; Resnick, 1976; Sternberg, 1977, 1979, 1981, 1985, 1986; Sternberg & Davidson, 1986; Sternberg & Detterman, 1979, 1986).

Through this history, the study of the gifted has progressed from relatively narrow and confined approaches of the concept of giftedness to more recent, multi-trait, multi-assessment views. For example, Terman and his associates' (Terman, 1925; Terman & Oden, 1947, 1959) early longitudinal investigations of genius appeared to readily accept the definition of intellectual giftedness as performing in the upper first percentile on a test of intelligence (Frasier, 1987, p. 157; Gregory, 1984-1985). During the Terman era, the measurement of mental abilities flourished with minimal self-criticism. Subsequently, group intelligence tests were utilized. However, as evidence accumulated which suggested that intelligence tests may not be valid for the disadvantaged and culturally different (Whitmore, 1980, p. 12), and as multi-trait theories of intelligence (e.g., Guilford) received greater recognition and acceptance, the glory years of optimism were replaced by caution in the field of mental measurement.

Through the years, legal definitions were gradually adopted. Prior to 1971, only four states had a legal or formal definition of giftedness (Fox & Brody, 1983). By 1978, forty-two states had formal or working guidelines (Fox & Brody, 1983), although the definitions differed from state to state (Rosner & Seymour, 1983, p. 79). The results of Marland's (1972) congressional report had a profound effect on the area of gifted education and on providing a definition. This newly adopted definition broadened the conceptualization of giftedness

to include not only demonstrated high ability, but the potential for high achievement as well. This federal definition delineated six types of giftedness: high abilities in intellect, academics, art, leadership, creativity and psychomotor talents (Whitmore, 1987, p. 144).

According to the Gifted and Talented Children's Act of 1978, gifted and talented children are those:

> ... who are identified ... as possessing demonstrated or potential abilities that give evidence of high performance capabilities in areas such as intellectual, creative, specific academic, or leadership ability, or in the performing and visual arts, and who by reason thereof, require services or activities not ordinarily provided by the school. (from Payne, Patton, Kauffman, Brown, & Payne, 1983, p. 138)

Gregory (1984-1985) provided the following summary of several of the prominent and major definitions and theories of giftedness:

> Definitions of the gifted and giftedness abound. For example, the gifted and/or giftedness has been defined as, performance in the upper 1% on a test of intelligence (Terman, 1925); demonstrated achievement or the potential ability to perform at a superior level as determined by professionally qualified persons (Marland, 1972); an exceptional level of performance based on a combination of above average ability, task commitment, and creativity

> (Renzulli, 1978); potential for critically acclaimed performance or exemplary production of ideas in a variety of spheres that enhance the life of humanity (Tannenbaum, 1983); exceptional competence in one or more domains of ability with interests, personality, traits, and environment fixing the orientation of the individual toward a particular field of talent and motivation fixing the intensity of the talent (Gagne, 1985); and superior general abilities, special focused talents, and a special view of self that views high level creative achievement or production as attainable (Feldhusen, 1986). (p. 157)

Many of the recent definitions of giftedness include the concept of "potential" although not all do (Fox & Brody, 1983, p. 102). While on the surface the addition of potential (as opposed to demonstrated ability) may appear rather unassuming, this inclusion has profound implications. At least on a conceptual level, nearly all students exhibit some form of potential to succeed in one area or another. In addition, this development has stirred some controversy since it is becoming less accepted that IQ tests measure potential and more agreed upon that to a fair degree IQ tests assess <u>achieved</u> ability. Obvious pertinent questions arise such as: "What do IQ tests really measure?" "How do we measure potential if the implication is that the behavior in question is not displayed?" "How do we infer potential?" Despite advocating strongly for the inclusion of potential in the definition of giftedness, Whitmore (1987) stated, "Identification of intellectually

gifted students has become much more difficult with the focus on potential and the need for multiple methods of assessment" (p. 144).

The label "high potential" (HP) has been applied to those individuals displaying, in one form or another, some of the necessary attributes and/or the beginnings of performance that would be considered above average. For example, according to Wechsler's (1974) "intelligence classification," an IQ equal to or above 110 would constitute "High Average (Bright)" abilities, and would include approximately the upper 25th percentile. [Individuals who are intellectually gifted as evidenced by an IQ equal to or greater than 130 are included in this HP group.]

The rationale follows that these students should perform in the high-average range or better on academic tasks (e.g., criterion-referenced tests, informal inventories, standardized achievement tests) given their above-average intellectual abilities. Unfortunately, these intellectual skills are necessary, but not sufficient factors in performing well on various formal and informal measures of academic achievement.

Attributes of the gifted are varied. Whitmore (1980) provided an interesting history of the stereotypes held about the gifted. Prior to the studies of Galton and Terman, the intellectually gifted was seen as a "queer, physically weak little prodigy who became neurotic and was apt to burn out quickly" (p. 9). More objective research by Galton and Terman shattered this myth. However, their investigations had the unfortunate side effect of creating yet another myth: that "children

of superior mental ability typically are large and strong for their ages, healthier than average children, more emotionally stable, far less apt to be guilty of juvenile misbehavior, and more resistant to temptations than other children" (p. 9). Although Terman's subjects were not necessarily high functioning in all areas such as spelling, factual information, history and arithmetic computation (Levine, 1987, p. 204), the misconception pervaded that individuals who were gifted were nearly perfect. Interpreters of the data did not take into account the selection bias that may have occurred. In particular, subjects in Terman's investigations were primarily from high socio-economic backgrounds and thus more apt to display the attributes mentioned.

Current views acknowledge that the gifted fall somewhere between the stereotypes held before the Galton-Terman era and the characteristics found in Terman's sample. It is generally accepted that children who are gifted and HP are heterogeneous with strengths and weaknesses like all children.

Due to this awareness of variability, the field of giftedness is presently dominated by research and practice that embrace multi-trait, multi-method assessment models (Whitmore, 1980). This entails utilizing information provided by the following: individual intelligence tests like the Wechsler Intelligence Scale for Children-Revised (WISC-R) and Stanford-Binet, Form L-M; group intelligence tests; individual achievement tests; group achievement tests; adaptations of conventional assessment methods such as utilizing

the Raven's Progressive Matrices (Raven, 1956, 1962); teacher nominations and checklists; parent nominations and other completed forms; peer nominations; community-leader nominations; self-nominations; creativity measures; culture-specific systems; quota systems; and instructional models (Alexander & Muia, 1982; Fox & Brody, 1983, pp. 104-105; Frasier, 1987; Gregory, 1984-1985; Renzulli & Hartman, 1981; Torrance, 1966, 1971).

Frasier (1987) provided a concise summary of the "best identification practices" for the gifted. She advocated for an emphasis on the diversity within the gifted population. This meant having inclusive definitions and identification practices, and the gathering of data from multiple sources (both objective and subjective) with multiple criteria for inclusion. Participating evaluators should include professionals and nonprofessionals who represent various areas of expertise and who are knowledgeable about gifted behavioral indicators. The identification process should occur as early as possible and should be on-going throughout the child's education. Cultural differences in manifesting gifted behavioral indicators should not be overlooked. Decisions only should be made when all pertinent data on a student have been obtained and reviewed. Finally, results of the diagnostic procedures should be used in determining the student's curriculum (p. 156).

Prevalence of the gifted (and not the more inclusionary category of HP) has been estimated to be between 2.5 to 3 million school-aged children with only 1.2 million in public special-education programs

(Zirkel & Stevens, 1987). These types of data prompted Whitmore (1980) to suggest that the gifted represent the most underserved classification in special education.

Underachiever: History, definitions, attributes, identification, prevalence. Used in this context, "underachievement" will refer to a global classification where the individual is not performing up to some measure of expectation. "Underachievement is the label attributed to a pattern of performance that is significantly discrepant from the individual's assessed level of ability" (Whitmore, 1980, p. 146).

A sub-category of this underachieving heterogeneous group is learning disability (LD), first coined by Kirk (1962). There are many formal definitions of LD (see Berk, 1983) and these have gone from being theoretically and medically oriented (e.g., minimal brain dysfunction) to being more practical and operational for the educational diagnostician (e.g., ability-achievement discrepancy) (Berk, 1983). The federal definition of LD as specified by Public Law 94-142 (Education of Handicapped Children Act 1975/1977) stated:

> "Specific learning disability" means a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, which may manifest itself in an imperfect ability to listen, think, speak, read, write, spell, or to do mathematical calculations. The term includes such conditions as perceptual handicaps, brain injury, minimal brain disfunction, dyslexia, and developmental aphasia. The term

> does not include children who have learning problems which are primarily the result of visual, hearing, or motor handicaps, of mental retardation, or of environmental, cultural, or economic disadvantage. (Federal Register, 1977, p. 42178)

This definition was not embraced by all professionals. Criticisms were raised on the following grounds (Berk, 1983): (1) The definition appeared to include only "children" and not adults. (2) The phrase, "basic psychological processes," was ill-defined. (3) The section, "In understanding or in using language, spoken or written," was redundant. (4) The inclusion of "spell" was unnecessary since this could be considered under written language. (5) "conditions" could not be defined clearly. And (6) "does not include ... which are primarily the result of," made assumptions that were not supported in practice.

As a result of these types of criticisms, six prominent and influential organizations formed the National Joint Committee on Learning Disabilities (Abrams, 1987; Hammill, Leigh, McNutt, & Larsen, 1981; National Joint Committee on Learning Disabilities, 1981). The six national associations were: (1) Association for Children and Adults with Learning Disabilities [now called the Learning Disabilities Association of America (LDAA)], (2) American Speech-Language-Hearing Association, (3) Council for Learning Disabilities, (4) Division for Children with Communication Disorders, Council for Exceptional Children, (5) International Reading Association, and (6) Orton Dyslexia Society.

One of its major purposes was to formulate a new definition of LD. This new definition stated:

> Learning disabilities is a generic term that refers to a heterogeneous group of disorders manifested by significant difficulties in the acquisition and use of listening, speaking, reading, writing, reasoning or mathematical abilities. These disorders are intrinsic to the individual and presumed to be due to central nervous system dysfunction. Even though a learning disability may occur concomitantly with other handicapping conditions (e.g., sensory impairment, mental retardation, social and emotional disturbance) or environmental influences (e.g., cultural differences, insufficient/inappropriate instruction, psychogenic factors), it is not the direct result of those conditions or influences. (National Joint Committee on Learning Disabilities, 1981)

While this new definition appeared to improve upon its predecessor, Berk (1983) noted the following : (1) "significant difficulties" was not defined. (2) "Due to central nervous system dysfunction" was ambiguous. And (3), the exclusionary opening statement was unclear as well: "It is not the direct result of those conditions or influences ..."

After reviewing the major definitions of LD, Berk noted that nearly all of the definitions have common elements of inclusion and exclusion. The inclusionary aspects consisted of:

(1) average/normal intelligence or higher (as implied by the exclusionary clause that the disability cannot be due to mental retardation);

(2) ability-achievement discrepancy with the responsibility for operationalizing the amount of required discrepancy placed upon state agencies;

(3) achievement disorder in one of the academic subject areas (i.e., reading/decoding, reading comprehension, spelling, writing, math computation, math concepts/application); and

(4) psychological process disorder (e.g., memory, perception, closure, modality, and sequencing). [However, Berk noted the decline in emphasis on psychological process disorders and the tentative nature of the measurement of such constructs.]

The exclusionary clauses stated that the disability could not be due primarily to the following, although these may exist in conjunction with the LD:

(1) mental subnormality, mental retardation;

(2) visual, hearing, and/or motor handicaps;

(3) emotional disturbance; and/or

(4) environmental, cultural and/or economically disadvantaged.

The LD classification can thus be seen as having a strong exclusionary component with the implication that the etiology is related to dysfunctions in the neurological system or central nervous system with perceptual- and/or psychological-process disorders.

More recently, the National Joint Committee for Learning Disabilities approved by majority vote the following definition:

> Learning disabilities is a general term that refers to a heterogeneous group of disorders manifested by significant difficulties in the acquisition and use of listening, speaking, reading, writing, reasoning, or mathematical abilities. These disorders are intrinsic to the individual, presumed to be due to central nervous system dysfunction, and may occur across the life span.
>
> Problems in self-regulatory behaviors, social perception, and social interaction may exist with learning disabilities but do not by themselves constitute a learning disability.
>
> Although learning disabilities may occur concomitantly with other handicapping conditions (for example, sensory impairment, mental retardation, serious emotional disturbance), or with extrinsic influences (such as cultural differences, insufficient or inappropriate instruction), they are not the result of those conditions or influences. (National Joint Committee on Learning Disabilities, 1990).

Consensus does not exist on what constitutes the following terms and how they relate to LD: reading disability, underachieving reader, and dyslexia. Some argue that they are all interchangeable while others have attempted to make fine and/or logical distinctions among the terms. From an historical perspective, the term dyslexia had its

roots in the study of congenital word blindness in the late 1800s and early 1900s under the medical model. The concept of LD formally emerged in the 1960s through a more educational model (Kirk, 1962), although the field of LD was certainly influenced by the medical model as well (see Doris [1986] for an excellent review).

For consistency purposes, the present approach will consider underachievement as the overall construct describing all ability-achievement discrepancy categories. This broad classification can be divided into two sub-categories: LD and "other." Further, the LD and "other" categories can be sub-divided into smaller units with specific reference to each of the academic subject matters. For example, reading disability and dyslexia will be used interchangeably and considered under the LD category. Dyscalculia, the term used in reference to a math disability, will be a sub-category of LD as well.

The characteristics of individuals with LD or underachievement have been generally well documented. Based on a comprehensive meta-analysis comparing students with LD and "normal" children, Kavale, Forness, Bender and Nye (1987) found discriminating attributes in all four major domains investigated: linguistic (e.g., syntax), achievement (e.g., reading or math achievement), neuropsychological (e.g., IQ, attention, perception), and social-behavioral (e.g., interpersonal skills). The "classic" student with LD is inattentive, hyperactive, and impulsive exhibiting perceptual-motor difficulties. For the Hawaii State Department of Education, the child must display attentional, perceptual and language disorders in order to be accorded

the diagnosis of LD. [Note that a recent revision of the Hawaii State criteria has been completed and implemented.]

In practice, identification procedures have generally involved teacher referrals followed by comprehensive assessments. While there have been many experimental models for identification, no consensus has been reached as to the assessment device(s) for the identification of students with LD or underachievement although there are many traditionally utilized instruments.

In terms of its stature, the LD category is the most recent and largest category of exceptional children. During the 1986-1987 school year, approximately 1.9 million students with LD from the ages 3 to 21 were served in special education (Lerner, 1989). Interestingly, the trend of increasing frequency of such placements across the years has made some to argue that we are over-identifying students with LD. For example, for the LD category, the numbers of children served in the U.S. and in insular areas were approximately .8 million, 1.6 million, and 1.9 million, for the school years 1976-1977, 1981-1982, and 1986-1987, respectively (Lerner, 1989). In contrast, for the mentally retarded, the frequencies of students served in the U.S. and in insular areas have steadily decreased (Jordan & Ramirez, 1987). The contention has been put forth that a large proportion of those that normally would be classified as mentally retarded in the past are being placed into the LD category. This may be occurring for many reasons two of which are the heightened public and professional awareness of LD, and the

lesser stigma associated with LD in comparison to the label of mentally retarded.

High potential/underachiever: History, definitions, attributes, identification, prevalence. Derived from the combination of HP on the one hand, and underachievement on the other, is the term high potential/underachieving (HPU). This group may include the gifted/underachiever, gifted/learning disabled, gifted/dyslexic, high potential/learning disabled, high potential/dyslexic, and so on.

To some extent, the dual-component HPU category is paradoxical and internally contradictory. How can a child exhibit both high achievement and underachievement simultaneously? (Fox, Brody, & Tobin, 1983b; Sapon-Shevin, 1987; Tannenbaum & Baldwin, 1983, pp. 11-12). However, the two can co-exist if we accept the term "potential" as opposed to demonstrated ability (Fox, 1987; Fox & Brody, 1983, p. 104). Therefore, students with HPU simply can be thought of as those at the higher intellectual end of the underachieving scale. Indeed, Sapon-Shevin (1987) argued that the categories of gifted and learning disabled were destined to merge given the development of defining giftedness from demonstrated ability to "potential."

Children with HPU are those who demonstrate above-average intellectual skills, but who are not achieving commensurately in academic achievement. For example, the youngster who is both gifted and learning disabled will typically have an IQ score of 125 or greater, will have estimated academic skills well below that expected based on the IQ measure, and this discrepancy will not have been

attributed to be due to the four previously delineated exclusionary factors. For the child who is intellectually HPU, an IQ of 110 or greater will be exhibited with significantly lower academic achievement demonstrated.

Before addressing the attributes of individuals with HPU, two points should be made: (1) The study of children with HPU is at a relatively early stage. Although the field is certainly gaining in knowledge and stature as evidenced by the increased number of texts on the subject, currently only a handful of texts are available and very little empirical research has been conducted (see Fox, Brody, & Tobin, 1983; Vaughn, 1989). Thus, nearly all of the characteristics to be discussed were based on anecdotal and case-study observations of investigators and therefore, should be considered somewhat tentative.

(2) A second point is that in reviewing the literature, it is difficult to discern the attributes from the hypothesized etiologies of children with HPU. For example, attentional difficulties are supposedly common characteristics of students with HPU (as well as for the LD, mentally retarded, etc.). Some have considered attentional difficulties as diagnostic signs (i.e., dependent variables) while others have equated such deficits as causes of the ability-achievement discrepancy (i.e., independent variables). The discussion to follow will not, at this juncture, attempt to differentiate the attributes from the causes, but will list the factors seemingly associated with HPU in order to provide a general "profile" of students with HPU.

Like all categories of exceptionality, the students who make up the HPU classification are varied and heterogeneous (Suter & Wolf, 1987; Tannenbaum & Baldwin, 1983; Vaughn, 1989). As would be expected, these individuals, especially the gifted/LD, have many characteristics of the gifted/non-LD. For example, Sapon-Shevin (1987), based on a review, found that children who were gifted/LD were similar to the gifted in interests, imagination, abstract thinking, creativity, and learning style. Both groups disliked drill and repetition, preferred problem solving, and were good in reasoning and verbal abilities. Suter and Wolf (1987) reiterated these commonalities. Other characteristics mentioned in the literature are included in Table 1.

As with all heterogeneous exceptionalities, not all students with HPU exhibit all of these characteristics; the group of children with HPU has many subtypes (Suter & Wolf, 1987). In addition, as implied by the educational and environmental attributes, not only are the characteristics of the HPU individual important, but so are the environmental factors. Professionals in the field have noted the downward-spiral effect where, for example, being slightly behind in academic skills can lead to being given too difficult instructional material, which results in even worse performance, which leads to even more remedial academic skills, and so on (Gleason, 1988; Whitmore, 1987). Additional environmental situations that may facilitate underachievement in children with HP include too low or high parent and/or teacher expectations, inappropriate curriculum that is too rudimentary or that does not consider the learning style of the child,

Table 1

Characteristics of High Potential/Underachievers

Area	Description
1. Readiness	Lack of academic readiness skills.
2. Attention	Inattention and/or selective attention, distractibility, hyperactivity or hypoactivity, impulsivity/impatience.
3. Perception & Motor	Auditory- and/or visual-perceptual deficiencies, fine- and gross-visual-motor delays.
4. Processing	Relatively weaker successive/sequential processing as compared to simultaneous processing, pervasive information-processing deficiencies such as short-term and long-term memory difficulties.
5. Development	Scattered/uneven skill development.
6. Organization	Disorganization, difficulty following directions, inflexibility.
7. Behavior	Low or selective motivation/interests, psychological disturbances and defenses, behavioral-management difficulties, low frustration tolerance, anxiety, conduct disorder.
8. Cognitive	Inappropriate expectations (too high or low), inadequate self-concept/self-confidence, learned helplessness.
9. Social	Immaturity, susceptibility to peer pressure, fear of success, lack of risk taking, passivity.
10. Education	Educational understimulation and inappropriateness.
11. Environment	Culturally diverse, unstable family setting.
12. Medical	Health impairments that decrease or detract from instruction.

Table 1 (continued)

Characteristics of High Potential/Underachievers

[Note: From Butler-Por, 1987; Clark, 1988; Gleason, 1988; Jacobson, 1984; Kendig, 1988; Levine, 1987, pp. 204-207; Mandel & Marcus, 1988; Rimm, 1986; Rosner & Seymour, 1983; Sapon-Shevin, 1987; Senf, 1983, p. 43; Snart, Das, & Mensink, 1988; Suter & Wolf, 1987; Tannenbaum & Baldwin, 1983; Vaughn, 1989; Whitmore, 1980, 1987.]

and socially deprived settings (Whitmore, 1980, 1988). Due to these and other reasons, Whitmore (1980, 1988) suggested that those at-risk for gifted/underachievement are the highly gifted/creative, young active males, adolescent females with low expectations, mildly/severely handicapped, and culturally different.

In terms of identification, it is generally acknowledged that the child with HPU comes to the attention of professional diagnosticians primarily through only two means: (1) They are referred by teachers or parents because of a very severe learning disability and by coincidence, giftedness (e.g., high intelligence) is found through comprehensive testing (Fox, 1983; Jacobson, 1984), or (2) they are referred by teachers or parents because of suspected giftedness and by coincidence, underachievement of one form or another is demonstrated (Fox, 1983). It has been suggested, therefore, that the remaining students with HPU in regular education are unidentified because there are no referral mechanisms in place to screen for the child who is both gifted and LD (Fox, 1983; Jacobson, 1984).

At the point of referral and comprehensive testing, many different types of information have been suggested for collection and analysis similar to the information recommended by Frasier's "best identification practices" for the gifted [see section on HP]. Table 2 lists suggested assessment practices to be taken into account.

Some research has been done on the data collected from these types of comprehensive evaluations. A relatively distinct aggregate subtest profile was obtained on the individually administered WISC-R. In

Table 2

Assessment Practices for High Potential/Underachievers

Method	Elaboration
1. Development	Fine- and gross-motor abilities, language development.
2. Perception	Auditory and/or visual discrimination.
3. Processing	Auditory and visual processing, learning style.
4. Achievement	Informal reading and math inventories, standardized achievement tests.
5. Intelligence	Standardized intelligence tests both individual- and group-administered (although the former is recommended by most), nonverbal-spatial intelligence tests.
6. Ability-Achievement	Discrepancies between achievement and ability, discrepancies between listening-comprehension and instructional-reading level, discrepancies between achieved grade equivalents and grade placement.
7. Creativity	Formal and informal measures of creativity and talent.
8. Behavioral	Teacher and clinical observations/judgment, child interviews, teacher checklists/evaluations/nominations.
9. Social	Formal and informal observations and measures of social aspects.
10. Cultural	Lowered cutoff criteria for the disadvantaged and culturally different.
11. Educational	Instructional-dynamic model of simultaneous placement and continual assessment.
12. Environment	Parental input and reports.
13. Medical	Medical screening for hearing, vision and speech.
14. Multi-discipline	Multi-method, multi-criteria, multidisciplinary team approach to assessment and diagnosis.

Table 2 (continued)

Assessment Practices for High Potential/Underachievers

[From Daniels, 1983a, 1983b; Fox, 1983; Fox & Brody, 1983; Gregory, 1984-1985; Jacobson, 1984; Rosner, 1983; Suter & Wolf, 1987; Tannenbaum & Baldwin, 1983; Torrance, 1966, 1971; Whitmore, 1980.]

particular, it was generally found that subjects with HPU scored higher on the Comprehension, Similarities and Vocabulary subscales, and performed lower on the Digit Span, Coding, and Arithmetic subtests (Suter & Wolf, 1987). In addition, some researchers have advocated using a significant difference between the Verbal and Performance IQs as an indicator of LD (see Fox, 1983; Suter & Wolf, 1987; Tannenbaum & Baldwin, 1983). Unfortunately, although overall group differences have been repeatedly found for students with HPU (and LD), reviewers have cautioned against the direct application of this knowledge to individual subtest profiles because of the high variability and scatter in even "average profiles" (Fox & Brody, 1983, p. 106; Kaufman, 1979; Sattler, 1988).

Partially due to the precarious nature of assessment, Fox and Brody (1983, pp. 112-113) advocated the view that identification of the gifted/LD should involve multiple screening methods that include evidence of high academic potential, nominations from various individuals in contact with the students, and measures of creativity and nonverbal intelligence. When "a discrepant pattern of peaks and valleys" (p. 113) is noted, the child should be tested individually with more comprehensive assessment instruments. "In the case of learning-disabled/gifted students, it is advisable to risk identifying students as gifted even if this might not be the case" (p. 113).

With regard to prevalence, while Fox (1983) stated that the gifted/LD are dominated by males with a ratio of three to one (3:1), an estimation of the total number of students who are gifted/LD is

difficult because the exceptionality often is not apparent directly and immediately to educators (Fox, Brody, & Tobin, 1983b). In addition, there is currently no systematic screening device for children who are gifted/LD that would allow for an estimate of that population (Fox, 1987, p. 255). Daniels (1983b) contended, "It must be recognized that the population being addressed is small which, in and of itself, puts a burden on the school and the teacher. ... Therefore, in order to address the needs of these children, changes must begin at the administrative level of the local school district" (p. 154).

The only empirical study related to answering the prevalence question was done by Mauser (1979) in an unpublished investigation as reported by Jacobson (1984). Based on a survey of over 5000 children with LD, 2.3% was found to have IQs above 120. While such a percentage is quite low, this research study accessed only samples of LD children; those in regular education and in gifted programs were not included. Therefore, it is likely that the percentage of gifted/LD and students with HPU is higher.

CHAPTER II

PHILOSOPHICAL-THEORETICAL AND EMPIRICAL-PRAGMATIC CRITIQUE

Philosophical-theoretical analysis

In examining the history of education, it appears that there are two competing trends: (1) the field attempts to incorporate new ideas and methods that are primarily dependent upon the dominating philosophical-theoretical approach of the era; and (2) the area unknowingly or intentionally recycles older ideas and techniques such that the field metaphorically takes steps forward, backward, and even laterally. The result has been an area of study that is generally either separatistic, eclectic and/or atheoretical (see Staats, 1983, for a discussion of these terms and their relevance to the social sciences).

With these types of characteristics, it is not surprising to observe that the topic of HPU appears to have been almost stumbled upon. For example, as editor, Kornrich (1965) assembled what was one of the first major texts on underachievement and wrote in his preface, "Considerable underachievement research is directed toward the intellectually gifted underachiever. Do not other groups underachieve? Although the editor never planned to concentrate excessively on the bright underachiever, it may appear that way" (p. xii).

The field is also in its very early stages as evidenced by the only recent production of texts on the subject matter. Aside from Thorndike (1963) and Kornrich's (1965) contributions, a significant

publication was Whitmore's (1980) text titled, Giftedness, Conflict, and Underachievement. Interestingly, the purpose of the latter book was somewhat unorthodox; the reason for its publication was more to plea for greater awareness of and expenditure for gifted/underachievers than it was to fulfill professional motives. This text was followed by a handful of subsequent books on the subject all of which were published in the 1980s (i.e., Butler-Por, 1987; Daniels, 1983a; Fox, Brody, & Tobin, 1983c; Griffin, 1988; Mandel & Marcus, 1988; Whitmore & Maker, 1985).

The relatively new HPU field has had some incipient influences from various sources (e.g., the disciplines of gifted, LD, special education, psychometrics). However, due to the lack of a comprehensive, overriding theoretical framework within education, the HPU area has been slow in gaining recognition and in development. The HPU discipline did not inherit a heuristic theory to address its future conceptual and practical concerns. With regard to identification, only relatively minor adjustments of traditional assessment methods have been made. The result of this has been an absence of the development of more efficient means of screening and identifying these children. Fortunately with respect to programming and instruction, novel approaches have been developed and implemented, and perhaps greater success has been found in this domain.

While the HPU field has characteristics similar to the larger education area, it is also typified by dissimilar attributes. For example, the HPU area can be considered quite confined with its small

projected number of children falling under the HPU category, and with its modest collection of professionals theorizing and conducting research. One very important advantage of this feature is that there appears to be a "them against us" phenomenon that results in a collective effort devoted to the promotion of HPU awareness, research and intervention (Fox, Brody, & Tobin, 1983c).

However, this collaborative approach is a very pragmatic one whereby its members are typically characterized by eclecticism and/or an atheoretical orientation. In fact, the issue of theoretical affiliation is rarely discussed although most participants would probably refer to themselves as being eclectic, cognitive behaviorists.

The ultimate outcome is a field which attempts to attack its problems with what can be called "educational common sense" rather than through a comprehensive theory that anticipates difficulties, hypothesizes testable solutions, and so on. In addition, potential resources may be overlooked that could readily contribute to the various domains of concern: identification, programming, and sociological aspects.

The limitations have been noted by Whitmore (1987), a prominent figure in the area. She called for a unified effort by individuals such as special educators and gifted-education specialists to better meet the needs of gifted/underachievers. Other experts have likewise given attention to the gifted/underserved and called for greater cooperation between specialties. Gallagher (1988), a noted expert in the area of gifted education, recently published an article in

Exceptional Children, the journal of the Council for Exceptional Children. In his "National Agenda," he proposed greater attention to the educational needs of the gifted underserved such as the underachievers, young gifted, and female gifted. Emphasis was placed on the need for a program quality support network including research, demonstration, development, and leadership training. Finally, cooperation between professions in various areas (e.g., curriculum development, technology, and definitions of intelligence) was deemed necessary (p. 107).

One of the major purposes of the present project is to provide a comprehensive theoretical framework for the study of HPU, and in doing so, to generate and test viable hypotheses that may serve a positive, functional role in the development of identification and/or programming techniques.

Empirical-pragmatic analysis

There are many issues related to the empirical and pragmatic concerns of individuals with HPU. While Public Law 94-142 supposedly guarantees special services for those identified as being HP/LD or gifted/LD, it should be duly noted that children underachieving who are HP or gifted are not legally required to be served. In addition, while mandating many educational objectives, the federal government has not followed through on much of the funding to the States, and the States have had to deal with this fiscal burden.

However, regardless of the legal requirements, perhaps the most important concern from a societal perspective is the repeatedly heard

outcry by educators and parents that if individuals with HPU are not identified and provided appropriate services, their potential contributions may be unfulfilled at the expense of both the individual and society (Fox, Brody, & Tobin, 1983a, 1983c; Gleason, 1988). This has been exemplified by professional pleas (e.g., Gallagher, 1987, p. 139), by autobiographical accounts of personal struggle and/or triumph (e.g., Pitlik, 1988), and by persuasion through various means (e.g., listing famous historical figures who presumably exhibited forms of underachievement).

As an example of the latter, the following individuals have been noted to exhibit both high achievement in a specific area while simultaneously having some form of disability or underachievement: Hans Christian Andersen, Winston Churchill, Harvey Cushing, Charles Darwin, Leonardo da Vinci, Thomas Edison, Albert Einstein, George Patton, Nelson Rockefeller, Auguste Rodin, Tolstoy, Woodrow Wilson, and Emile Zola (Adelman & Adelman, 1987; Fox, Brody, & Tobin, 1983b; Tannenbaum & Baldwin, 1983). While the point has been made that educational professionals have a difficult enough time diagnosing living beings let alone doing a "posthumous" assessment (see Aaron, Phillips, & Larsen, 1988; Adelman, 1988; Adelman & Adelman, 1987; Wiederholt, 1987), the fact remains that these individuals underachieved in a particular area and somehow compensated or overcame their disability to make a significant contribution to society. Further, if these disabilities go undetected, they may interact to

create even greater problems--and a downward-spiral regression may thus incur (Gleason, 1988).

Given that individuals with HPU can be highly productive societal members, the next pragmatic question becomes, "How can we better identify these individuals and provide the necessary programs to foster their positive development?" This brings us to the three major areas pertinent to the study of individuals with HPU: identification (Fox, 1983; Fox & Brody, 1983; Rosner, 1983; Senf, 1983; Shoff, 1984; Suter & Wolf, 1987; Whitmore & Maker, 1985), program and instruction (Daniels, 1983a, 1983b; Fox, Brody, & Tobin, 1983c; Kornrich, 1965), and socio-political factors (Gallagher, 1988; Kornrich, 1965; Sapon-Shevin, 1987; Whitmore, 1980).

The present discussion will devote its efforts to the issues of identification. In doing so, the author wishes to neither over-emphasize nor under-emphasize the importance of any of the three categories. For example, 100%-accurate identification would be useless (if not indirectly detrimental) if such identification is not accompanied by appropriate programming and instruction. Similarly, highly effective programming would remain idle without appropriate detection of students with HPU.

Before examining in greater detail the research literature on the topic of HPU, it must be noted from the onset that the majority of information is based on intuition, anecdotal observations, and case studies, as noted previously. "... because the incidence is low and identification difficult, there is little empirical data available"

(Suter & Wolf, 1987, p. 235). Only a handful of investigations have been conducted on students with HPU for which even tentative conclusions can be made. This must be taken into account when analyzing the HPU literature.

The most pressing problem with regard to identification of students with HPU is in the projected underidentification of these children in the regular-education system. Nearly every single source on the subject comments on and rationally speculates that individuals with HPU are severely underidentified (e.g., Daniels, 1983a; Fox, 1983; Fox & Brody, 1983; Fox, Brody, & Tobin, 1983b; Rosner & Seymour, 1983; Tannenbaum & Baldwin, 1983; Whitmore & Maker, 1985). [Only fleetingly and on rare occasion is the possibility mentioned that a subtype of students who are gifted/LD may be overidentified. Levine (1987, pp. 204-207) referred to these subtypes as pseudointellectualism and pseudounderachievement; these include students whose intellectual abilities have been overestimated or those for whom too specific of a skill has been highlighted.] It is important to note that the underidentification issue is a hypothesis at this point. The fact that the prevalence of children with HPU and students who are gifted/LD cannot be specified or even estimated is reflective of this speculative nature.

The underidentification issue is a formidable challenge. To see why this is true, a detailed presentation and analysis of current practices of identification will follow.

Most children who are mildly disabled are referred for comprehensive testing by teachers. "The most common method of identifying students in need of special education services has been teacher-submitted nominations of students who are then individually administered traditional psychological and educational measures by a school psychologist" (Stone, Cundick, & Swanson, 1988, p. 71). It has been estimated that approximately 90% of those referred qualify for special education (Galagan, 1985; Stone, Cundick, & Swanson, 1988, p. 71). While this is a logical avenue for referral, several difficulties and biases arise especially with regard to students with HPU.

(1) Due to the only recent awareness of students with HPU and the gifted/LD, and because of the lack of dissemination of relevant information to teachers, teachers are not well informed about the discriminating attributes (Ban, 1988) and may even have difficulty conceptualizing that both high potential and underachievement can occur for the same child (Rosner & Seymour, 1983; Sapon-Shevin, 1987). In effect, in addition to the teachers "looking for a needle in a haystack," they may not know what the needle looks like. Related to this issue is the suggestion that traditional curricula and instructional practices do not allow for the demonstration of high expression and intellect, which may further depress such observations (Sapon-Shevin, 1987; Whitmore & Maker, 1985).

(2) Another aspect that masks these students is their grade-appropriate academic functioning. Virtually by definition, students with HPU will demonstrate approximately grade-level academic

production; only in very severe cases will grade-level performance be significantly less than the grade placement. "... there is an extremely low likelihood that a child's performance appropriate to his or her grade level would ever signal a teacher or a parent to investigate potential learning disabilities" (Senf, 1983, p. 42). Therefore, if the teacher is basing his/her referrals primarily on deviations from grade-level performance, children with HPU will almost never be referred for comprehensive testing (Daniels, 1983b; Fox, 1983; Fox, Brody, & Tobin, 1983b; Jacobson, 1984; Rosner & Seymour, 1983; Suter & Wolf, 1987). For such teachers, identification of students with HPU will occur only when the child in question exhibits exceptionally high skills (and is subsequently found to have a disability) or low skills (and is subsequently found to have a severe discrepancy between higher-than-average intellectual ability and academic achievement) (Sapon-Shevin, 1987). It is the rare and astute teacher that can look beyond the average grade-level performance on academic tasks and see high intellectual abilities.

In the Johns Hopkins pioneering study (Fox, 1983), 17,000 cases dating from 1952 to 1979 from the Temple University Reading Clinic were analyzed on screening criteria including age and "gifted" restrictions. Upon completion of their initial analysis, 432 cases were further scrutinized. Based on this sample of subjects who were gifted/reading disabled, it was found that only 10% performed two or more years below their respective grade placements on a standardized reading test. "... a far larger percentage scored at or above grade level making it

unlikely that schools would refer students for evaluation" (Fox, 1983, p. 135).

(3) Making the situation more complex is the issue of what type of students are referred for comprehensive testing. Investigators in the field have speculated that students with LD and HPU who do ultimately get referred for further testing are only those exhibiting what can be called mild (or severe) behavior problems (Algozzine & Ysseldyke, 1986; Senf, 1983; Ysseldyke, 1983). They would include children who are disruptive, difficult to manage and/or withdrawn. As noted by Senf (1983), "The learning disabled/gifted child is seldom referred for psychological assessment because of a skill deficiency but rather for the psychological manifestations of distress" (p. 43). Tannenbaum and Baldwin (1983) went as far as to say that not even these children with behavior problems are referred because, "The various school adjustment problems not only tend to obscure any signs of giftedness but also detract the teacher from suspecting that giftedness exists" (p. 21). For example, students with low motivation may just be labeled "lazy" or indifferent with no referral at all. In a similar light, Fox (1983) speculated that females may be particularly underidentified because when they are performing below expectation, they "are simply less likely to vent anger or frustration in ways that will lead parents or teachers to notice them. Thus, girls are less likely to be referred for clinical evaluation" (p. 135). Finally, Schiffman and Daniels (as reported by Fox [1983, p. 118]) also suggested that not only may

children with HPU be underidentified, but they may be misidentified as hyperactive, emotionally disturbed, or low in motivation.

(4) Even if the previous three difficulties could be resolved, some investigators have argued that the child with HPU may still be underidentified because he/she may compensate for his/her disability and simply "get by" with school requirements (Jacobson, 1984). A somewhat extreme position has been taken by others. They have contended that the problem of underidentification remains quite elusive because the underachievement or disability may adversely affect intellectual ability such that a significant difference eventually will no longer exist between ability and achievement (Fox, 1983; Fox & Brody, 1983, p. 105; Sapon-Shevin, 1987). From the present behavioral perspective, however, this may not be a testable hypothesis since a certain degree of circularity is exhibited in this argument.

(5) Although children referred for a comprehensive evaluation generally qualify for special-education placement, empirical data on the effectiveness and accuracy of teacher nominations for the gifted have not been impressive (Fox, 1987; Fox & Brody, 1983, pp. 110-111; Gear, 1976). One contributing factor may be that teachers nominate for giftedness "dutiful students rather than those who are brilliant but bored" (Fox & Brody, 1983, pp. 110-111). In addition, such evaluative data of teacher referrals are not available for nominations of students with HPU or children who are gifted/LD.

To complicate matters further, it has been found that personality-type attributes of teachers affect their referrals. Meijer

and Foster (1988) reported findings consistent with the notion that teachers scoring high on a measure of self-efficacy referred less students with "problems" and these teachers exhibited lower "referral chance" (p. 383). Although these types of findings are not totally unexpected, it raises fundamental questions as to whether referrals (and ultimately special-education placements) are student dependent as perhaps it should be, or highly teacher dependent.

Due to these difficulties with teacher-related methods, several avenues have been suggested and pursued. (1) In an effort to improve teacher evaluations, behavioral-type checklists have been developed for the identification of children who are gifted (e.g., Alexander & Muia, 1982; Renzulli & Hartman, 1981). However, these forms have been geared toward the gifted, and therefore, may not be valid for students with HPU and/or the gifted/LD.

Hamada and Tomikawa (1986), using the teacher-rated Windward Rating Scale, found quite favorable results in screening for children with LD and students without LD in the grades from kindergarten to sixth. Through complex canonical correlations, factor analyses, weighted formulas, demographic information, and the results of teacher ratings, these investigators obtained an 82% accuracy rate using the optimal cutoff score. While these findings are very promising for screening children with LD using teacher ratings, several comments are relevant: (1) Students with HPU or those who were gifted/LD were not differentiated, and thus the questionnaire may not be applicable to these students; (2) the rating scale consisted of 65 items that the

teacher had to complete thus making it a somewhat cumbersome task; and (3) the study did not identify previously unidentified students. Of course, the investigators had no intention of fulfilling the goals of the present project and therefore, must be viewed in this context.

Finally, Whitmore and Maker (1985) recommended teacher training to increase greater awareness and to educate teachers on the characteristics of children with gifted/underachievement.

(2) Because of the difficulties associated with teacher evaluations, other researchers have attempted to minimize the role of subjective teacher appraisals in the screening process. These researchers have called for an increase in the testing of students in regular education on an individual basis. For example, Fox (1983) suggested using formal and informal measures of listening and reading achievement; when a severe discrepancy is found, the child should be referred for further comprehensive testing. In particular, Fox recommended utilizing an informal reading inventory (IRI) to estimate reading-achievement level.

Others have noted that the WISC and WISC-R IQ tests can provide the diagnostician with information that may suggest further in-depth testing. As noted previously, for example, subjects with HPU have been found to score higher on the Comprehension, Similarities and Vocabulary subscales, and to perform lower on the Digit Span, Coding, and Arithmetic subtests (Suter & Wolf, 1987). In addition, some researchers have advocated using a large difference between Verbal and Performance IQs as an indicator of a LD (Fox, 1983; Suter & Wolf, 1987;

Tannenbaum & Baldwin, 1983). Unfortunately, as stated earlier, although overall group differences have been repeatedly found for students with HPU (and LD), reviewers have cautioned on its direct application to individual subtest profiles given the high variability and scatter in even "average profiles" (Fox & Brody, 1983, p. 106; Kaufman, 1979; Sattler, 1988).

(3) Some investigators have attempted to utilize more traditional screening methods involving group-administered instruments. Unfortunately, the results of these types of tests have to be analyzed and interpreted with caution because most group-administered instruments are presented in a written format necessitating reading, are typically timed, and require a large degree of self-directedness (Fox & Brody, 1983). As suggested by many, IQ cutoff scores should be decreased when utilizing group-administered, intellectual measures so as not to exclude otherwise eligible students with HPU. Fox and Brody (1983) suggested using IQs of 120 or as low as 115 as cutoff scores for identifying potential students who are gifted although these investigators noted that performance on group IQ tests should not be used for decisions about program placement.

(4) Another possible source of valuable information is that of parents. It should be noted that parents are always able to provide their input into the referral and identification processes. However, Rosner and Seymour (1983) contended that while teachers may tend to under-refer, parents have the inclination to over-refer. No empirical data were provided, however.

(5) A multi-stage/multi-criteria assessment procedure has been advocated by many as the ideal system for identification (e.g., Fox & Brody, 1983; Gregory, 1984-1985; Suter & Wolf, 1987; Tannenbaum & Baldwin, 1983; Whitmore, 1980). This overall method would involve a combination of all of the previously mentioned techniques in addition to others such as instructional assessment (e.g., Frasier, 1987; Gregory, 1984-1985; Tannenbaum & Baldwin, 1983). This strategy of identifying students with HPU or those who are gifted is commendable in its comprehensiveness and inclusionary stance. However, in practice, issues of the validity of the individual methods incorporated need to be scrutinized further (e.g., there is some question surrounding the validity of the psychometric instruments used to measure creativity) (Fox & Brody, 1983).

To summarize the problem of underidentification, the following appears applicable: Teachers are the educational professionals who are in closest contact with the students and are therefore sought for their input with regard to referral. The large majority of children with mild handicaps are identified in this manner. Unfortunately, several difficulties are revealed with respect to this system including lack of teacher awareness and training on the characteristics of students with HPU, traditional curricula and instruction that impede manifestation of the HP component, masked high potential due to grade-level performance on academic measures, teacher bias in favor of referral of children with behavior problems, lowered intellectual potential as a result of underachievement, non-impressive teacher-nomination effectiveness for

the gifted, and teacher-dependent referral effects. The possible ways of resolving these difficulties have been to attempt to improve on the information that teachers provide, to minimize the role of subjective teacher evaluations, and to strive for a multi-stage/multi-criteria assessment procedure.

All of these techniques and other tangentially related methods should be seriously considered in order to increase accuracy of identification and thus decrease underidentification. However, aside from the specific criticisms raised for each, there exists the very practical problem that all of the potential solutions are too costly in terms of time, effort, and finance, and/or have not been attempted in a regular-education setting. Although the precise prevalence of students with HPU (and more specifically, gifted/LD) is unknown, it is estimated that we are dealing with a low-incidence population. It would be impractical for educational departments to relinquish substantial amounts of resources to identify students with HPU in regular education. All of the proposed strategies entail a fairly high commitment of resources.

Increasing teacher awareness alone would perhaps not make the necessary impact needed. Teacher training on such topics as HPU attributes would be beneficial; however, this would certainly involve much expenditure of resources. In addition, aside from the hypothesis of children who are culturally different and females who are shy, not even "experts" in the field are willing to speculate on the characteristics of students with HPU who are undetected in regular

education. Improved checklist-type questionnaires are very encouraging; however, these devices require teachers to complete rather lengthy forms on a large portion of children in regular education and therefore, may not be the most unobtrusive means of screening for students with HPU. The techniques suggested thus far that minimize the role of teachers have all entailed substantial expenditures of time, effort and funds to the point where the cost-benefit ratio is questionable. Furthermore, most of the proposed methods do not address the pressing issues, one of which being the underserved: females who are gifted and gifted/underachieving, students who are culturally different, young children with high potential, students who are gifted and physically handicapped (Gallagher, 1987, 1988; Williams, 1988). For example, most gifted programs start at about the third or fourth grade without providing provisions for the gifted before these grade placements (Gallagher, 1987); early intervention is needed for prevention of underachievement.

The multi-stage/multi-criteria method deals effectively with many of the issues discussed. This assessment technique utilizes information such as intelligence, creativity, talents, achievement, socio-economic status, response to instructional stimulation and enrichment, and so on. However, this procedure entails much time, effort, and cost as well. For instance, instructional response requires a substantial program commitment. Essentially, for this procedure, children are screened using very inclusive criteria. Those who qualify are then placed into a program that provides for

stimulation and enrichment activities. While in this new educational environment, continual assessment of the appropriateness of the child's placement is provided. This is no doubt an ideal system, since the best predictor of a certain type of behavior involves placing the individual into an environment that elicits such behavior. However, this is an almost utopian situation given most funding and programming constraints.

The situation has been summarized concisely by Fox (1983), as she suggested a solution that entailed one-to-one, teacher-administered IRIs.

> ... this data suggests most of the brightest children with problems will not be identified by the types of screening techniques commonly used by schools. Clearly, a thorough screening and clinical evaluation of all children in the school system would be necessary to determine the exact numbers of learning disabled students and the percentage of those who could also be described as intellectually gifted. Such an undertaking would be costly. (pp. 137-138)

In short, all of the relevant studies on the identification of students with HPU either have been conducted on those already identified or have involved relatively cumbersome techniques of assessment that appeared to have been impractical to apply on a large scale in regular education. An accurate but yet feasible solution has yet to be proposed, empirically evaluated, and implemented.

CHAPTER III

PARADIGMATIC-BEHAVIORAL THEORY AND ANALYSIS

History and status

Paradigmatic behaviorism (PB) (see Staats, 1963, 1964, 1968, 1971, 1975, 1977, 1986a) is a third-generation, unified, behavioral theory. This comprehensive theory of behavior has as its foundation the knowledge advanced by first-generation behaviorists such as Pavlov, Thorndike and Watson, and by second-generation experimentalists such as Skinner, Keller, Hull, Spence, Osgood, Mowrer, Schoenfeld, and N. Miller (Staats, 1975, 1986a). PB's theoretical formulations have been applied in a variety of disciplines ranging from basic animal learning to complex human behavior including the areas of psychometrics and education. While having much overlap with traditional radical behaviorism, PB has introduced many new developments as well (Staats, 1975, 1986a). In particular, PB has its own unique theoretical formulations concerning basic learning (Staats, 1963, 1975), personality (Staats, 1971, 1975, 1986a, 1987b), abnormal behavior and clinical treatment (Evans & Eifert, in press; Staats, 1972, 1975, 1987b, 1988a; Staats & Heiby, 1985), behavioral assessment (Burns, 1978, 1980, 1986; Staats, 1975, 1986a; Staats & Burns, 1981), and philosophy of science (Staats, 1981, 1983, 1987c, 1987d).

Basic tenets and application to high potential/underachievers

Unified positivism. Currently, the HPU area is characterized by an "educational common sense" pragmatism that is eclectic or

atheoretical. What the HPU area requires is a heuristic philosophical-theoretical framework to guide research in identification and programming. PB, with its comprehensive theoretical formulations, can provide the HPU field with a philosophical-theoretical framework that readily generates viable and testable hypotheses. By surveying the theoretical, methodological, and pragmatic circumstances in a given subject area, PB may also be able to offer feasible solutions to practical problems. Furthermore, PB could serve as the conceptual force to foster greater unified efforts among professionals in diverse fields.

It should be noted, however, that any relatively brief delineation of PB, as will occur here, cannot do justice to the comprehensive and unifying nature of the theory. [For a more molecular as well as molar presentation of PB, see Evans & Eifert, in press; Staats, 1963, 1968, 1971, 1975, 1977, 1986a, 1988a.] Perhaps an unfortunate outcome of the brevity will be the false appearance of a discontinuous, eclectic "theory" of behavior. It is important to note that PB integrates and unifies large and seemingly disparate fields of study. This is accomplished by utilizing a multilevel formulation of animal and human behavior. In this process, detailed paradigmatic-behavioral analyses are conducted along with the development of more global philosophical-theoretical conceptualizations. PB's multilevel theory incorporates such diverse fields as physiology, comparative psychology, human learning, child development, personality, assessment, social psychology, abnormal and clinical psychology, education, and

organizational psychology (Staats, 1975; 1983, pp. 321-322; 1988a; 1988b). In addition, the philosophy of science called unified positivism (Staats, 1983, 1986a, 1986b, 1987a, 1987c, 1987d, 1987e, 1988a, 1988b) emphasizes anti-separatistic, unified endeavors including unification-integration across theories, schisms, fields, methodologies, philosophies, and sociological perspectives (Staats, 1983, 1987c, 1988a, 1988b).

When performing a theoretical analysis on any field of study, it is critical to review the literature in order to determine the "facts" that have been replicated and accepted. Unfortunately, the relatively new status of the HPU research base has lent itself to rather unsystematic methodologies, namely anecdotal and case-study techniques. While disadvantages of such methodologies are acknowledged, there appear to be patterns or clusters of behaviors that are reported more often than others as evidenced in the previous listing of HPU characteristics. In addition, these attributes of students with HPU appear to be what one would expect when combining the characteristics typically cited for students who are gifted on the one hand and children with LD on the other. Therefore, a theoretical application of paradigmatic behaviorism, while tentative due to the nature of the empirical data, can be formulated and tested as to its validity and heuristic value.

Personality and the basic behavioral repertoires (BBRs). Behavior can be categorized on many different dimensions. Inspection of the various personality-trait theories will exemplify this. Staats (1975)

proposed a taxonomy of behavior that reflects a correspondence to the two major forms of learning (i.e., classical and instrumental conditioning) and the generally unique language abilities demonstrated by humans. This taxonomy is developed around the concept of basic behavioral repertoires (BBRs). These BBRs are learned skills or responses that act as both independent and dependent variables.

(1) Emotional-motivational basic behavioral repertoire: The first BBR involves the emotional and motivational aspects of the individual such as the person's interests, desires, fears, and sexual preferences. The primary mechanism for its development and maintenance is through classical conditioning with its emphasis on involuntary, physiological responses associated with smooth muscles and glands (Staats, 1975, p. 35).

A major component of the emotional-motivational system is the three-function, attitudinal-reinforcing-directive (A-R-D) formulation. Classical and instrumental conditioning are typically introduced as distinct and separate paradigms. However, as noted by Staats (1963, 1975) and others (e.g., Mowrer, 1960; Rescorla, 1987), classical conditioning occurs in every instrumental conditioning situation. The discriminative or directive stimulus in instrumental conditioning acts as the conditioned stimulus in a classical-conditioning situation and the reinforcer in instrumental conditioning serves as the unconditioned stimulus. Therefore, through repeated pairings, the discriminative or directive stimulus comes to elicit the conditioned response.

With this conceptual base, Staats (1975), formulated the attitudinal-reinforcer-directive (A-R-D) theory. Any stimulus that elicits an attitudinal (A) or emotional response will have reinforcing (R) and directive (D) stimulus functions. If the stimulus elicits a positive emotional response and is made contingent upon an instrumental response, the frequency of that behavior will increase. Conversely, if the stimulus elicits a negative emotional response and is made contingent upon an instrumental response, the frequency of that behavior will decrease. If the stimulus elicits a positive emotional response, the organism will tend to approach the stimulus. In contrast, if the stimulus elicits a negative emotional response, the organism will avoid the stimulus. These approach-avoidance behaviors are learned as a general class of behaviors.

This analysis can be taken a step further by analyzing the instrumental response itself. When an instrumental response is displayed, the stimulus properties of that response become associated with the unconditioned stimulus (i.e., reinforcer). The stimulus properties of the instrumental response thus comes to elicit the conditioned response as well. As a result, instrumental responses followed by positive stimuli will tend to elicit positive emotions, while behaviors followed by aversive stimuli will generally come to elicit unpleasant emotions. This has direct implications to many phenomena including educationally related topics such as intrinsic motivation, preferred cognitive style, and the Premack principle where

more frequently engaged-in activities can be utilized as reinforcers of other lower-frequency behaviors.

(2) Sensory-motor basic behavioral repertoire: The second BBR, that of sensory-motor responses, consists of instrumental or motoric behaviors. These responses can be categorized under two general classifications: fine-motor coordination such as grasping, playing with intricate toys, writing, and typing, or gross-motor behaviors including crawling, walking, and participating in athletic sports activities. These types of skills obviously involve the principles of instrumental conditioning with its emphasis on what can be considered to be voluntary responses of the skeletal muscular system (Staats, 1975, p. 35). However, because stimuli that elicit an emotional response also increase directive approach or avoidance responses that may involve motoric use, classical conditioning and A-R-D theory are critical to such a behavioral analysis as well.

(3) Language-cognitive basic behavioral repertoire: In attempting to predict, control and explain complex human behavior, it is quite clear that any behavioral theory must extend the basic principles of behavior to an analysis of human language. PB attempts to fulfill this endeavor by first suggesting that language or "cognition" is partially implicit or overt verbal behavior controlled by the same principles of classical and instrumental conditioning as other forms of behavior. However, PB extends this notion by explicating on a molecular level its view on such constructs as language acquisition, intelligence, problem solving and reasoning, self-reinforcement, self-concept, and modeling.

Both instrumental and classical conditioning play major roles for the language-cognitive BBR.

In particular, a series of systematic theoretical and empirical investigations resulted in a detailed analysis of reading that included discrimination of letters, labeling of grapheme-phoneme units, sounding out, whole-word reading, reading of phrases, and so on (see Collette-Harris, 1974; Ryback, 1969; Ryback & Staats, 1970; Staats, 1968, 1971). The first general PB theory of LD and dyslexia was delineated by Staats in 1975 (pp. 410-413). The learning of these types of skills was declared to be a long-term, cumulative-hierarchical process for which a significant breakdown in the pre-requisite repertoires would severely hinder reading progress. It was further stated that if a child is able to learn the language with average or above proficiency, this same student should be able to learn to read. Aside from downward-spiral effects of lacking appropriate reading responses, Staats (1975) noted that a critical and necessary component to achieve reading success was the utilization of potent extrinsic reinforcers to maintain the effortful behaviors. In addition, lack of more global basic repertoires such as attention and following of directions could adversely impact the learning of important skills. Greater elaboration of PB's theory of LD was provided by Hufano (1982).

It is critical to note that these three BBRs have been described generally in isolation; however, in most applied situations, they are interrelated and overlapping repertoires. For example, as stated previously, not only are the pre-requisite skills important in reading,

but tapping the emotional-motivational BBR is vitally important as well to maximize learning. These BBRs serve as the foundation upon which the great majority of behavior disorders can be categorized. For example, on a general level, the anxiety and fear disorders correspond to the emotional-motivational BBR, the physical disabilities with the sensory-motor BBR, and the intellectually handicapped with the language-cognitive BBR. Most individuals who seek therapeutic assistance have multiple inappropriate and/or deficient repertoires in one or all three domains.

Many exemplary theoretical analyses have been conducted on various forms of abnormal behavior (e.g., Staats, 1963, 1975 [chapters 8 & 9], 1988a; Staats & Heiby, 1985). According to PB, aberrant behavior can be conceptualized as deficits and/or inappropriate responses in one or more of the three BBRs. For example, Staats (1975) applied this taxonomy to children with behavioral handicaps who would be classified under special-education provisions. Students who are mentally retarded and culturally different display deficits in the language-cognitive BBR, children with speech-language difficulties exhibit inappropriate language-cognitive BBRs, children with autism exhibit deficits in the emotional-motivational BBR and engage in self-stimulating and self-injurious behaviors reflective of an inappropriate sensory-motor BBR, and so on.

Many of the attributes of students with HPU can be conceptualized as lesser variants of children with behavioral difficulties. Analyses and studies have been conducted based on PB analyses of dyslexia (e.g.,

Collette, 1979; Collette-Harris, 1974; Collette-Harris & Minke, 1978; Ryback, 1969; Ryback & Staats, 1970) and LD (e.g., Hufano, 1982; Staats, 1987b). In addition, Hishinuma (1987) broadly delineated PB's theory to other exceptionalities including the gifted, mentally retarded, speech-language delayed, physically handicapped, emotionally disturbed, and so on.

The overlap between these works and their high applicability to the category of HPU are indicative of the similarities exhibited between students with LD and HPU. This is not to imply that these two exceptionalities are identical; many experts feel that the overall classification of underachievement is the "umbrella" label for all students who underachieve including the LD. On the other hand, very little support has been found for the notion that there are clear empirical differences between these categories. Currently, most individuals in the field believe that there are theoretically relevant differences between underachievers and the LD.

Regardless, based on previous PB analyses as well as the current one, a PB classification scheme can be derived. This is presented in Tables 3 to 6.

This type of classification of behavior is merely a first step toward identification of and programming for children with HPU. Others have generated and organized on a rudimentary level the attributes of students with HPU using different dimensions. However, once behavior has been classified within the deficit-inappropriate and three-BBR

Table 3

Deficit and Inappropriate Behaviors for the
Emotional-Motivational Basic Behavioral Repertoire

Deficit	Inappropriate
Lack of traditional "reinforcers" to serve as potent rewards resulting in "low motivation"	Traditional positive reinforcers are aversive, traditional aversive stimuli are positively reinforcing, and/or traditionally neutral stimuli are positively or negatively reinforcing
Lack of a positive self-concept	Negative self-concept
	Dislike for drill-and-practice
	Low frustration tolerance
	Anxiety

Table 4

Deficit and Inappropriate Behaviors for the Sensory-Motor Basic Behavioral Repertoire

Deficit	Inappropriate
Poor fine- and/or gross-motor coordination	Attention-getting and other inappropriate fine- and gross-motor behaviors including pencil resistance, physical aggression, etc.
Hypoactivity, inattention	Hyperactivity, inattention, distractibility, impulsivity, selective attention, off-task behaviors
Lack of following directions	Oppositional-type behaviors

Table 5

Deficit and Inappropriate Behaviors for the Language-Cognitive Basic Behavioral Repertoire

Deficit	Inappropriate
Lack or uneven development of academic skills including those in readiness, reading, math, social studies, science, etc.	Interfering and inappropriate academic skills
Poor study skills and work habits	Behaviors in avoidance to improve study skills and work habits
Lack of verbal articulation	Defensive and manipulative verbal skills
Lack of positive self-concept and positive self-verbalizations	Negative self-concept and self-verbalizations
Verbalizations of low self-expectations	Verbalizations of too high self-expectations
Poor social skills	Overly assertive/aggressive social interactions

Table 6

Positive Basic Behavioral Repertoires

Basic Behavioral Repertoire	Positive Attribute
Emotional-Motivational System	Selective interests/motivation can be quite intense and can be utilized as reinforcers for academic remediation
Sensory-Motor System	Creativity and talents (e.g., drawing/painting, music, drama)
Language-Cognition System	Above-average abilities in vocabulary, comprehension, abstract thinking, problem solving, verbal reasoning, imagination, etc.; creativity in story telling, expository expression

matrix, many implications with regard to identification and intervention directly follow.

As stated earlier, individuals with HPU constitute a very heterogeneous group (Suter & Wolf, 1987). The advantage of the completed taxonomy with respect to identification is that the behavioral matrix not only categorizes different known types of individuals with HPU, but hypothesizes the many different possible subtypes of groups with HPU as well. It is conceivable that a child could exhibit a severe ability-achievement discrepancy but not manifest any of the other behavioral correlates described in the taxonomy. One possible parsimonious explanation would be that the home environment provided enough stimulation prior to the school age of five which resulted in above-average intellectual functioning of the child, but the educational school curriculum, instruction, and classroom management were such that only grade-level skills were attained.

On another extreme, it is possible for a student to demonstrate a severe ability-achievement difference and display nearly all of the deficit and inappropriate behaviors listed. For example, a student may come to exhibit these behaviors due to the lack of acquisition of positive affect toward authority and school-related activities, deficit and inappropriate interaction skills, and poor attentional and organizational skills. The situation would be further compounded if the student learned manipulative and argumentative verbal behaviors, disliked social approval, was proficient at avoiding educational activities by "acting out," and so on. It is perhaps more probable

that most children with HPU fall somewhere between the two extremes just described, thus exhibiting only a sub-set of the behaviors. The only common thread for all students with HPU is the one imposed by the definition; that is, they all display a significant discrepancy between presumed ability and demonstrated achievement.

Cumulative-hierarchical nature of learning. Developmental psychologists have reported normative data demonstrating the seemingly sequential development of many types of behavior. These observations have traditionally been attributed to biological maturation. Although PB acknowledges, for example, the effects of physiological maturation on the sexual development of the individual, the theory recognizes that many of the developmental sequences of behavior are due to the systematic presentation of environmental stimuli and/or the "cumulative hierarchical" nature of learning. This latter notion states that in order for higher-level behaviors to occur, the individual must have first acquired pre-requisite skills.

For example, a teacher may wish to train a child to write the letters of the alphabet (Staats, 1968, 1975). The first class of behaviors that the teacher must train if it is not readily exhibited is that of attentional or orienting behaviors. Subsequently, many other repertoires, if learned, would greatly facilitate the task at hand. For instance, the child must learn to discriminate the various letters, must begin to imitate or reproduce modeled behaviors and must begin to follow directions. To the extent that these skills generalize to other

situations, the child will have less difficulty acquiring other higher-level repertoires such as learning to write whole words.

The concept of cumulative-hierarchical learning is important in at least three respects: (1) Such a notion explains the sequential and progressive nature in which many behaviors are attained, thus facilitating greater prediction and control of complex responses.

(2) The cumulative-hierarchical formulation conversely predicts that when pre-requisite skills are not mastered, one cannot expect more complex behaviors to be mastered. If remediation of the lower-level skills does not occur, then the child will fall farther and farther behind his/her peers. This downward-spiral regression (Staats, 1971) has been suggested with students with HPU (Gleason, 1988). On a general level, nearly all tasks require some degree of such skills as attention, discrimination of relevant stimuli, following of directions, and imitation. However, the analysis can be applied to more specific, higher-level behaviors. For instance, in order to convert regular numbers to their scientific notations, the child must first be taught how to transform regular numbers to decimals and must understand the concept of exponents (e.g., 710 = 7.1 x 10 to the 2nd power).

(3) The cumulative-hierarchical concept offers at least a partial solution to the controversy over the matter of potential and how it should be measured. The traditional thinking is as follows: Giftedness can be exhibited through demonstrated accomplishments or in incipient ways through other means such as performance on IQ tests. When a child performs above average on an IQ test but does not achieve

commensurately in academic subjects, this child is said to have the potential, but not the demonstrated achievement. When a significant discrepancy exists between the two domains, a "problem" is said to be manifested because the child displays high potential but does not demonstrate similar performance on academics. This type of logic has been criticized to some extent because of equating potential with performance on an IQ test and/or the ambiguity of the term potential.

From a PB perspective, potential can be conceptualized as demonstrated pre-requisite skills. Based on this notion, potential is not an ambiguous term referring to unobservable entities. The basic repertoires that are required in order for a child to perform well on an IQ test include very essential skills such as attention, discrimination, following directions, labeling and imitation as well as higher-level thinking skills such as abstract thinking, problem solving, and verbal reasoning. If this child can perform relatively well on these activities, then the student has the pre-requisite BBRs to comprehend written text. The only major obstacle would be the decoding and pronunciation of written words.

In other words, reading comprehension can be sub-divided into two major pre-requisite sets of skills: decoding and meaning. Decoding involves the actual pronunciation of the text which may include attention, discrimination, following directions, and imitation. Meaning consists of having the appropriate associates (e.g., connotative and denotative) to words and phrases so that the individual can "comprehend" what is said. If a child is able to score high on an

IQ test, the assumption is that the meaning and verbal-reasoning components of language are well-developed, and if reading comprehension is not demonstrated, then it is possible that the lack of decoding skills is hindering reading comprehension.

Although this is consistent with a PB analysis of oral language, IQ tests, and academic achievement, PB also suggests caution with such a simplified view of the discrepancy between ability and achievement. First, it appears that while children who are gifted/LD may have superior higher-level thinking skills (as evidenced by higher performance on the Comprehension, Similarities, and Vocabulary subtests of the WISC-R), their attentional and recall skills may be less developed (as indicated by lower scores on the Digit Span, Coding, and Arithmetic subscales) or they may be much more selective in the stimuli to which they attend.

Second, the traditional view that IQ tests measure global potential or ability that can lead directly to academic achievements invokes many profound assumptions. These assumptions are contrary to more current theories (e.g., Gardner, 1983, 1987; Staats, 1975; Sternberg, 1985) which state that "intelligence" is composed of many sub-abilities, some more relevant to reading, spelling, and writing, and others more pertinent to math computation and math concepts/application.

Let us examine the WISC-R more closely. This intelligence test is composed of 12 subtests, only three of which require the mental processing of numerals. The Digit Span subscale consists of the

examiner reading off a series of numbers and the examinee recalling these digits in the sequence presented. For the Coding subtest, a key is referred to on the top portion of the subject's test sheet that is composed of single-digit numbers paired with designated symbols; each single-digit is associated with only one arbitrary symbol. Below this key is a series of single digits without symbols. The task of the examinee is to write the corresponding symbol next to each number such that it is congruent with the key. A time limit is imposed making this a speed test. Notice that the Digit Span and Coding subtests do not require math computation and/or math conceptual understanding for successful performance, although prior exposure to numbers may be beneficial. The only WISC-R subscale that involves math computation and concepts is the Arithmetic subtest. The majority of the items for this test requires the subject to answer mental-computation word problems posed by the examiner.

What is the significance of a person scoring high on the WISC-R and performing significantly lower on a math-computation or math-concepts achievement test? According to PB, a discrepancy between performance on a test that measures math-concepts skills and one that assesses math-computation proficiency would be much more revealing and important. Such a difference would be reflecting an individual who conceptually understands math operations (e.g., addition, subtraction, multiplication, division), but who may not have been taught the detailed computational skills. It would be predicted that this individual would perform substantially better when given a calculator

(provided calculator skills have been learned) and that it should be much easier to teach this individual math computation since the conceptual understanding is already demonstrated (assuming no inappropriate and interfering skills were learned). Therefore, according to PB, a more relevant discrepancy would be between math "intelligence" (i.e., conceptual understanding and application skills) and math computation.

A similar analysis can be made on listening comprehension versus reading. In the present context, the only salient difference between comprehending language through listening as compared to reading is that listening comprehension involves a speaker producing the linguistic text while for reading comprehension, the reader generates the phonological text. A listening-reading gap would suggest that if one were to teach reading-decoding skills, greater use of contextual cues (e.g., pictures, surrounding sentences), and so on, then reading comprehension should become more commensurate with listening-comprehension abilities.

This analysis does not mean to downplay the notion of global intelligence, g, because, at least according to PB, while intelligence is composed of many higher-level specialized sub-skills, it also consists of more general basic behaviors such as those related to appropriate attention, discrimination, following directions, imitating, labeling, and verbal reasoning. However, the present PB analysis suggests that perhaps IQ tests such as the WISC-R, while heuristic as overall measures of intellectual ability, may not be the most

appropriate comparison to academic achievement. In the case of reading comprehension, a measure of listening comprehension may be useful, and an estimate of math-concept knowledge may prove to be valuable information in comparison to math-computational skills.

Basic behavioral repertoires as both causes and effects. When reading the HPU literature, it is interesting to note that some investigators described poor attention, for example, as a characteristic of students with HPU, while other researchers discussed such a deficiency as an etiology. The distinction between an effect versus a cause is a very critical difference worthy for any theory to address. In particular, if inattention is merely a dependent variable, then investigators should not expend many resources on correcting such behaviors, since remediation would not positively affect students with HPU. If, however, it is hypothesized that inattention is a cause of other HPU characteristics, then it is paramount that such deficient behaviors be addressed through various interventions.

The result of the eclecticism and atheoretical nature of the HPU area has been the neglect of these types of issues. The outcome has been programming focusing on educational and social-emotional behaviors with the hopes of decreasing inattention, or programming attempting to compensate for such behaviors rather than the implementation of behavioral procedures aimed at specifically improving attentional skills.

PB is explicit in this regard (Hufano, 1982; Staats, 1987b): behavior is both a dependent and independent variable. In other words,

behavior can be considered both a response and a stimulus for other behaviors. Such a notion has profound implications for students with HPU. It means that all of the descriptions that were included in Tables 3 to 6 are potentially both dependent and independent variables. One example will be discussed. Let us say that a child exhibits inattention, hyperactivity and impulsivity. In a class with other children and with the teacher lecturing in front of the class, the child is looking out of the window, playing with the pencil in his/her hands, and when called upon to answer a question, he/she impulsively says the first thing that comes to mind. These behaviors can be conceptualized as dependent variables in response to the multiple stimuli of the classroom (e.g., teacher lecturing, teacher questioning). In addition, however, it would be probable that this child would not learn much from the teacher's instructions. The student may even learn other irrelevant things such as what is occurring outside on the playgrounds; these may actually interfere with the acquisition of academic skills. In this regard, the behaviors of inattention and hyperactivity can be considered to be independent variables or causes of other behaviors and events. Therefore, because PB's formulations suggest that attentional behaviors are both causes and effects of further learning, comprehensive identification procedures should include assessing such behaviors and interventions should include techniques that address these behaviors, be it directly or indirectly.

Interestingly, PB's view is that attentional behaviors are necessary but not sufficient conditions for the learning of academic skills (Staats, 1987b). This has been empirically verified repeatedly where it has been generally found that merely increasing attentional behaviors or decreasing impulsivity and hyperactivity does not automatically result in proportional academic gains (see Neeper & Lahey, 1988).

Behavior, personality, environment, and their interactions as determinants of behavior. Aside from the specific and interactional effects of heredity and biology, behavior is a function of the dual interplay between personality (or BBRs) and the present environment (Staats, 1963, 1975, 1988b). Through detailed paradigmatic-behavioral analyses, seeming paradoxical findings concerning personality become understandable: consistency of an individual's behavior across different situations, consistency of behaviors for different individuals in the same situation, and the interactional effects of individual differences and situational factors (Staats, 1975, 1986a, 1988b). An important point is that while an individual's behavior is a function of his/her personality and environment, the individual's personality is acquired, maintained and altered by the past and current learning history of the person.

The prediction and explanation of human behavior are formidable tasks especially in more naturalistic settings where there are many uncontrolled variables. PB recognizes the complexity of situations involving social interactions, for example. However, rather than

eclectically stating that both personality and the environment influence behavior as do cognitive-behavior theorists, PB attempts to explicate the relationships between these complex variables and to derive specific predictions and explanations of such behaviors.

In the relatively simple case of two individuals interacting with each other, the following information is needed to accurately predict, control and explain their behavior: Person 1's basic behavioral repertoires, Person 2's basic behavioral repertoires, situational stimuli affecting one or both individuals, and the manner in which these elements will in combination affect behavior. For example, take the following relatively common parent-child relationship. The parent has a high tolerance for child-nagging behaviors. The child has learned nagging behaviors in the presence of stimuli that elicit a positive emotional response. Both the parent and the child are in an environment where the child has a positive emotional response to tangible objects in the environment (e.g., a supermarket or toy store). Based on a PB analysis, it would be probable that this "mismatch" between parent-child behavioral repertoires would result in nagging and eventual tantrum behaviors on the part of the child through shaping. In addition, PB would be able to explicitly state methods of controlling these responses and would be able to explain such undesirable behaviors.

The taxonomy of deficit and inappropriate behaviors delineated previously may have given the impression that the skills in each of the six cells are relatively independent from one another. However, a

rather simple example will show the direct and indirect relationships between behaviors in different cells as well as illustrate both interactionism and the downward-spiral effect. Let us say that a child displays reading skills lower than his/her peers. Initially, this may be the only difficulty exhibited by the individual. However, due to this deficit, the student may be teased in and outside of class, and the teacher may even attend less to the child because the teacher is less reinforced when attending to the child because of the lowered performance. The outcome of these circumstances unfortunately may associate school with negative or aversive affect. This may result in avoidance of the school as evidenced by increased absences as well as avoidance from school-related stimuli including books in the home. The whole series of events come full circle when the avoidance of school and school-related stimuli further decreases the child's proficiency in reading.

PB's notion of interactionism is highly relevant to children with HPU. It gives theoretical and explanatory substance to many observations of experts in the HPU field. For example, as stated previously, Whitmore (1980, 1988) suggested that the following types of children who are gifted are at-risk for underachievement: highly gifted/creative, young active males, adolescent females with low expectations, mildly/severely handicapped, and individuals who are culturally different. From a PB perspective, children who are highly creative are susceptible to underachievement because their unorthodox, divergent responses are not what is expected and/or required by most

teachers. Young males who are active may be at-risk due to their lack of basic behavioral repertoires (e.g., attention). Adolescent females with low expectations may require closer monitoring because of lower A-R-D value for academic achievement. The mildly/severely handicapped may be susceptible to greater disabilities since their mild/severe handicap may detract teachers from their strengths, may indirectly cause social-emotional problems, and may induce over-protective treatment. And children who are culturally different and gifted may be at-risk for underachievement because their language-cognitive BBR may not be culturally relevant to the white, middle-class requirements.

Whitmore (1980, 1988) also noted environmental situations that may facilitate underachievement in the gifted: too low or high parent or teacher expectations, inappropriate curriculum that is too simple or that does not consider the learning style of the child, and socially deprived settings. A PB analysis would predict that too low parent or teacher expectations may result in positive reinforcement of low mastery of academic skills while too high parent or teacher expectations may result in too few occasions of positive reinforcement. Inappropriate curriculum would indicate that the academic stimuli presented to the child are not appropriate for skill mastery. Socially deprived environments may foster social isolation and negative affect for school, which in turn, may cause low motivation, and avoidance.

Indeed, for some children, half the battle is improving the attitude the student has toward school. Almost every source on programming mentioned the need for some form of counseling be it with

the teacher or with more qualified professional counselors, thus attesting to the importance of the emotional-motivational BBR of the child (Whitmore, 1980; Jacobson, 1984). In addition, the multi-method programs recognize the necessity not to ignore non-intellectual and non-academic areas such as social-emotional and classroom behaviors.

Assessment theory. A substantial portion of scientific research and application centers around psychometrics, assessment, diagnosis, and identification. PB's formulations on these types of issues have been explicated in congruence with its other conceptualizations (Burns, 1978, 1980, 1986; Staats, 1963, 1975, 1986a, 1988b; Staats & Burns, 1981). PB's assessment involves the measurement of aspects of the BBRs. In general, interest and vocational inventories attempt to ascertain information concerning the emotional-motivational and language-cognitive BBRs, achievement and intelligence tests convey data relevant to the language-cognitive and sensory-motor BBRs, and personality instruments attempt to assess language-cognitive and emotional-motivational BBRs.

Verbal paper-and-pencil instruments can provide valuable information with regard to many psychological aspects such as the reinforcing properties of objects, behavioral tendencies in specified hypothetical situations, and intellectual and problem-solving skills. "... it is suggested that the individual's verbal behavior is lawful--as lawful as any other type of behavior" (Staats, 1975, p. 427).

There are theoretical, methodological, and practical limitations that must be taken into account when utilizing such techniques, however (Anastasi, 1988, p. 368). A PB analysis of test-taking behaviors, for example, suggests that while the theorist ideally hopes that the subjects' responses are valid and truthful, it is conceivable that such responses may be based on other variables as well including motivation, test-taking anxiety, inferred reinforcement consequences, social desirability, and demand characteristics.

It is not uncommon for a child with LD to race through his/her group-administered, timed, reading test by marking random answers. A PB analysis of this particular situation would take into account the following: (1) the reading ability and subsequent effort required to complete the test, (2) the aversiveness of reading, (3) the positive reinforcers made contingent upon finishing the test early (e.g., the child may be allowed to play a quiet game on the computer while the other students complete the test in the required time), and (4) the attentional and following-directions skills of the individual.

However, while the negative aspects of paper-and-pencil tests are evident, when these tests are accompanied by behavioral-observation assessments, much can be discovered in terms of the behavioral taxonomy outlined previously.

Consistent with the multi-method assessment practices advocated by many experts in the HPU field, PB argues that different methods may be appropriate at different times depending on the specific circumstances involved. PB qualifies such multi-method techniques by stating that

only relevant assessment devices should be utilized rather than a standard battery of tests. For example, for some students with HPU, personality-type inventories may be applicable based on teacher observations of social-emotional difficulties while for other children such instruments may not be necessary.

Finally, what is most important about PB's psychometric theory is that comprehensive assessment, diagnosis and identification of the BBRs all lead directly to hypotheses concerning the acquisition, maintenance and modification of behavior (Staats, 1975, 1986a, 1988b). For example, a child who has a negative emotional reaction to reading material and whose reading skills are poor will probably require the use of potent reinforcers to maintain effortful reading responses. As reading becomes increasingly associated with positive reinforcers and as the student's reading skills improve to the point where it is no longer effortful to engage in such behaviors, it would be expected that reading behaviors would increase in frequency. In addition, less potent reinforcers should be required to maintain reading responses and it would be expected that the A-R-D value of the reading content itself will contribute to the maintenance of reading behaviors (Staats, 1975).

CHAPTER IV

PARADIGMATIC-BEHAVIORAL APPLICATION TO THE UNDERIDENTIFICATION PROBLEM

Interventions and programs cannot be provided to students with HPU unless these individuals are first identified. However, current identification procedures have not been attempted in regular-education settings, presumably because they are too costly in terms of time, effort, and finance relative to the supposedly low prevalence.

One strategy to the solution of the problem of underidentification involves utilizing to their fullest extent existing data available for all students, but without using methods that would directly exclude individuals underserved (e.g., the young, culturally different, and female children with HPU).

Two tests that might be relevant to this task will be discussed that are periodically administered to students in regular education in Hawaii as well as elsewhere. The first, the Otis-Lennon School Abilities Test (OLSAT) will be addressed because of its presumed measure of intelligence, and the second will be the Stanford Achievement Test (SAT) because of the possible usefulness of this instrument.

Otis-Lennon School Abilities Test

Some students in the Hawaii State Department of Education are given the Otis-Lennon School Abilities Test, one of the most frequently utilized group-administered instruments (Oakland, 1985) supposedly

measuring intellectual ability. This test is composed of five levels: Primary I (grade 1), Primary II (grades 2-3), Elementary (grades 4-5), Intermediate (grades 6-8), and Advanced (grades 9-12).

While this device appears to be, in general, an adequate screening measure of intellectual ability, it has some shortcomings especially for the reading disabled. (1) Like any group-administered test, the OLSAT requires the examinees to appropriately attend and not be distracted during the testing sessions (Oakland, 1985). (2) The test primarily assesses verbal abilities (Dyer, 1985; Oakland, 1985). (3) Although generally accepted as being a reliable measure at the upper age levels, the evidence of validity provided by the publishers and authors has been scant at best (Dyer, 1985; Oakland, 1985).

(4) It is the fourth disadvantage that is most relevant in the present context. For the Elementary, Intermediate and Advanced levels, the OLSAT requires the subjects to read the test items (Dyer, 1985; Oakland, 1985). Therefore, children above the third grade must be able to read at a certain proficiency rate before the requirements of the task can be understood (Oakland, 1985).

(5) Finally, to put the reading disabled at an even greater disadvantage, the OLSAT's standardized administration procedures dictate a time limit as well. It is difficult enough for remedial readers to have to read test items; when a time limit is placed upon them, this further restricts their performance since their reading tends to be slow and laborious.

In defense of the OLSAT, two things are noteworthy: (1) It has been reported that 91% to 98% of the items are below the respective reading-difficulty grade level for each test level and form (Dyer, 1985, p. 1109). However, even if this were accepted, the slower reading rate of the reading disabled and the aversiveness reading material has for a large portion of these students would suggest that the reading requirements may still adversely affect their performance.

(2) The Primary I and II levels may constitute useful information for children with LD and HPU because all of the items are orally administered by the examiner, although the less reliable nature of these lower levels must be taken into account. For example, the correlations between the Metropolitan Achievement Test (MAT) and the OLSAT are very high for the fourth, sixth and eighth grades, high for second graders, and only moderate for first graders (Oakland, 1985, p. 1112).

Stanford Achievement Test (SAT) series

Any intelligence test that requires reading and is timed will in all likelihood result in underidentification of students with HPU because these children tend to have relatively lower reading skill levels often requiring more time for reading activities due to the non-automaticity of their decoding skills. The question then becomes, "Is there another measure of intellectual ability and/or achievement that can be used?" The Hawaii State Department of Education administers to all students the appropriate level of the Stanford Achievement Test (SAT) series every two to three years. The SAT series

is composed of 10 levels, each consisting of 5 to 11 subtests. While the SAT is generally recognized as an adequate group-achievement measure, it has not been traditionally accepted as a measure of intellectual ability (e.g., Shoff, 1984). In addition, like all achievement tests, while the various subtests correlate significantly with intelligence tests, the correlations are only moderate and much of the variance is unaccounted for.

However, when examining the substantive skills assessed by the various SAT subtests, PB has some interesting hypotheses that may have important implications and functional applications with regard to the screening and subsequent identification of students with HPU in regular education.

It must first be reiterated that all group-administered, standardized tests require many pre-requisite behavioral skills. Traditional paper-and-pencil tasks require a fair degree of the following behaviors: attention to relevant stimuli, visual and auditory discrimination of pertinent stimuli, following directions, fine-motor coordination including use of the pencil, imitation and modeling, adequate motivation, and absence of severe test-taking anxiety that may interfere with and adversely affect performance. The SAT series is no exception; in fact, it even necessitates the skills of bubbling in multiple-choice options, a behavior that should not be taken for granted especially for kindergarten and first graders.

With these shortcomings in mind, a very molecular PB analysis could be performed on each and every subtest of every level. For

example, the lowest level has a subtest called "Sounds and Letters." This subtest is composed of five subsections with a total of 44 items.

Subsection 1 (called Auditory Perception), Items #1-10 (10 problems): For each of the 2 sample and 10 regular items, the subject (S) is presented four pictures of objects. The first picture object is the target stimulus and is framed in a box that is outlined to signify this. The examiner (E) orally labels (or names) all four picture objects for the S, and the S is instructed to select the picture object that "starts with the same sound as" (Madden, Gardner, & Collins, 1982a, p. 17) the first target picture object. The first item consists of a picture of a baby (target stimulus) followed by pictures of a bike, pony and desk; Item #10 is composed of a picture of wood (target stimulus) followed by pictures of a roof, wagon and rabbit. Since this subscale is normed for kindergarten children, very basic behavioral repertoires are being assessed. These behavioral skills include: auditory-visual attention and discrimination of the E's orally presented labels of the visual picture stimuli; and auditory matching of beginning sounds of the labels.

Subsection 2 (also part of Auditory Perception); Items #11-20 (10 problems): This portion of the test is similar to Subsection 1 except that the S is instructed to select the picture object that "rhymes with the first picture" (Madden, Gardner, & Collins, 1982a, p. 18). Item #11 involves a picture of a man (target stimulus) followed by pictures of a fan, cake and pen; Item #20 consists of a picture of a car (target stimulus) followed by pictures of a door, cap and star. The behavioral

skills include: auditory-visual attention and discrimination of the E's orally presented labels of the visual picture stimuli; auditory matching of ending sounds of the labels; and the concept of rhyme.

Subsection 3 (Symbol Perception), Items #21-28 (8 problems): For each of the two sample and eight regular items, the S is presented a picture of an object followed by three written, upper- or lower-case letters. The picture merely serves as a marker to denote what item the E is on. For example, the E would instruct the S to find the picture of the "fish" to cue the S to the appropriate item. The E then orally labels the name of one of the three written upper- or lower-case letters. The S is instructed to select out of the three options the letter that was named by the E. Item #21 displays a marker picture of a moon followed by the three written, upper-case letters of "W," "V" and "N." The S is requested to identify the letter "W." Item #28 consists of a picture of a pail as the marker stimulus followed by the three written, lower-case letters of "b," "d" and "p," and the S is required to identify the "d." It is interesting to note the selection of these three lower-case letters by the authors since beginning and remedial readers appear to have greater difficulty discriminating these similar letters. The repertoires measured include: auditory attention and discrimination of the E's orally presented label of a letter; visual attention and discrimination of the written, upper- and lower-case letters; verbal labeling of written, upper- and lower-case letters; and discrimination and matching of the oral label of the

letter with its corresponding verbal label for its written upper- or lower-case counterpart.

Subsection 4 (also part of Symbol Perception), Items #29-36 (8 problems): This part has two sample and eight regular items. Each problem begins with a written lower-case letter followed by three pictures of objects. The E orally labels the three picture objects and asks the S, "Which picture begins with the letter you see?" Item #29 consists of the letter "s" followed by a picture of a cart, wolf and "some salt" (actually, a salt shaker; Madden, Gardner, & Collins, 1982a, p. 19); Item #36 presents the letter "c" followed by a picture of a gift, coat and horse. The skills required are: auditory-visual attention and discrimination of the E's orally presented labels of the three visual pictures; visual attention and discrimination, and phonological labeling of the written, lower-case letter; and discrimination and matching of the beginning sounds of the labels of the three visual pictures with the phonological label of the lower-case letter.

Subsection 5 (also part of Symbol Perception), Items #37-44 (8 problems): For each of the two sample and eight regular problems, a picture of an object is followed by three written, lower-case letters. The E orally labels the picture of the object and the S is requested to select the written, lower-case letter "that stands for the first sound in the word" (Madden, Gardner, & Collins, 1982a, p. 20). Item #37 begins with a picture of a sun followed by the written, lower-case letters of "s," "t" and "d"; Item #44 is composed of a picture of a

bird followed by the written, lower-case letters of "g," "f" and "b." The behavioral repertoires include: auditory-visual attention and discrimination of the E's orally presented label of the visual picture; visual attention and discrimination, and phonological labeling of the written, lower-case letters; and discrimination and matching of the beginning sound of the label of the visual picture with the phonological labels of the three, written, lower-case letters.

Such a detailed analysis of each of the subtests for each of the levels could be done in order to delineate the molecular behavioral repertoires necessary in order to perform well on these tests. The type of information gained from such analyses would be critical for a remedial teacher who is involved in the daily lesson planning and instructing [see Appendix A for narrative descriptions of the various subtests]. However, for the purposes of the present project, a comprehensive evaluation of the subtests is not essential. Only a global analysis of the behavioral requirements is necessary.

Table 7 gives the following information: (1) presents the 10 levels and indicates the corresponding subtests and grade levels, (2) denotes whether skills in letters, words, and/or sentences are required for successful performance, and (3) signifies whether the subtests are timed or examiner paced. The results of the table are derived from the following sources: Gardner, Callis, Merwin and Rudman (1982a-1982c), Gardner, Rudman, Karlsen and Merwin (1982a-19821, 1983a-1983f), and Madden, Gardner and Collins (1982a-1982d, 1983a-1983b).

Table 7

Summary of Stanford Achievement Test (SAT) Series:
Individual Subtests

	Levels									
	SS1	SS2	P1	P2	P3	I1	I2	A	T1	T2
	Grade Placements									
Subtests	K.0-K.9	K.5-1.9	1.5-2.9	2.5-3.9	3.5-4.9	4.5-5.9	5.5-7.9	7.0-9.9	8.0-12.9	9.0-13
Sounds & Letters	R/P	R/P								
Word Study Skills			R/TP	R/TP	R/T	R/T	R/T			
Word Reading	R/P	R/TP	R/T	R/T						
Sentence Reading		R/TP								
Reading Comprehension			R/T	R/T	R/T	R/T	R/T	R/T	R/T	R/T
Vocabulary			NR/P	NR/P	NR/P	NR/P	NR/P	NR/P		
Reading Vocabulary									R/T	R/T
Listening to Words & Stories	NR/P	NR/P								
Listening Comprehension			NR/P	NR/P	NR/P	NR/P	NR/P	NR/P		
Spelling			R/P	R/T	R/T	R/T	R/T	R/T	R/T	R/T
Language					R/T	R/T	R/T	R/T		
English									R/T	R/T
Concepts of Number			NR/P	NR/P	NR/P	R*/T	R*/T	R*T		
Mathematics Computation & Applications			NR/TP							
Mathematics Computation				NR/T	NR/T	NR/T	NR/T	NR/T		
Mathematics Applications				NR/P	R*/T	R*/T	R*/T	R*/T		
Mathematics (A)	NR/P	NR/TP							R/T	R/T
Mathematics (A & B)	NR/P	NR/TP								
Environment	NR/P	NR/P	NR/P	NR/P						
Science					R/T	R/T	R/T	R/T	R/T	R/T
Social Science					R/T	R/T	R/T	R/T	R/T	R/T

Table 7 (continued)

Summary of Stanford Achievement Test (SAT) Series:
Individual Subtests

[Note: SS1 = Stanford Early School Achievement Test, Level 1; SS2 = Stanford Early School Achievement Test, Level 2; P1 = Primary, Level 1; P2 = Primary, Level 2; P3 = Primary, Level 3; I1 = Intermediate, Level 1; I2 = Intermediate, Level 2; A = Advanced; T1 = Test of Academic Skills, Level 1; T2 = Test of Academic Skills, Level 2. K = Kindergarten. R = more than minimal proficiency in written letters, words, and/or sentences is required for successful performance; R* = reading necessary but the subject may ask questions pertaining to the reading text; NR = No R. T = timed; P = examiner paced; TP = a combination of timed and examiner paced.]

The SAT strategically combines some of its subtests within a level to form Total test scores. Table 8 delineates the subtests per level that constitute the various Reading, Total Reading, Total Listening Comprehension, Total Language, and Total Math scores.

It should be noted that for all of the subtests marked with an "*," all of the questions posed are in written-sentence form on the S's test booklet and thus necessitate a certain degree of reading proficiency. In order to attempt to offset this influence, the authors of the test included in the administration instructions, "If you [S] have any trouble reading a question, raise your hand and I [E] will help you" (Gardner, Rudman, Karlsen, & Merwin, 19821, p. 20). However, the frequency and extent to which a child with remedial-reading needs would ask for reading assistance during a formal standardized test is unknown. In addition, there is a time limit to these subtests which already restricts slow and laborious readers. Finally, it is perhaps a rare instance for a student to ask such questions. Therefore, given the requirements for reading and the time restrictions, it is likely that this subtest is influenced by the reading repertoires of the S as well.

Paradigmatic-behavioral analysis of the SAT series and subtests. According to a PB analysis of psychometric tests, there are many factors that can affect how well an individual performs on a particular test. The variables relevant to the present discussion are: reading-spelling-writing requirements, rote versus conceptual learning,

Table 8

Stanford Achievement Test (SAT) Series:
Total Test Scores

	Levels									
	SS1	SS2	P1	P2	P3	I1	I2	A	T1	T2
	Grade Placements									
Subtests	K.0-K.9	K.5-1.9	1.5-2.9	2.5-3.9	3.5-4.9	4.5-5.9	5.5-7.9	7.0-9.9	8.0-12.9	9.0-13
Sounds & Letters	TR	TR								
Word Study Skills			TR	TR	TR	TR	TR			
Word Reading	TR	R&TR	R&TR	R&TR						
Sentence Reading		R&TR								
Reading Comprehension			R&TR	R&TR	TR	TR	TR			
Vocabulary			TLs	TLs	TLs	TLs	TLs	TLs		
Listening Comprehension			TLs	TLs	TLs	TLs	TLs	TLs		
Spelling					TLn	TLn	TLn	TLn		
Language					TLn	TLn	TLn	TLn		
Concepts of Number			TM	TM	TM	TM	TM	TM		
Mathematics Computation & Applications			TM							
Mathematics Computation				TM	TM	TM	TM	TM		
Mathematics Applications				TM	TM	TM	TM	TM		

[Note: SS1 = Stanford Early School Achievement Test, Level 1; SS2 = Stanford Early School Achievement Test, Level 2; P1 = Primary, Level 1; P2 = Primary, Level 2; P3 = Primary, Level 3; I1 = Intermediate, Level 1; I2 = Intermediate, Level 2; A = Advanced; T1 = Test of Academic Skills, Level 1; T2 = Test of Academic Skills, Level 2. K = Kindergarten. R = Reading; TR = Total Reading; TLs = Total Listening Comprehension; TLn = Total Language; TM = Total Math.]

"hands-on" applications, oral-vocabulary level, and attentional requirements.

(1) Assuming the instruments are adequately reliable and valid, then perhaps the most obvious variable that would influence test scores would be the construct being measured. A critical issue in a PB analysis of the SAT and the underidentification problem is: "What are the differences between IQ and achievement tests?" It should be first noted that many of the differences are either artificial or made strictly on the basis of their respective definitions. From a PB perspective, the commonalities in the behavioral repertoires required to perform well on both IQ and achievement tests include: attention, discrimination, matching, labeling, imitation, modeling, and following directions. In these respects, the two types of constructs overlap.

However, it has been argued that IQ tests assess abilities associated with higher-level thinking such as problem solving, abstract association, concept formation, verbal and spatial reasoning, adaptability, pre-planning, and purposiveness. These types of abilities are clearly reflected in IQ tests such as the OLSAT, WISC-R and Stanford-Binet L-M.

If the rationale is that students with HPU have these higher-functioning abilities, then surveying the SAT subtests would suggest that children with HPU should do better on the following subscales: Reading Comprehension, Listening to Words and Stories, Listening Comprehension, Vocabulary, Concepts of Number, Mathematics

Computation and Application, Mathematics Applications, Mathematics, Environment, Science, and Social Studies.

(2) The situation becomes more complex, however, because the other factors referred to prior facilitate or impede the acquisition or manifestation of these intellectual abilities. For instance, many of the subscales listed in the previous discussion require the children to read, spell and/or have knowledge pertinent to writing. In essence, students with HPU may not have the pre-requisite reading, writing, and spelling repertoires to engage competitively with peers who are able to demonstrate these skills. Because students with HPU supposedly are deficient in such areas relative to their intellectual potential, they cannot be expected to score high on these subtests. Therefore, performance on the following subscales would be predicted to be either in the average range or below for children with HPU: Sounds and Letters, Word Study Skills, Word Reading, Sentence Reading, Reading Comprehension, Spelling, Language, Concepts of Number (higher SAT levels), Mathematics Applications (higher SAT levels), Science, and Social Studies. In addition, students with HPU should score even lower on these subscales because many have strict time limits (i.e., "R/T") which would further hinder students with a reading disability given their slow and laborious reading rate.

(3) Some experts often note the distaste for certain mundane drill-and-practice activities by students with HPU (and children with LD and average intelligence). If this observation holds true, then the A-R-D value of repetitive training methods is aversive for students

with HPU. PB would therefore predict lowered performance on tests involving skills that have been traditionally taught utilizing drill-and-practice formats. These subtests would include: Spelling, and Mathematics Computation, and possibly other subscales such as Word Study Skills, and Language. Therefore, while students with HPU may do well on Mathematics Computation because minimal reading is involved, the mundane attributes of arithmetic computation and perhaps accompanying math underachievement would suggest that children with HPU would do poorly on this measure.

(4) Another characteristic of individuals with HPU is the greater motivation for "hands-on," applied, and functional activities. If the A-R-D value of such tasks is positive, PB's theory would suggest higher performance on subscales that are associated with such presentations. While none of the SAT subtests can be said to be "hands-on," some are more applied and functional than others. For example, the expectation would be for higher scores in the following subtests: Listening to Words and Stories, Listening Comprehension, Math Applications, Environment, Science, and Social Science.

(5) Having higher potential, as measured on an IQ test, typically coincides with possessing a well-developed oral vocabulary, or in PB terms, labeling repertoire. For children with HPU with mature labeling repertoires, one would anticipate the following subtests to be performed well: Vocabulary, Listening to Words and Stories, Listening Comprehension, Environment, and to a lesser extent, Word Reading,

Sentence Reading, Reading Comprehension, Reading Vocabulary, Spelling, Language, Math Applications, Science, and Social Science.

(6) Many children with HPU have deficits in auditory and/or visual attention. If this is a pervasive trait of the individual, one would expect depressed scores across all group-administered tests since attention is such a basic repertoire for virtually any other skillful behavior. If the inattention is selective depending on motivation (i.e., the stimuli impinging on the subject), then one would expect variable performance as a function of the characteristics of the various tests. Any test requiring a fair degree of attention (and recall) would most likely result in relatively poor performance. These tests would include: Listening to Words and Stories, and Listening Comprehension.

Based on the previous discussion and in an attempt to appropriately weigh all of the factors that influence performance on the SAT, the contents of Tables 9 and 10 would be suggested based on a PB analysis.

Several points are relevant: (1) The projections of Tables 9 and 10 are primarily targeted for students with HPU who are underachieving in the language arts and math subjects. Children underachieving in only math should have depressed scores only in math; their other subtests should be substantially higher assuming that their reading, spelling and writing skills are more proficient.

(2) Based on the PB analysis, the subtests on the TASK, Levels 1 and 2, will perhaps not significantly differentiate themselves from one

Table 9

Paradigmatic-Behavioral SAT Predictions:
Individual Subtests

	Levels									
	SS1	SS2	P1	P2	P3	I1	I2	A	T1	T2
	Grade Placements									
Subtests	K.0-K.9	K.5-1.9	1.5-2.9	2.5-3.9	3.5-4.9	4.5-5.9	5.5-7.9	7.0-9.9	8.0-12.9	9.0-13
Sounds & Letters	L-A	L-A								
Word Study Skills			L-A	L-A	L-A	L-A	L-A			
Word Reading	L-A	L-A	L-A	L-A						
Sentence Reading		L-A								
Reading Comprehension			L-A	L-A	L-A	L-A	L-A	L-A	L-A	L-A
Vocabulary			H	H	H	H	H	H		
Reading Vocabulary									L-H	L-H
Listening to Words & Stories	H	H								
Listening Comprehension			H	H	H	H	H	H		
Spelling			L-A	L-A	L-A	L-A	L-A	L-A	L-A	L-A
Language					L-A	L-A	L-A	L-A		
English									L-A	L-A
Concepts of Number			A-H	A-H	A-H	A-H	A-H	A-H		
Mathematics Computation & Applications			A-H							
Mathematics Computation				L-A	L-A	L-A	L-A	L-A		
Mathematics Applications				A-H	L-H	L-H	L-H	L-H		
Mathematics	A-H	A-H							L-H	L-H
Environment	H	H	H	H						
Science					L-H	L-H	L-H	L-H	L-H	L-H
Social Science					L-H	L-H	L-H	L-H	L-H	L-H

[Note: SS1 = Stanford Early School Achievement Test, Level 1; SS2 = Stanford Early School Achievement Test, Level 2; P1 = Primary, Level 1; P2 = Primary, Level 2; P3 = Primary, Level 3; I1 = Intermediate, Level 1; I2 = Intermediate, Level 2; A = Advanced; T1 = Test of Academic Skills, Level 1; T2 = Test of Academic Skills, Level 2. K = Kindergarten. L = Low Average; A = Average; H = High Average.]

Table 10

Paradigmatic-Behavioral SAT Predictions:
Total Test Scores

	Levels									
	SS1	SS2	P1	P2	P3	I1	I2	A	T1	T2
	Grade Placements									
Subtests	K.0-K.9	K.5-1.9	1.5-2.9	2.5-3.9	3.5-4.9	4.5-5.9	5.5-7.9	7.0-9.9	8.0-12.9	9.0-13
Total Listening Comprehension			H	H	H	H	H	H		
Reading		L-A	L-A	L-A						
Total Reading	L-A	L-A	L-A	L-A	L-A	L-A	L-A			
Total Language					L-A	L-A	L-A	L-A		
Total Math			L-A	L-A	L-A	L-A	L-A	L-A		

[Note: SS1 = Stanford Early School Achievement Test, Level 1; SS2 = Stanford Early School Achievement Test, Level 2; P1 = Primary, Level 1; P2 = Primary, Level 2; P3 = Primary, Level 3; I1 = Intermediate, Level 1; I2 = Intermediate, Level 2; A = Advanced; T1 = Test of Academic Skills, Level 1; T2 = Test of Academic Skills, Level 2. K = Kindergarten. L = Low Average; A = Average; H = High Average.]

another primarily because these require a substantial degree of reading; there are no listening-comprehension-type subscales. Therefore, the discussions to follow will be addressing the SESAT, Levels 1 and 2; Primary, Levels 1 to 3; Intermediate, Levels 1 and 2; and Advanced Level.

(3) In examining Tables 9 and 10 more closely, the pronounced differences between normal children and students with HPU should occur on only a few of the subtests and Total test scores. Children with HPU should perform relatively higher on the Vocabulary, Listening to Words and Stories, Listening Comprehension, and Environment subscales, and on the Total Listening Comprehension score. Further, the scores on these subtests for children with HPU should be higher in comparison to the other subscales with particular reference to Spelling, and Math Computation, and to a lesser degree, the Sounds and Letters, Word Study Skills, Word Reading, Sentence Reading, Reading Comprehension, and Language subtests. For the Total test scores, the Total Listening Comprehension measure should be greater than the Total Reading, Total Language and Total Math. However, finer distinctions among the latter three Total scores are more difficult to project because of the heterogeneous subtests contained in each.

The predictions made based on PB refer to a discrepancy between listening-comprehension and reading skills. This notion that a difference between listening comprehension and reading decoding/comprehension, or between expressive/receptive language and reading decoding/comprehension, is not novel. Reading specialists will

sometimes use as diagnostic information the child's differential comprehension performance on an IRI under two separate conditions: the text being independently read by the child and the text being orally read by the examiner. If the student's comprehension is much better when the passage is orally read to the child by the examiner as compared to when the student is required to independently read the material, then it can be reasonably concluded that lack of decoding skills may be hampering reading comprehension (University of Hawaii at Manoa, Reading Clinic, Dr. Kelvin Young). Ideally, normative data would be required to determine exactly how much of a listening-reading comprehension discrepancy is needed to be considered significant.

Daniels (1983b) suggested that gaps between listening and reading comprehension may be useful in identifying students who are gifted/underachieving; however, no empirical data were provided. Fox (1983), in describing the Johns Hopkins study, found favorable results when the discrepancy between listening comprehension and instructional reading level was used as one operational definition of reading disability. Wood, Buckhalt and Tomlin (1988) attempted to identify children in regular education using a listening-reading difference. These investigators found supportive results although students who were HP (including the gifted) were not targeted in this investigation. In other study, Spring and French (1990) found significant differences between listening- and reading-comprehension scores on a modified administration of the Peabody Individual Achievement Test (PIAT) (Dunn

& Markwardt, 1970). This method clearly differentiated the reading-disabled from the non-reading-disabled children.

Unfortunately, for the present purposes, there were drawbacks to the aforementioned studies. While there appeared to be consistent and supportive evidence of the functional value of a listening-reading discrepancy, no research project has applied this technique to the identification of currently unidentified children with HPU in regular education. In addition, efficient use of pre-existing, group-administered test results has not been utilized. Further, as the PB analysis has indicated, identification of children with HPU may rest not only on the listening-reading discrepancy, but on other subtests as well, including the Vocabulary subtest.

Critique of utilizing standardized tests

There are several criticisms of using standardized tests for the screening and identification of students with HPU currently in regular education.

(1) There has been speculation that a substantial portion of students with HPU have motivational and attentional problems, and that these characteristics may obscure performance on a test such as the SAT where independence and at least moderate interest are necessary. This would be a serious impediment to the screening process advocated here. For example, if a child exhibits severe lack of motivation during testing and ends up randomly responding, an overall low subtest profile would be expected (Daniels, 1983b). This particular type of underachiever would thus not be identified by this procedure.

(2) Many view the SAT, because it is a group-administered test, as not resulting in the best estimate of academic-achievement levels. While this is acknowledged, it must be recognized that one of the major goals of this project is the utilization of a cost-effective screening procedure, and as such, gross measures that are available may prove to be adequate reflections of overall academic achievement. In addition, the present view is to refer these children for further comprehensive testing at the point of screening identification. While not professing to be a perfect instrument, the reliability and validity of the SAT has been generally found to be adequate as a group-administered measure (Gardner, Madden, Rudman, Karlsen, Merwin, Callis, & Collins, 1985).

Preliminary empirical support of the SAT as a screening device

Empirical support of the predictive validity of the SAT as a screening device (although not for students with HPU) comes from a recent study by Stone, Cundick, and Swanson (1988). "The possibility that group testing could provide an effective initial screening and identification of the mildly handicapped is an intriguing notion. If effective, it would provide more human resource use at other points in a continuum of educational and personal experiences" (p. 72).

The subjects of this research investigation consisted of a pool of eight elementary schools, four of which were chosen at random from a Utah district. The total sample size was 1434 first to sixth graders; 126 were in special education (81 LD, 35 behavior disordered, 10 mildly intellectually handicapped). All had been previously administered the appropriate level of the SAT series in the Spring of 1985. The

cross-validity sample included 2 of 64 elementary schools taken at random in Utah with a sample size of 1011 first to sixth graders, 921 of which were in regular education and 90 were in special education. The SAT total achievement and total reading scores were used as predictors with varying criteria cutoff percentiles of 20, 15, 10 and 5.

As expected, the higher the cutoff percentile, the greater the probability that children in special education were classified as being such. The lower the cutoff, the more likely the students in special education were not categorized as being in special education. The results were similar for the original and cross-validation samples, and for the total SAT and total reading scores, although there was a slightly greater number of "hits" for students in special education using the total battery score as compared to the total reading score.

Overall, "In identifying students previously identified as handicapped, it appears that this screening system is capable of the same basic 90% accuracy found in the present teacher referral system" (p. 73). Setting the cutoff percentile at the fifth percentile almost exclusively identified children who were already in special education. "If this procedure were used for this particular group of students, between 400 and 600 hours of school psychologist and classroom teacher time could have been spared" (pp. 74-75).

In the present situation, prior to the demonstration of identification accuracy as high or higher than that obtained under current procedures, referral for comprehensive testing is recommended

should a student with possible HPU be identified using the PB-SAT system. At that point, a more multi-method/multi-criteria assessment procedure should be implemented. Identification using the SAT as a screening instrument is the beginning, not the end of diagnosis and programming.

CHAPTER V

METHOD

There are two general ways of evaluating the efficacy of using the SAT series as a screening device: retrospective and prospective analyses. A retrospective method would entail comparing SAT-subtest profiles of students already identified as being HPU (e.g., gifted/LD) in special education against a control sample from regular education. A prospective investigation would involve predicting exceptionality classification before the comprehensive evaluation and diagnosis.

The present study consisted of a retrospective analysis whereby SAT-subtest compositions were contrasted based on group affiliation. Due to practical limitations on data availability and access, statistical analyses could be performed only on the Total test scores of certain levels of the SAT series. However, data were collected not only from populations of children from regular education and students with HPU, but from one reflecting a population of those high in potential and not underachieving.

The subtests making up the Total Listening Comprehension score generally involve skills that are similar to those assessed on IQ tests that measure verbal abilities (e.g., vocabulary, listening comprehension, verbal reasoning, problem solving, adaptation, abstract thinking), that require minimal reading and/or spelling proficiency, and that can be considered functionally relevant in content. Therefore, PB would suggest that subjects with HP and HPU will score

significantly above students in regular education on these types of measures.

However, a PB approach would predict that subjects with HPU will score similarly to the subjects in regular education on the Total Reading, Total Language, and Total Math composites. This is projected because of the requirements for performing well on the subtests that compose these Total scores: reading, spelling and writing; rote and drill-and-practice tolerance; less emphasis on conceptual/abstract thinking abilities; and strict time limits. Finer distinctions among these three Total composites were difficult to propose given the heterogeneity of the subtests within each of the Total tests.

Subjects

Three groups of subjects were obtained and constituted the GROUP main-effect factor in the subsequent analysis.

(1) Experimental/HPU group. The experimental subjects were collected at ASSETS School, an educational institution located in Hawaii and geared to serve children who are gifted/high potential, learning disabled/dyslexic, and both high potential/learning disabled. Several criteria were set in the selection process: (a) All subjects must have attended the Summer Session and/or the Day School, thus receiving an Individualized Education Plan (IEP) facesheet and diagnosis. Because all Summer Session and Day School students received such a document, no inherent bias was introduced at this level. (b) All students must have been diagnosed to have been underachieving (e.g., learning disabled, dyslexic) in at least one area (e.g.,

reading, spelling, writing, math) or at least "at risk" for underachievement. This was determined based on the diagnosis of the Multidisciplinary Team and this opinion appeared on the IEP for each student. (c) All subjects must have had an IQ of 110 or higher. If any of the Wechsler IQ tests were utilized, then the Full Scale IQ was the score used to determine inclusion in this study. No bias was indicated here as well because an IQ score existed for all of the children. (d) All students must have been administered the 1982 version (i.e., Form E or F) of the SAT either prior to or during the time of the evaluation. If the results of more than one administration of this SAT edition were available, then the subtests utilized were those administered just prior to the diagnosis. This was done because of the goal of predicting identification before formal evaluations had taken place. Because both the Hawaii State Department of Education and ASSETS routinely utilized the SAT series, no significant selection bias was projected.

Based on these criteria, an initial sample of 82 possible subjects was obtained. However, because not all of the SAT subtests were administered for a proportion of this group, those without Total Listening Comprehension, Total Reading, Total Language, and Total Math scores were excluded. As a result, 40 subjects that were "intact" constituted the final experimental group. Because of the possible bias that this last criterion may have introduced, *t* tests were conducted to give a cursory indication of the presence of any selection bias (see Results Chapter).

The final ASSETS sample consisted of 4 (10%) third graders one of whom had repeated a grade, 9 (22.5%) fourth graders one of whom had repeated a grade, 9 (22.5%) fifth graders, 7 (17.5%) sixth graders, 9 (22.5%) seventh graders one of whom had repeated a grade, and 2 (5%) eighth graders. Of the 40, 35 (87.5%) were males and 5 (12.5%) were females; this predominance of males is characteristic among nearly all special-education categories. The SAT levels that were represented included 7 Primary 3, 8 Intermediate 1, 15 Intermediate 2, and 10 Advanced; 14 received Form E and 26 Form F. The dates of administration ranged from April, 1985, to May, 1989.

With the exception of one subject being diagnosed as being "at risk" and one other student being identified as being a "gifted/underachiever," all of the remaining children were categorized as having some variation of a learning disability or of dyslexia. These formal assessments were conducted between May of 1985 and July of 1989. Thirty-eight of the 40 subjects received the Wechsler Intelligence Scale for Children, Revised (WISC-R), one was administered the Stanford-Binet Form L-M, and the remaining subject was given the Kaufman Assessment Battery for Children (K-ABC). The administration dates for these tests ranged from June, 1982, to March, 1989. The average IQ was 120.4 and the individual scores ranged from 110 to 137.

(2) Control/RE group. In order to compare the group of subjects with HPU with a sample from regular education, SAT scores were obtained from the Hawaii State Department of Education (DOE). In Hawaii, the SAT is administered when the students are in the third, sixth, eighth

and tenth grades. The initially obtained data set of approximately 1200 subjects were randomly selected from the various seven school districts; however, no tenth-grade records were included because these entailed the upper-level SAT tests that were not as useful for the present analysis.

From this data set, 40 subjects were randomly selected to form the regular-education (RE) control group. All of these children received Form E of the SAT in May of 1988; 9 (22.5%) were third graders who were administered the Primary 3, 15 (37.5%) were sixth graders who were given the Intermediate 2, and 16 (40%) were eighth graders who received the Advanced level. No IQ information was available for these subjects.

(3) Control/HP group. The last of the three groups consisted of students from Le Jardin Academy in Hawaii. Because of the nature and selection process of many of the private schools in Hawaii, Le Jardin included, the students of these schools typically perform higher on academic tasks and standardized tests. Therefore, subjects from Le Jardin were defined as being high potential (HP). This group allowed for meaningful comparisons between children with HP and HPU.

Of the initial 70 cases provided, 40 were randomly selected for inclusion in this study. The SAT tests were given in May of 1989, and all subjects received Form F. The 23 fifth graders received the Intermediate 1 level and the 17 seventh graders were administered the Intermediate 2 level. Like the control/RE group, no IQ information was available.

Procedures and design

Because of the retrospective nature of the archived data collected, the subjects were not exposed to any formal experimental procedures in the traditional sense. The only procedural task that was performed was in the conversion of all the SAT Total test scores to standard scores with a mean of 100 and standard deviation of 15. In addition, because the Reading Comprehension subtest of the Advanced level is the only reading subscale, the results on this subtest served as the Total Reading score for this SAT level.

The design of this study involved two main effects and one interaction effect. The between factor consisted of three levels of group affiliation: experimental/HPU, control/RE, and control/HP. Each group was composed of 40 subjects resulting in a total of 120 subjects. The within factor involved four levels of the Total tests: Total Listening Comprehension, Total Reading, Total Language, and Total Math. The final non-error-term source of the design consisted of the interaction between these two variables; this interaction between the groups and tests represented the critical comparison.

CHAPTER VI

RESULTS

Test for selection bias in the experimental/HPU group

A *t*-test was attempted on each of the available Total test scores comparing the subjects selected to be included in this study (i.e., those with all four Total test scores) with those excluded from the main analyses (i.e., those without all four Total test measures). As indicated by Table 11, no significant difference was found with the Total Listening Comprehension, Total Reading, and Total Math composites; for the Total Language measure, a *t*-test was not conducted because only one subject who had a Total Language score was not included in the experimental group of 40 subjects. In addition, inspection of the relative placements of the means of the Total Listening Comprehension, Total Reading, and Total Math composites were identical for the "selected" versus excluded experimental subjects with HPU.

Analysis of variance

An equal-*ns*, analysis of variance (ANOVA) design with one between and one repeated-measures factor was employed. This entailed a total of 120 subjects with 40 per group (i.e., experimental/HPU, control/RE, control/HP) and 4 repeated-measures scores (i.e., Total Listening Comprehension, Total Reading, Total Language, Total Math). The ANOVA results are provided in Table 12.

Table 11

Test for Selection Bias in the Experimental Group

	Selected Sample		Excluded Sample			
Total Test	Mean	N Size	Mean	N Size	t value	p value
Total Listening Comprehension	108.3	40	111.7	26	1.07	p = .29
Total Reading	93.4	40	96.0	31	.86	p = .39
Total Language	92.7	40	(87.0)	1	NA	NA
Total Math	98.6	40	102.0	25	.94	p = .35

[Note: Only one subject with a Total Language score was excluded in the experimental group of 40 subjects with HPU. Therefore, because of the deficient number of subjects in this comparison, a *t*-test was not conducted on the Total Language composite. NA = not applicable.]

Table 12

Analysis of Variance

Source	df	SS	s^2	F	p value
GROUP	2	23,463.2	11,731.6	22.6	$p < .001$
S(GROUP)	117	60,771.7	519.4		
TEST	3	1,211.7	403.9	6.5	$p < .001$
GROUPxTEST	6	7,759.1	1,293.2	20.8	$p < .001$*
S(GROUP)TEST	351	21,773.7	62.0		
Total	479	114,979.3			

[Note: *$p < .001$ even with the Greenhouse and Geisser (1959) correction of the critical *F* value.]

(1) GROUP main effect. As predicted, a significant $F(2,117)$ value of 22.6 ($p < .001$) indicated a substantial overall mean difference among the experimental/HPU, control/RE, and/or control/HP groups. Table 13 and Figure 1 depict the means of the three groups.

Dunn's subsequent test (Dunn, 1961; Keppel, 1973) was utilized to make the necessary t-test comparisons. The Dunn's test was used because all of the t-test contrasts were apriori, involved a relatively small total number of comparisons in relation to the total number of interaction means, and both pair-wise and combination contrasts were required. A total of 12 contrasts were done resulting in a critical t value of 3.06 for 117 degrees of freedom with alpha set at .05. [Actually, the critical t value of 3.06 corresponds to 15 contrasts and 60 degrees of freedom.] Table 14 presents the results of the Dunn's analysis on the group means.

As predicted, the control/HP group scored significantly higher on the average of the Total tests when compared to both the experimental/HPU and control/RE groups. In addition, no significant difference was found between the experimental/HPU and control/RE samples.

(2) TEST main effect. A significant $F(3,351)$ value of 6.5 ($p < .001$) indicated a significant difference among the overall means of the four Total tests. Table 15 and Figure 2 display these means.

For the purposes of the present investigation, significant or non-significant differences on this repeated-measures factor did not

Table 13

Means of the Three Groups:
High Potential/Underachiever, Regular Education, High Potential

Group	Mean
Experimental/HPU	98.25
Control/RE	98.23
Control/HP	113.05

[Note: HPU = High Potential/Underachiever; RE = Regular Education; HP = High Potential.]

Figure 1

Overall Means of the SAT Total Tests for the Three Groups:
High Potential/Underachiever, Regular Education, High Potential

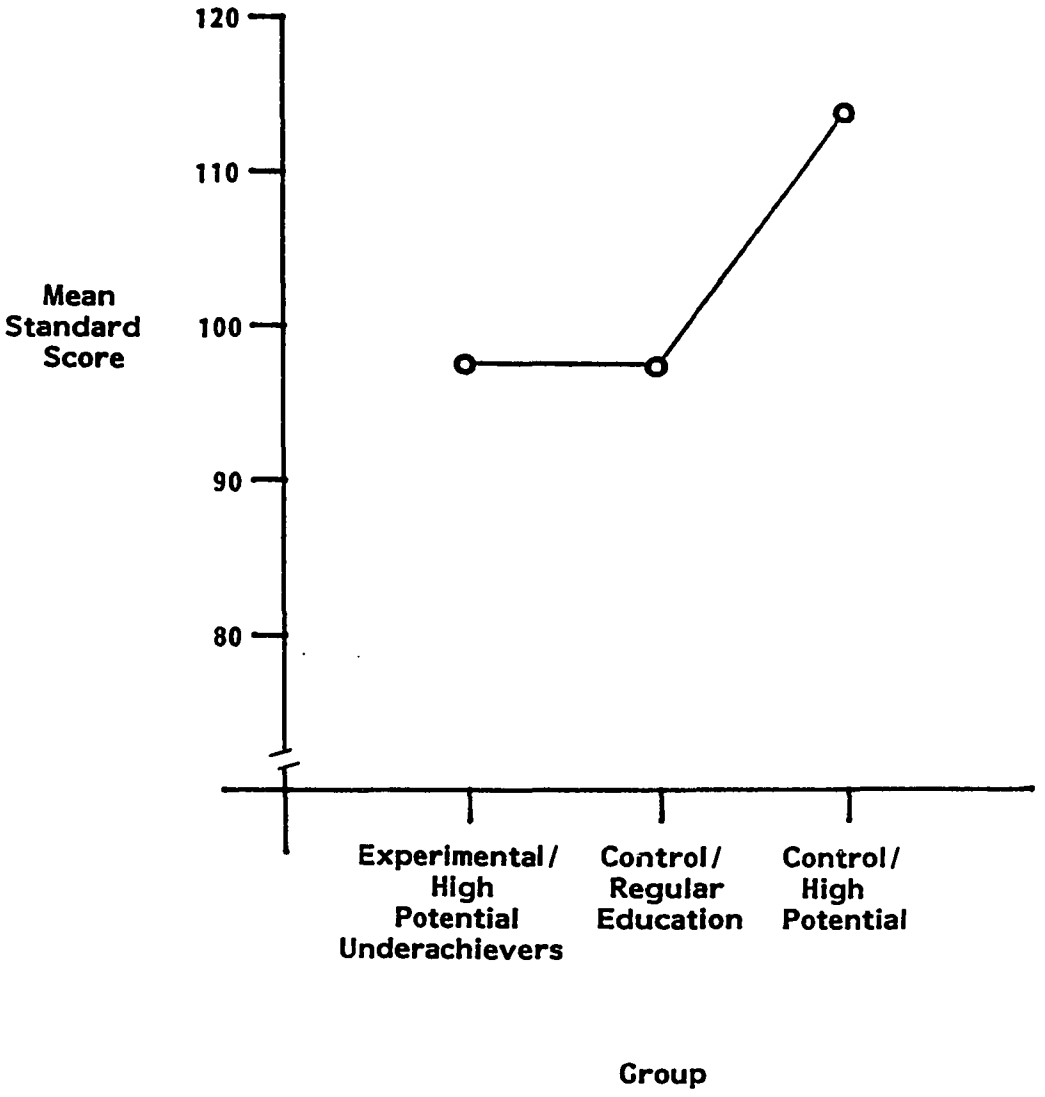


Table 14

Dunn's Subsequent Test on the Group Means

Comparison	Difference	t value	Critical t value	Significant
Experimental/HPU - Control/RE	.02	.01	3.06	No
Experimental/HPU - Control/HP	-14.80	-5.81	3.06	Yes
Control/RE - Control/HP	-14.82	-5.82	3.06	Yes

[Note: HPU = High Potential/Underachiever; RE = Regular education; HP = High Potential.]

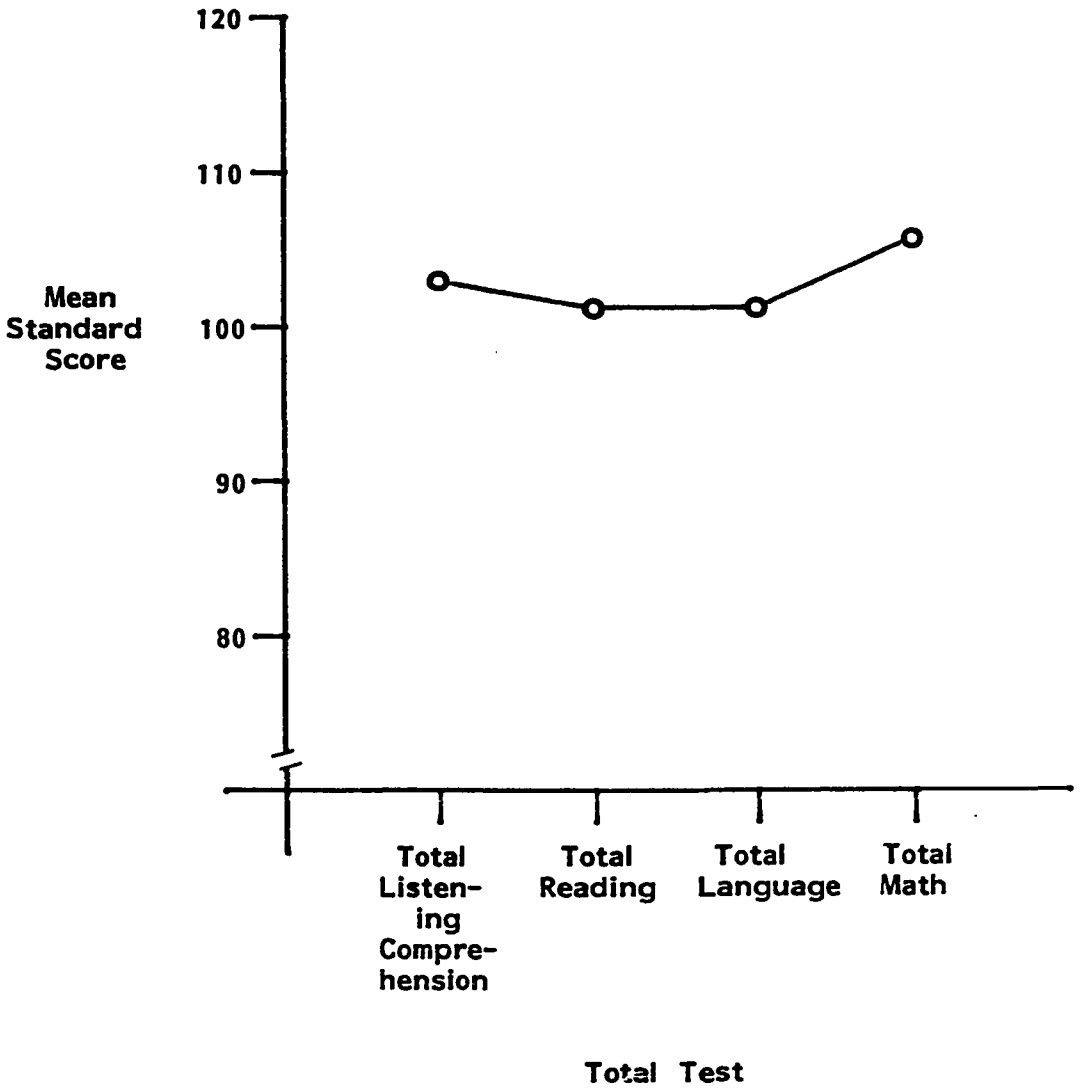
Table 15

Means of the Four Total Tests:
Total Listening Comprehension, Total Reading, Total Language,
Total Math

Total Test	Mean
Total Listening Comprehension	103.7
Total Reading	101.6
Total Language	101.8
Total Math	105.6

Figure 2

Means of the Four Total Tests:
Total Listening Comprehension, Total Reading, Total Language,
Total Math



have major implications, and therefore, subsequent tests were not conducted to ascertain which means differed from which.

(3) GROUP X TEST interaction effect. With regard to the development of a screening instrument for students with HPU, the GROUP X TEST interaction was the most critical source of comparisons. An $F(6,351)$ value of 20.8 ($p < .001$) indicated a significant interaction effect. However, because of the possibility of a positive bias in favor of making Type I errors (i.e., falsely rejecting the null hypothesis) due to heterogeneity of variance-covariance, the conservative Greenhouse and Geisser (1959) correction was employed. The new critical $F(2,60)$ value was 7.76 with alpha set at .001. Therefore, the obtained F value of 20.8 remained significant with $p < .001$. Table 16 and Figure 3 represent the GROUP X TEST interaction means.

In addition to the three comparisons that were made involving the overall group means, nine contrasts were conducted. For six of these nine comparisons, the Cochran and Cox correction factor was utilized because of the positive bias for making Type I errors (i.e., falsely rejecting the null hypothesis) when there is possible heterogeneity in variance-covariance. However, because the Dunn's critical t value was determined based on the lowest degrees of freedom for the two error terms, the same critical t value was obtained and thus utilized (i.e., 3.06). The subsequent test results are presented in Table 17.

Based on the PB analysis explicated herein, students with HPU should perform relatively higher on tasks that require such

Table 16

Means of the Group X Test Interaction

Group	Total Listening Comprehension	Total Reading	Total Language	Total Math	Average Total Reading, Language, & Math
Experimental/ HPU	108.3	93.4	92.7	98.6	94.9
Control/RE	93.9	98.2	100.4	100.4	99.7
Control/HP	108.8	113.2	112.5	117.7	114.5

[Note: HPU = High Potential/Underachiever; RE = Regular Education; HP = High Potential.]

Figure 3

Means of the Group X Test Interaction

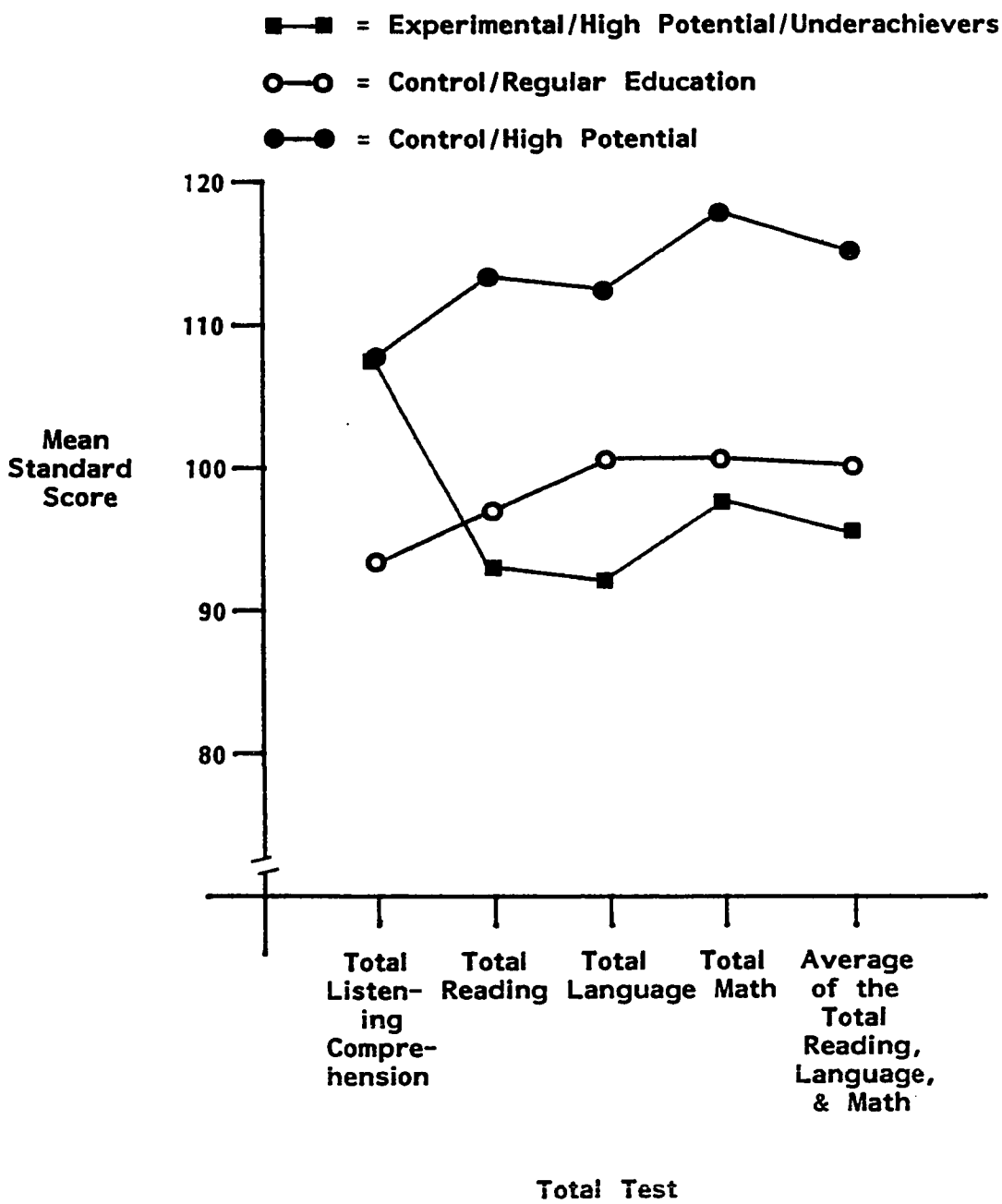


Table 17

Dunn's Subsequent Test on the Group X Test Interaction

Group Comparison	Total Listening Comprehension	t value	Critical t value	Significant
Experimental/HPU - Control/RE	14.40	4.85	3.06	Yes
Experimental/HPU - Control/HP	-.50	-.17	3.06	No
Control/RE - Control/HP	-14.90	-5.02	3.06	Yes

[Note: HPU = High Potential/Underachiever; RE = Regular Education; HP = High Potential.]

Table 17 (continued)

Dunn's Subsequent Test on the Group X Test Interaction

Group Comparison	Average Total Reading Language, & Math	t value	Critical t value	Significant
Experimental/HPU - Control/RE	-4.77	-2.78	3.06	No
Experimental/HPU - Control/HP	-19.57	-11.41	3.06	Yes
Control/RE - Control/HP	-14.80	-8.63	3.06	Yes

[Note: HPU = High Potential/Underachiever; RE = Regular Education; HP = High Potential.]

Table 17 (continued)

Dunn's Subsequent Test on the Group X Test Interaction

Group	Total Listening Comprehension minus Average Total Reading, Language, & Math	t value	Critical t value	Significant
Experimental/HPU	13.4	9.32	3.06	Yes
Control/RE	-5.8	-4.01	3.06	Yes
Control/HP	-5.7	-3.94	3.06	Yes

[Note: HPU = High Potential/Underachiever; RE = Regular Education; HP = High Potential.]

language-cognitive BBRs as vocabulary (i.e., labeling), listening comprehension, abstract thinking, and verbal reasoning. This is provided that there are minimally hindering factors such as being required to read the test items. Therefore, it would be expected that for the subjects with HPU, the Total Listening Comprehension mean would be higher than the other Total test averages. However, this should not be the case for the control/RE and control/HP groups. Viewed another way, it would also be expected that students with HPU would score similarly to children with HP on the Total Listening Comprehension test, but perform higher than the control/RE group on this measure. For the Total Reading, Total Language and Total Math tests, however, it would predicted that students with HPU would score lower when compared to children with HP, but perform similarly to the control/RE group.

The Total Listening Comprehension mean score was significantly higher for the experimental/HPU as compared to the control/RE group, but not significantly different from that of the control/HP sample. In addition, the control/HP group performed significantly better than the control/RE sample on this measure.

Also consistent with PB theory was the finding that the average of the Total Reading, Total Language, and Total Math scores was significantly lower for the experimental/HPU group in relation to the control/HP sample, but not significantly different from the control/RE group. Further, the control/HP group obtained scores much greater than those found for the control/RE children.

Additional supportive results were revealed whereby the experimental/HPU group performed significantly better on the Total Listening Comprehension composite as compared to the average of the Total Reading, Total Language, and Total Math measures. Interestingly, the reverse was found for the control/RE and control/HP groups; for these subjects, they obtained significantly higher average Total Reading, Language, and Math composites relative to the Total Listening Comprehension results.

Discriminant analysis

A discriminant analysis was conducted on the data to ascertain if the resulting discriminant function coefficients would provide for an accurate formula for predicting classification. Because one of the primary purposes of this study was to differentiate unidentified students with HPU in regular education, the control/HP group was not included in this analysis.

With the subjects in the experimental/HPU group coded as 1 and those in the control/RE sample coded as 0, a discriminant analysis was performed utilizing the Total Listening Comprehension, Total Reading, Total Language, and Total Math scores as the predictor variables. A Wilks' Lambda of .4664 and chi-square of 57.97 resulted in a probability level less than .001 with an accuracy rate of 88.75%. Table 18 displays the actual versus predicted group memberships and Table 19 presents the standardized and unstandardized discriminant function coefficients and the discriminant formula.

Table 18

Discriminant-Analysis Actual Versus Predicted Group Membership

Actual Group Membership	Predicted Group Membership	
	Experimental/HPU	Control/RE
Experimental/HPU	35	5
Control/RE	4	36

Overall percent of cases correctly classified: 88.75%

Table 19

Standardized and Unstandardized Discriminant Function Coefficients, and Discriminant Formula

Test Variable	Standardized Discriminant Function Coefficient	Unstandardized Discriminant Function Coefficient
Total Listening Comprehension	1.41	.0949
Total Reading	-.81	-.0605
Total Language	-.82	-.0639
Total Math	.30	.0198
(Constant)		.4019

Discriminant formula

TLC(.0949) + TR(-.0605) + TL(-.0639) + TM(.0198) + .4019

[Note: TLC = Total Listening Comprehension; TR = Total Reading; TL = Total Language; TM = Total Math.]

The standardized coefficients provide for measures of the relative predictive contribution of each of the variables (Klecka, 1980). It is clear that the Total Listening Comprehension factor followed by the Total Reading and Total Language variables contributed most to predicting group affiliation.

The unstandardized coefficients are the beta weights to be utilized to compute the discriminant scores using the subjects' raw Total scores. Table 18 includes the discriminant formula; obtained values greater than zero predict experimental/HPU-group membership while scores less than zero project control/RE-group affiliation. Appendix B lists the actual discriminant scores for the 40 subjects in the experimental/HPU sample and 40 children in the control/RE group.

To ascertain the discrimination ability of this formula, it was applied to the control/HP group. It should be noted that the control/HP sample was not involved in determining the discriminant formula. Interestingly, an accuracy rate of 77.5% (i.e., 31 out of 40) was found. Perhaps more interesting was the finding that 3 of the 40 subjects in the control/HP group obtained discriminant scores of over 1.0 (see Appendix B).

CHAPTER VII

DISCUSSION AND CONCLUSION

The purposes of the present investigation were (1) to provide the HPU field with a unified theoretical framework that is heuristic in its manner of explaining current phenomena and in anticipating potential problems, (2) to suggest a practical device for screening of the low-incidence, HPU population with the goal of better serving these individuals, and (3) to delineate important ramifications of the present analysis.

Unified theoretical framework and paradigmatic behaviorism

The HPU area was analyzed from both a philosophical-theoretical and empirical-pragmatic level. The HPU field is guided by a relatively small number of professionals whose views can be best characterized as being cognitive-behavioral and thus eclectic in orientation. This pragmatic approach to studying and serving students with HPU has resulted in greater awareness on the part of other professionals and parents of the needs of children with HPU. However, the lack of a unified theory to predict, control, and explain the various phenomena in the HPU field has resulted in practical problems to be unresolved for this relatively young and developing discipline.

PB theory was explicated to some degree as a unified framework to guide the HPU field. The following basic tenets were discussed: three basic behavioral repertoires, formulation of aberrant behavior (i.e.,

deficit and inappropriate behaviors), cumulative-hierarchical learning, causes and effects of behavior, interactionism, and assessment theory.

It was proposed that such a theory could not only have implications for explaining and resolving current phenomena, but anticipating other problematic issues as well.

Application of paradigmatic behaviorism to the underidentification problem

The three broad areas of study in the HPU field include identification, programming, and socio-political factors. In order to demonstrate the heuristic value of PB, a more molecular analysis of the underidentification problem was undertaken.

Nearly every expert in the field hypothesized that there are many individuals with HPU currently in regular education who have not been identified through the traditional referral process. The various reasons for this state of affairs and the attempts at resolving this situation were discussed. However, to date, the speculated pervasive problem of underidentification of students with HPU has persisted. Ultimately, the "solutions" proposed have been too costly in terms of time, effort, and/or finance, or have not been applied in the regular-education setting.

The SAT series was proposed as a possible candidate for screening purposes. A PB analysis of the various subtests and the respective skills required to perform well on these subscales revealed that some tasks involved verbal and intellectual abilities similar to that found on IQ tests. These skills included general information, vocabulary

knowledge, listening comprehension, verbal reasoning, abstract thinking, problem solving, and so on. The Total Listening Comprehension composite consisting of the Vocabulary and Listening Comprehension subtests was determined to be such a test. In addition, the tasks for this Total test did not require much reading, spelling, and writing skills, and did not entail strict time limits.

In contrast, the Total Reading, Total Language, and Total Math tests required relatively greater proficiency in reading, spelling, and writing. In addition, these composites necessitated higher levels of tolerance for rote, drill-and-practice activities with greater adherence to strict time limits.

With preliminary empirical support of its notions, a PB analysis suggested that students with HPU would perform similar to subjects with HP on the Total Listening Comprehension test; however, both these groups should obtain higher scores when compared to a control sample of children from regular education. In addition, students with HPU should score similar to children from regular education on an average measure of the Total Reading, Total Language, and Total Math results; however, both these groups should perform significantly lower when compared to the sample of subjects with HP. Further, PB theory projected that for subjects with HPU, the Total Listening Comprehension composite would be significantly greater than a measure of the average Total Reading, Total Language, and Total Math scores. Finally, the overall performance of the HP group should be higher than the HPU and regular-education samples.

Utilizing an equal-ns, analysis of variance (ANOVA) design with one between and one repeated-measures factor, all of the previous predictions were supported. The only unexpected significant finding was that the Total Listening Comprehension measure was lower than the average of the Total Reading, Total Language, and Total Math scores for both the HP and regular-education groups. One obvious hypothesis concerning why this occurred would be that the tests are valid and thus, the HPU group had higher verbal abilities relative to their reading, spelling, writing, and math skills while the reverse relationship existed with the HP and control/RE groups. Another factor that should not be neglected is the way standardized tests are developed. If there is a proportion of the norm reference group for which a subtest profile is evidenced like that of the HPU population where the Total Listening Comprehension scores are relatively higher than other composites, then there must be other lower Total Listening Comprehension scores somewhere within the remaining standardized sample to "off-set" the higher measures such that the overall mean is 100 and the standard deviation is approximately 15. The only question becomes, "What is the relative proportion of subjects with HPU in the norm sample?" because this will determine how much of their unique profile will have to be off-set.

The discriminant analysis conducted on the HPU and regular-education groups resulted in an accuracy rate of 88.75% and a significant discriminant function. The standardized discriminant function coefficients revealed that the Total Listening Comprehension

composite contributed the most to predicting exceptionality classification. This factor was followed by the Total Reading and Total Language variables. Interestingly, when the derived discriminant formula was applied to the subjects with HP, an accuracy rate of 77.5% was obtained. Three of the 40 students in this sample had discriminant scores of over 1.0.

Critique. The results of the present study suggested a promising avenue for screening for students with HPU currently in regular education. However, several cautionary notes deserve discussion at this point. (1) Due to the practical limitations of the types of SAT scores that were available, analyses could not be performed on the individual subtest scores. Perhaps greater discriminant accuracy would have been the outcome if the complete subtest results for all of the groups were available.

(2) Although there appeared to be no significant inherent selection bias in the experimental/HPU sample that was ultimately utilized, the intake and application processes of ASSETS School may have introduced some pattern of subject characteristics such that, for example, the discriminant-function formula may not be as applicable for students with HPU in regular education. All ASSETS School students accepted for the Summer Session and Day School must be referred or recommended by an outside professional. As part of the intake process, formal measures of potential (i.e., IQ) and academic achievement must be available. In addition, while the math disabled are amply served at ASSETS School, the majority of students accepted and placed at ASSETS

are those who exhibit reading, spelling, and/or writing disabilities. Therefore, the obtained discriminant formula may be more applicable for dyslexic and the reading disabled than math disabled. In fact, if a child exhibits a specific learning disability only in math, then a different SAT subtest profile would be predicted based on PB theory. It would be hypothesized that the Total Listening Comprehension, Total Reading, and Total Language composites would be significantly higher than the Total Math score.

(3) Other factors would suggest that only a certain subtype of students with HPU would be identified by the present SAT process. These individuals should have high abilities in the following areas: vocabulary or labeling repertoire, listening comprehension or relevant word association, abstract/conceptual thinking, verbal reasoning and problem solving, and so on. In addition, a certain minimal degree of attention to and motivation for taking group-administered tests would be expected. Students with attributes that do not correlate moderately or highly with these characteristics may not be screened as accurately with this SAT method. Possible qualities that may fall under this category would include the following: high nonverbal-spatial abilities, creative and talented, low motivation, poor study and test-taking skills, test anxiety, inattention and distractibility. In this regard, despite the fact that this SAT method may uncover more students with HPU currently in regular education, full utilization of such a technique may still result in underidentification of these individuals.

(4) To some extent, the accuracy rate of 88.75% can be criticized in that it would mean that over 10% may be misdiagnosed. It should be noted, however, that the 88.75% accuracy rate is commensurate with the current teacher-dependent referral process and requires perhaps much less resources. In fact, the combination of teacher referrals and SAT screening may produce a higher "hit" rate. In addition, it cannot be assumed one way or the other that those "missed" by the discriminant formula are appropriately diagnosed to begin with. It would be interesting to examine the results of a comprehensive assessment for the four "misdiagnosed" students in the regular-education group that were predicted to be in the experimental/HPU group and the three subjects in control/HP sample that obtained discriminant scores of over 1.0. Would these subjects ultimately be diagnosed as being HPU? A prospective study would better address this issue.

Advantages and implications

Specific to the high-potential/underachievement field. Given the purposes of the present analysis, it becomes important to delineate the advantages and implications for the current and future status of the HPU area. (1) The most direct application of the present study involves the utilization of SAT scores in an attempt to screen for students with HPU in regular education. A very rudimentary computer program could be developed to accomplish this task assuming that all of the relevant student and SAT information are already accessible by the computer. The analysis conducted herein would suggest that not much cost in terms of time, effort and finance would have to be expended in

pursuit of identifying children with HPU. In addition, a complex discriminant formula would not have to be utilized by the teacher. Visual inspection of any SAT subtest or Total-test profile would indicate relative strengths and weaknesses such that further comprehensive testing may be warranted.

(2) The need for early identification of students who are gifted or gifted/LD in an effort to prevent them from being "at risk" has been voiced by many (e.g., Gallagher, 1987; Mathews & Burns, 1987; Williams, 1988). While not enough subjects were obtained to complete a statistical analysis of the younger levels of the SAT, it is interesting to note that the mean of the Environment subtest was 112.2 (standard score with a mean of 100 and standard deviation of 15) with an HPU _n_ size of 11. The results of the subscale were projected to be in the high-average range like the scores on the Vocabulary and Listening Comprehension subtests. The Environment subscale appears on the lowest level of the SAT series and can be given to children just starting kindergarten.

(3) It is suggested, however, that PB can contribute even more to the HPU field. As stated earlier, the disciplines of HPU and LD have struggled with various components of the definition of LD and how to measure these factors. For example, how do we define and measure "potential." Currently, the field is characterized by theorists and practitioners (e.g., educational diagnosticians) conjecturing to a large degree on what intelligence and academic achievement are and how they should be measured. It is unclear to the average diagnostician

exactly what abilities differentiate intelligence versus academics with particular ambiguity for such skills as listening comprehension, vocabulary, science, and social studies.

PB would suggest that when potential is defined as demonstrated pre-requisite skills, then more explicit and logical formulations evolve. In particular, analysis of what constitutes intelligence and academics reveals a greater need to examine logically the discrepancies between intelligence and achievement in terms of BBRs or skills. Therefore, a discrepancy between listening comprehension and reading comprehension, and a significant difference between math conceptual understanding and math computation would be more meaningful and relevant from a PB perspective. Conversely, performance on the Porteus Maze test of the WISC-R would have less pertinence to both reading comprehension and math computation.

As another example, the HPU and LD fields have been self-critical of the four exclusionary clauses. How do we assess whether the significant discrepancy between potential and achievement is not due primarily to the four exclusionary clauses of (a) mental retardation, (b) visual, hearing, and/or motor handicaps, (c) emotional disturbance, and/or (4) environmental, cultural and/or economic disadvantages. Most of the debate has centered around the last factor of environmental influence. Based on a national survey of school psychologists, Harris, Gray, Davis, Zaremba and Argulewicz (1988) found that 47% reported compliance, 38% stated purposeful noncompliance, and 10% reported

inconsistent compliance to the application of the environmental-cultural exclusionary clause of the LD definition.

In light of the global nature of environmental factors and the lack of psychometric instruments to measure "environmental" influence, such statistics are not surprising. PB argues that because there is past and present interaction between the person's basic behavioral repertoires and his or her environment, both components are critical to the diagnosis, treatment and prognosis of that individual. Unfortunately, the large majority of our psychometric instruments are geared to measure person attributes at the expense of environmental influences (Hishinuma, 1989). The result has been an over-emphasis on changing cognitive structures and personality characteristics of the individual as opposed to altering the environment to accomplish the same goals. In addition, virtually no continual and systematic diagnostic-prescriptive methods are utilized, and therefore, very minimal adjustments in placement and instruction may occur in a child's educational lifetime (Salvia & Ysseldyke, 1988).

(4) Another viable area of application of PB theory to the HPU field is in instruction and programming. However, before discussing the various types of programs, it should be noted that implicit throughout this analysis has been the notion that identifying children with HPU is a "good" thing to do for them. This assumes that their current placement in regular education is inappropriate and that another more suitable educational setting would serve them better. It is suggested that for some students with HPU, depending on their

characteristics and the services provided at their current placement, this may not be the case; that is, their regular-education placement may actually be quite appropriate. Therefore, the identification of students with HPU and their possible subsequent displacement must be assessed carefully. This relates directly to the regular-education initiative (REI) and consultation-collaboration model of program intervention (see Hallahan, Kauffman, Lloyd, & McKinney, 1988). However, another legal point of discussion is associated with the fact that generally, only certification of a handicapping condition "guarantees" special services. From a PB perspective, an analysis of the students' BBRs and the services provided by both the regular-education and special-education settings would be critical.

Assuming in general that some degree of special assistance is required for these children, there is sentiment in the literature that one should not identify exceptional children for special services if there are no programs in the planning or already in place. "It would be wasteful, for example, to seek out children who have a flair for creative writing unless plans were completed or at least underway to cultivate these talents" (Tannenbaum & Baldwin, 1983, p. 25). This state of affairs is also tied to the availability of funds for program development and maintenance (Whitmore, 1980). To a large extent, this is reality in many school settings whereby no program exists for students with HPU or those who are gifted/LD. However, in the past, part of the difficulty has been the underidentification problem such that not enough students with HPU could be found to justify such a

unique program. In short, due to poor identification, little emphasis is placed on programming (Shoff, 1984; Suter & Wolf, 1987). Perhaps with more efficient and pragmatic screening and identification techniques, more justification can be made for tailored educational and instructional methods for these children.

Many different types of programs for the gifted/LD have been considered. As noted by Daniels (1983b), the "least restrictive environment" in Public Law 94-142 is often misinterpreted sometimes to mean full mainstream. To the contrary and as evidenced in most "ideal" projected programs, the emphasis is on the needs of the "total" child (Daniels, 1983a, 1983b). In addition to remediation (Elkind, 1973; Fox, Brody, & Tobin, 1983b; Rosner & Seymour, 1983, p. 92; Tannenbaum & Baldwin, 1983, p. 21; Vaughn, 1989) and compensation (e.g., using a tape recorder, giving oral presentations as a substitute for written expression, utilizing the word processor instead of handwriting) (Suter & Wolf, 1987; Williams, 1988), learning through the child's strengths is stressed (Fox, Brody, & Tobin, 1983b; Suter & Wolf, 1987; Tannenbaum & Baldwin, 1983, p. 21). To address both the strengths and weaknesses of these children, an integrative, multisensory approach to teaching has been advocated by some (Daniels, 1983a, 1983b; Suter & Wolf, 1987; Vaughn, 1989). Other typical services include acceleration, enrichment, mentor programs (Levey & Dolan, 1988), and pull-out services to address the higher-functioning aspects of students with HPU.

Of particular importance to many children with HPU is in the area of study skills. For some students, the basic repertoires for these skills are so deficient that these behaviors must be taught by the teacher (e.g., work habits, organization, time management, responsibility, independent study) (Daniels, 1983a, 1983b; Kendig, 1988; Tannenbaum, 1983).

The appropriate development of the social-emotional components such as self-concept and leadership (Daniels, 1983a, 1983b; Vaughn, 1989; Williams, 1988; Zirkel & Stevens, 1987) and behavioral factors such as coping skills of children with HPU is highly emphasized. Preventative measures and other interventions include holding class meetings (Kendig, 1988), strategically directing peer interactions, supporting individual counseling (Broedel, Ohlsen, Proff, & Southard, 1965; Daniels, 1983a, 1983b; Iscoe, 1965; Kendig, 1988; Senf, 1983; Suter & Wolf, 1987; Williams, 1988), and recommending family counseling (Daniels, 1983a, 1983b). Suicide has been conjectured to be an area in need of greater attention and consideration for the gifted/LD (Hayes & Sloat, 1988).

In all, a very positive and individualized approach is very much advocated for including the development and implementation of behavioral contracts (Daniels, 1983a, 1983b; Kendig, 1988; Williams, 1988). One of the more highly individualized programs include that put forth by Tannenbaum and Baldwin (1983). They suggested liberal placement into an enriching and challenging setting with the goals of continual assessment and re-evaluation of placement and type of

instruction. The authors argued that it is primarily through these types of ongoing interactive programs that truly gifted/underachievers will be identified and more appropriately served.

With all of these diverse and complex services to provide, it is understandable that most experts believe that intense teacher training and teacher competence are necessary for the success of such programs (Daniels, 1983a, 1983b; Fox, Brody, & Tobin, 1983c; Whitmore, 1980, pp. 26-28). In addition to such high expectations for the teachers, "creative" school-administrative adjustments may have to be made. For example, on a practical level, adjacent-grade-level placements and the combining across schools and districts may make HPU programs more feasible (Tannenbaum, 1983).

How can PB build upon this already somewhat comprehensive approach to the education of children with HPU? Examination of the behavioral taxonomy will point to many areas and methods to address. For example, for the emotional-motivational BBR, an assessment of the reinforcers of students with HPU would be highly advantageous, especially in light of the fact that many of these students have low-motivation difficulties as other researchers have noted as well (Davis & Rimm, 1989). In an effort to improve low self-concept, structuring for success and attainment of positive rewards, and an analysis of the students' self-verbalizations may prove to be helpful. In the sensory-motor area, techniques within the total program designed to address poor fine- and/or gross-motor coordination would greatly benefit these individuals for such tasks as writing. Inattention and hyperactivity

cannot be ignored should these behaviors persist even in challenging educational environments; behavioral and cognitive-behavioral interventions would assist in this area. Language-cognitive BBRs of importance might include addressing, among other aspects, verbalizations of self-expectations and the expectations of significant others. Inappropriate social skills (e.g., overly aggressive verbalizations) may necessitate training in this area. Capitalizing on the strengths of students with HPU may include selecting topics of general or selective interest to them, tapping their creativity and talents (e.g., drawing), and presenting teachings requiring high levels of thinking (e.g., problem solving).

(5) Although it may appear that PB has little relevance for the socio-political factors of children with HPU, a few examples to the contrary will be given. With the overall philosophy of unified positivism, PB has advocated the view of unification and integration among the social sciences and disciplines within psychology. Should a close approximation of this orientation take hold, perhaps a child with HPU characteristics will no longer be a "paradox" to the average practitioner. This may facilitate better techniques of identification and more appropriate programs.

As another instance and perhaps on a more realistic scale, PB has been at the forefront of research on attitude change and associative meaning. This "technology" can be applied to the gifted and underachieving population in an effort to minimize the negative connotations (e.g., elitism) and maximize the positive connotations

(e.g., underserved) associated with this group of individuals. A systematic and comprehensive approach along these lines may have profound effects on such things as funding for identification, intervention, and programming. It is interesting to note that one of the purposes of Whitmore's 1980 text was for sociological advocacy of identification and programming for gifted and gifted/underachievers. Attitude change in favor of these children was of major importance for this work.

Specific to disciplines related to high-potential/underachievers. One related field would be the LD area (Collette, 1979; Collette-Harris, 1974; Collette-Harris & Minke, 1978; Hishinuma, 1987; Hufano, 1982; Ryback, 1969; Ryback & Staats, 1970; Staats, 1975; Staats, 1987b). For example, PB would predict that the discriminant formula derived using subjects with HPU versus those in regular education should prove to be functionally useful for children with LD/underachievement and average potential. Preliminary analysis of one class of 14 students with LD provided very positive support of a similar SAT subtest profile as that obtained on the students with HPU with the obvious difference that the means for the LD sample were relatively lower on all subtests.

In addition, the concept of demonstrated pre-requisite skills in place of "potential" was noted to be more operationally defined, more measurable, and less paradoxical. Although the following quote by Sapon-Shevin (1987) pointed to the frustration experienced in the field

over the term "potential," the passage also referred to many of the issues advocated by PB, albeit in more everyday terminology:

> There is no way of validating the concept of potential. Potential is a theoretical prediction of how well someone will do something. We speak of people failing to reach their potential and even exceeding their potential (overachievers), and yet there is no empirical basis of support for the notion of potential in the first place. ... A more descriptive statement about a person with discrepancies between his/her potential and his/her performance would be that "Michael did very well on the math problems on the IQ test but does poorly on the math problems he is asked to do in class." A careful descriptive analysis of the differences in Michael's performance in the two settings would probably lead to information more helpful in designing educational programs for Michael than using this discrepancy to conclude that "He is not working up to his potential in math." (pp. 188-189)

Similar analyses can be made to the high-potential and gifted disciplines of study.

Specific to other educational areas. As has been done in the past, all other exceptionalities can be analyzed based on a PB perspective (e.g., Hishinuma, 1987; Staats, 1963, 1968, 1971, 1975, 1977; Staats, 1987b). Similar heuristic outcomes have been achieved and hopefully, more can be anticipated in the near future.

Conclusion

As evidenced by the results obtained herein, unified positivism and paradigmatic behaviorism offer many advantages to the social sciences including education. This is not to say that other theories would not predict the specific findings of this retrospective experiment. However, PB's comprehensive, unifying scope distinguishes it from most other theories. With its basic tenets, paradigmatic behaviorism has the potential to unify the field of education and as a result, paradigmatic behaviorism can produce functionally useful screening, identification and treatment outcomes.

APPENDIX A

Stanford Achievement Test (SAT) Levels and Subtest Descriptions

The following are descriptions of the various SAT levels:

> Level 1 of SESAT (Stanford Early School Achievement Test) is designed to measure a segment of the cognitive learning of five- and six-year-old children. As such, the test assesses the learning that children have acquired upon entrance to school and gain as they progress through kindergarten and first grade. Knowledge of cognitive development in these critical early years serves as a baseline from which instruction can begin ... (Madden, Gardner & Collins, 1982a, p. 6)
>
> Level 2 of SESAT is designed to measure a segment of the cognitive learning of five-, six-, and seven-year-old children. As such, the test assesses the learning that children gain as they progress through kindergarten and first grade. Knowledge of cognitive development in these critical early years serves as a baseline from which instruction can begin. (Madden, Gardner & Collins, 1982c, p. 6)
>
> SESAT is not a "readiness" test. Rather, its purpose is to assess the cognitive development of children upon entrance into school in order to establish a baseline where instructional experiences may best begin. (Madden, Gardner & Collins, 1982a, p. 4)
>
> The Primary 1 battery includes measures of reading, listening, spelling, mathematics, and understanding of the environment. The concepts area are those ordinarily taught during the second half of first grade and in Grade 2. (Gardner, Rudman, Karlsen & Merwin, 1982h, p. 7)
>
> The Primary 2 battery includes measures of reading, listening, spelling, mathematics, and understanding of the environment. The concepts and skills that are assessed in each content area are those ordinarily taught during the second half of Grade 2 and in Grade 3. (Gardner, Rudman, Karlsen & Merwin, 1982j, p. 7)
>
> The Primary 3 battery includes measures of reading, listening, spelling, language, mathematics, science, and social science. The concepts and skills that are assessed in each content area are those ordinarily taught during the

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Stanford Achievement Test (SAT) Levels and Subtest Descriptions

second half of Grade 3 and in Grade 4. (Gardner, Rudman, Karlsen & Merwin, 19821, p. 6)

The Intermediate 1 battery includes measures of reading, listening, spelling, language, mathematics, science, and social science. The concepts and skills that are assessed in each content area are those ordinarily taught during the second half of Grade 4 and in Grade 5. (Gardner, Rudman, Karlsen & Merwin, 1982d, p. 5)

The Intermediate 2 battery includes measures of reading, listening, spelling, language, mathematics, science, and social science. The concepts and skills that are assessed in each content area are those ordinarily taught during the second half of Grade 5 and in Grades 6 and 7. (Gardner, Rudman, Karlsen & Merwin, 1982f, p. 5)

The Advanced battery includes measures of reading, listening, spelling, language, mathematics, science, and social science. The concepts and skills that are assessed in each content area are those ordinarily taught during the second half of Grade 7 and in Grades 8 and 9. (Gardner, Rudman, Karlsen & Merwin, 1982b, p. 5)

... the six levels of Stanford Achievement Test are designed to measure the important learning outcomes of the school curriculum. The test provides dependable measures of these outcomes for use in connection with the improvement of instruction and the evaluation of progress.

... Each revision was undertaken in order to provide: (1) a close match between test content and current instructional practices. (2) norms that accurately reflect the performance of pupils in different grades. (3) modern means of test score interpretation resulting from improvements in measurement technology.

Levels 1 and 2 of TASK (Stanford Test of Academic Skills) include measures of reading, vocabulary, spelling, English, mathematics, science, and social science. Level 1, which is intended for use in Grades 8 through 12, assesses those basic concepts and skills that have been taught prior to the eighth grade; Level 2, which can be used in Grades 9 through 13, measures the extent to which students have learned those fundamental concepts and skills necessary to

APPENDIX A (continued)

Stanford Achievement Test (SAT) Levels and Subtest Descriptions

> continued academic training. (Gardner, Callis, Merwin & Rudman, 1982c, p. 4)
>
> The two levels of Stanford Test of Academic Skills (TASK) are intended ... as measures of basic skills. Level 1 is designed primarily for students ... for whom the assessment of competence at the adult social level is desired; this level of the test measures those skills and competencies that presumably have been learned prior to the eighth grade. Level 2 ... is more difficult than Level 1 and assesses those skills that are requisite to continued academic training. (Madden, Gardner & Collins, 1982a, p. 4)

The following are descriptions of the various SAT subtests: (1) Sounds and Letters subtest: SESAT, Levels 1 and 2.

> The Sounds and Letters subtest has two major emphases: auditory perception and symbol perception. Auditory perception involves the ability to match beginning sounds or ending sounds in words, and symbol perception has to do with the ability to recognize upper-case and lower-case letters and to match letters to the sounds those letters most frequently represent. (Madden, Gardner & Collins, 1982a, p. 6)

(2) Word Study Skills subtest: Primary, Levels 1 to 3; and Intermediate, Levels 1 and 2.

> The Word Study Skills subtest has two major emphases: structural analysis and phonetic analysis. Structural analysis has to do with the decoding of words by analyzing word parts, and phonetic analysis is concerned with the relationship between sounds and letters. (Gardner, Rudman, Karlsen & Merwin, 1982h, p. 7)

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Stanford Achievement Test (SAT) Levels and Subtest Descriptions

(3) Word Reading subtest: SESAT, Levels 1 and 2; and Primary, Levels 1 and 2.

> This [Word Reading] subtest measures children's ability to recognize words in three somewhat different ways. First, children are asked to match two printed words; then, to match a spoken word to the same word in print; and finally, to identify the printed word that names a particular illustration. All words included in this subtest are conceptually very simple and are part of children's speaking and listening vocabulary. (Madden, Gardner & Collins, 1982a, p. 6)

> The [Word Reading] subtest measures pupils' ability to recognize words and attach meaning to them. As such, it provides an assessment of pupils' ability to function at a very basic level in reading, going from the printed word to the spoken word.
>
> The test-taking task involves the identification of words that describe, or are associated with, a particular illustration. The test words represent words that are typically taught in grades 1 and 2, such that the correct word can be identified through the use of phonics or memory. Each word is also conceptually simple and included in pupils' speaking and listening vocabularies. (Gardner, Rudman, Karlsen & Merwin, 1982h, p. 7)

(4) Sentence Reading subtest: SESAT, Level 2.

> The reading of sentences [Sentence Reading subtest] requires more advanced skills than the reading of isolated words. In this subtest, children are asked to identify the picture that best illustrates the meaning of a printed sentence, and of a few passages containing two sentences in which meanings must be joined. Included in the sentence patterns, all of which can be found in contemporary primers and first-grade readers, are simple sentences, questions, commands, compound sentences, and other common patterns. (Madden, Gardner & Collins, 1982c, p. 6).

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Stanford Achievement Test (SAT) Levels and Subtest Descriptions

(5) Reading Comprehension subtest: Primary, Levels 1 to 3; Intermediate, Levels 1 and 2; Advanced; and TASK, Levels 1 and 2.

> Since some six- and seven-year-old children still have difficulty reading connected discourse, this [Reading Comprehension] subtest has been designed to be simple in format and high in motivational value.
>
> The subtest begins with six riddles that are conceptually very simple and require the reading of only three- or four-word kernel sentences. The rest of the subtest assesses pupils' ability to read and understand short passages, increasing gradually in length and presented in a multiple-choice, modified cloze format. The reading vocabulary of the passages has been limited to words taught in the primary grades, with the content of the passages selected to be appealing to young children and within their experiential backgrounds. The modified cloze format enables pupils to respond in a way that approximates the reading process, since this format allows pupils to read each passage without having to backtrack or look ahead for answers. (Gardner, Rudman, Karlsen & Merwin, 1982h, p. 7)

> Given the wide range of reading ability that exists in the second and third grades, this [Reading Comprehension] subtest has been designed to provide adequate measurement of pupils who are having difficulty reading connected discourse, as well as those who are capable of interpreting brief reading selections. Thus, two different formats are used to assess reading comprehension.
>
> The subtest begins with three short passages presented in a multiple-choice, modified cloze format. This rather simple format enables pupils to respond in a way that approximates the reading process and should provide all children with the motivation to continue. The rest of the subtest consists of complete passages with accompanying questions. The reading vocabulary of the passages has been limited to words found in reading materials designed for the primary grades, with the content of the passages selected to be interesting and varied in content. (Gardner, Rudman, Karlsen & Merwin, 1982j, p. 7)

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Stanford Achievement Test (SAT) Levels and Subtest Descriptions

> Two approaches to the measurement of the comprehension skills are included in this [Reading Comprehension] subtest:
> 1. Comprehension as it relates to the type of material read.
> 2. Comprehension as it relates to the particular questions asked.
>
> Since different kinds of reading material often require somewhat different reading skills, three types of reading passages have been selected for inclusion in this subtest. These can best be described as passages that are typical of the kinds of material found in grade-appropriate textbooks (textual reading); passages that reflect the printed material one finds in daily life, such as directions for doing something, advertisements, etc. (functional reading); and passages that represent the kinds of material one reads for enjoyment, such as fiction, humor, or poetry (recreational reading).
>
> The questions that follow each passage are designed to tap the literal and inferential comprehension skills. Literal comprehension refers to the pupils' ability to understand what has been explicitly stated in the passage, and inferential comprehension refers to pupils' ability to make inferences, draw conclusions, predict outcomes, etc. (Gardner, Rudman, Karlsen & Merwin, 19821, p. 6)

(6) Vocabulary subtest: Primary, Levels 1 to 3; Intermediate, Levels 1 and 2; and Advanced.

> The Vocabulary subtest is dictated in order to provide a measure of pupils' language competence without requiring them to read. The words were selected to represent the various parts of speech, as well as the vocabulary encountered in school and in ordinary conversation. Though vocabulary, as such, is generally not a part of the school curriculum, the information that can be derived from the assessment of language development in this way has considerable diagnostic utility. (Gardner, Rudman, Karlsen & Merwin, 1982h, p. 7)

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Stanford Achievement Test (SAT) Levels and Subtest Descriptions

(7) Reading Vocabulary subtest: TASK, Levels 1 and 2.

> This [Reading Vocabulary] subtest is a measure of general reading vocabulary. The words were selected to represent the various parts of speech, as well as the vocabulary encountered in a wide variety of reading material. While the majority of test words will have been encountered by the end of the eighth or ninth grade, these words will continue to be used throughout the high school grades. (Gardner, Callis, Merwin & Rudman, 1982c, p. 6)

(8) Listening to Words and Stories subtest: SESAT, Levels 1 and 2.

> The first part of this [Listening to Words and Stories] subtest is designed to measure children's knowledge of word meanings. The words were selected to represent the various parts of speech, as well as the vocabulary encountered in school and in ordinary conversation. In the second part of the subtest, children are required to answer questions about short passages that are read to them. The types of questions asked are intended to reflect children's ability to remember details and sequences of events, to follow directions, to identify cause and effect, to determine the main idea, and to understand aspects of language structure. (Madden, Gardner & Collins, 1982a, p. 6)

(9) Listening Comprehension subtest: Primary, Levels 1 to 3; Intermediate, Levels 1 and 2; and Advanced.

> Listening and reading are the modes through which most learning takes place. Thus, the primary purpose of the Listening Comprehension subtest is to evaluate pupils' ability to process information that has been heard, both in terms of the retention of specific details and the organization, or understanding, of the material as a whole. The stimulus material for this subtest has been selected to

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Stanford Achievement Test (SAT) Levels and Subtest Descriptions

represent listening tasks that are related to school learning and to obtaining information outside of school. (Gardner, Rudman, Karlsen & Merwin, 1982h, p. 7)

(10) Spelling subtest: Primary, Levels 1 to 3; Intermediate, Levels 1 and 2; Advanced; and TASK, Levels 1 and 2.

This [Spelling] subtest is administered as a teacher-dictated spelling test, where the teacher pronounces a word, reads a sentence containing that word, and then reads the word again. Pupils are asked to identify the correct spelling of the word from three spellings of the same word. Test words include phonetically "regular" words, such as cat or run; words with inflectional endings, such as liked or songs; and words that are sufficiently "irregular" to be taught as sight words, such as could or does. All words appear to one or more spelling lists designed for the primary grades, with distracters reflecting children's most common misspellings as complied by Gates in A List of Spelling Difficulties in 3876 Words (New York: Teachers College Press, Columbia University, 1937). (Gardner, Rudman, Karlsen & Merwin, 1982h, p. 8)

The format of this [Spelling] subtest requires pupils to identify the misspelled word from a group of four words. Each incorrectly spelled word contains the error that is most commonly made by children at this level, as presented by Gates in A List of Spelling Difficulties in 3876 Words (New York: Teachers College Press, Columbia University, 1937) ... (Gardner, Rudman, Karlsen & Merwin, 19821, pp. 6-7)

The format of this [Spelling] subtest requires students to identify the misspelled word from a group of four words. The misspellings to be detected have been selected to represent the use of an incorrect homophone, errors resulting from the improper use of letter-sound relationships, and errors resulting from the incorrect spelling of inflectional word forms. (Gardner, Callis, Merwin & Rudman, 1982c, p. 6)

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Stanford Achievement Test (SAT) Levels and Subtest Descriptions

(11) Language subtest: Primary, Level 3; Intermediate, Levels 1 and 2; and Advanced.

> The Language subtest is organized into three parts: conventions, language sensitivity, and reference skills. The conventions section samples the use of capital letters for proper names, days of the week, titles, etc.; the use of periods, commas, question marks, and apostrophes; and the use of appropriate verb forms, pronouns, and comparative and superlative forms of adjectives. The language sensitivity section is designed to determine whether pupils can recognize complete sentences, sentence fragments, and run-on sentences. The third part, reference skills, assesses pupils' ability to alphabetize words and use a dictionary. (Gardner, Rudman, Karlsen & Merwin, 19821, p. 7)

(12) English subtest: TASK, Levels 1 and 2.

> The English subtest, which is a measure of students' functional knowledge and effective use of the English language, is organized into four parts: reference skills, language sensitivity, conventions, and paragraph arrangement. The reference skills section deals with the use of the dictionary and resource materials, such as an atlas, encyclopedia, almanac, etc., as well as parts of a book and sections of a newspaper as aids to finding various types of information. In the language sensitivity section, students are asked to determine which one of four simple, compound, or complex sentences expresses a given idea in the most straightforward manner. The conventions section assesses several aspects of the usage conventions simultaneously by presenting a set of short narrative passages with certain portions underlined. For each underlined portion, students are to determine whether there is an error in capitalization, grammar, or punctuation. The paragraph arrangement section requires students to order sentences in a paragraph so that the paragraph presents the intended idea properly. (Gardner, Callis, Merwin & Rudman, 1982c, p. 6)

APPENDIX A (continued)

Stanford Achievement Test (SAT) Levels and Subtest Descriptions

(13) Concepts of Number subtest: Primary, Levels 1 to 3; Intermediate, Levels 1 and 2; and Advanced.

> The purpose of this [Concepts of Number] subtest is the assessment of pupils' understanding of basic number concepts. Since an understanding of these concepts is requisite to facility with computation and problem solving, it is important that these concepts be developed as instruction in mathematics proceeds. (Gardner, Rudman, Karlsen & Merwin, 1982h, p. 8)

(14) Mathematics Computation and Applications subtest: Primary, Level 1.

> The computation portion of this [Mathematics Computation and Applications] subtest includes addition and subtraction facts, as well as addition and subtraction of tens and ones, the sums less than 100. The applications section, which provides information about pupils' ability to apply the number concepts and computation skills they have learned, assesses understanding of the language of mathematical problem situations and the ability to solve problems by the choice of the appropriate mathematical operation. Principles of geometry and measurement and the interpretation and use of time and monetary units are also measured by this section of the subtest. (Gardner, Rudman, Karlsen & Merwin, 1982h, p. 8)

(15) Mathematics Computation subtest: Primary, Levels 2 and 3; Intermediate, Levels 1 and 2; and Advanced.

> This [Mathematics Computation] subtest includes the addition, subtraction, and multiplication facts and the addition and subtraction of whole numbers, with and without renaming. (Gardner, Rudman, Karlsen & Merwin, 1982j, p. 8)

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Stanford Achievement Test (SAT) Levels and Subtest Descriptions

[Other test levels reflect the developmental math skills at that grade-placement level.]

(16) Mathematics Applications subtest: Primary, Levels 2 and 3; Intermediate, Levels 1 and 2; and Advanced.

> The Mathematics Applications subtest provides information about pupils' ability to apply the number concepts and computation skills they have learned by assessing understanding of the language of mathematical problems and the ability to solve problems by the choice of the appropriate mathematical operation. Reading and interpreting graphs and principles of geometry and measurement, including the use of various units of measure, are also assessed. (Gardner, Rudman, Karlsen & Merwin, 1982j, p. 8)

(17) Mathematics subtest: SESAT, Levels 1 and 2; and TASK, Levels 1 and 2.

> The Mathematics subtest consists of two parts. Part A is appropriate for use prior to formal instruction; Part B, which is optional, is recommended for use with children who have had somewhat more concrete experiences in mathematics. The purpose of this subtest is to measure children's understanding of some of the basic number concepts, including number and numeration, counting, and the language of comparison; knowledge of geometric shapes and certain fundamental principles of measurement; and understanding of the language of simple mathematical problem situations. In addition, Part B assesses children's knowledge of basic addition and subtraction facts with sums to nine. (Madden, Gardner & Collins, 1982a, p. 6)

> The Mathematics subtest is designed to measure general mathematical competence. It emphasizes numerical concepts, computation skills, and applications of these concepts and skills to problem-solving situations. Basic principles of

APPENDIX A (continued)

Stanford Achievement Test (SAT) Levels and Subtest Descriptions

> algebra, geometry, and measurement are also assessed. The content of this subtest has been selected to represent the mathematics that is considered to be an integral part of general education, as well as basic preparation for more advanced study. (Gardner, Callis, Merwin & Rudman, 1982c, p. 6)

(18) Environment subtest: SESAT, Levels 1 and 2; and Primary, Levels 1 and 2.

> The Environment subtest is designed to assess children's understanding of the basic concepts reflecting the social and natural environment of their world. Concepts of the social environment include home and family, the neighborhood, ways people live together, ways of traveling, and communication. Concepts of the natural environment relate to plants and animals, earth/sun relationships, and the tools and other machines that people use. (Madden, Gardner & Collins, 1982a, p. 6)

(19) Science subtest: Primary, Level 3; Intermediate, Levels 1 and 2; Advanced; and TASK, Levels 1 and 2.

> The Science subtest measures pupils' ability to understand basic concepts of the physical and biological sciences and to use inquiry skills related to these aspects of the environment. The fundamental concepts assessed include conservation of matter, conservation of energy, changes in the physical universe, and the environmental interactions among living things. (Gardner, Rudman, Karlsen & Merwin, 19821, p. 7)

(20) Social Science subtest: Primary, Level 3; Intermediate, Levels 1 and 2; Advanced; and TASK, Levels 1 and 2.

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Stanford Achievement Test (SAT) Levels and Subtest Descriptions

> This [Social Science] subtest measures pupils' understanding of key concepts in six social science disciplines: Geography, History, Anthropology, Sociology, Political Science, and Economics. The subtest also includes a number of situations that have been designed to challenge pupils to use inquiry skills to explore each of these disciplines. (Gardner, Rudman, Karlsen & Merwin, 19821, p. 7)

APPENDIX B

Standardized Scores and Actual Discriminant Scores

Experimental/High-Potential Underachiever Group:

Subject Number	Total Listening Comprehension	Total Reading	Total Language	Total Math	Discriminant Score
1	78	84	82	96	-0.6193
2	98	114	110	112	-2.0089
3	97	96	100	103	-0.5542
4	113	96	86	85	1.5033
5	107	86	93	90	1.1899
6	108	100	96	91	0.2663
7	107	94	90	91	0.9178
8	110	83	97	114	1.8747
9	106	91	95	113	1.1196
10	111	93	102	116	1.0849
11	121	98	96	96	1.7197
12	112	102	93	102	0.9343
13	118	106	102	131	1.2598
14	108	103	107	97	-0.4997
15	98	85	86	96	0.9624
16	90	74	72	64	1.1307
17	94	64	81	64	1.5394
18	113	90	95	100	1.5872
19	100	94	84	97	0.7557
20	136	116	100	105	1.9771
21	122	87	91	103	2.9377
22	128	116	100	118	1.4750
23	106	87	91	97	1.3008
24	121	114	103	125	0.8782
25	107	80	77	84	2.4569
26	96	79	87	97	1.0912
27	113	97	86	98	1.6999
28	136	119	102	107	1.7074
29	91	84	91	96	0.0389
30	109	75	81	81	2.6340
31	97	82	82	96	1.3047
32	98	84	87	100	1.0380
33	119	113	98	93	0.4358
34	106	95	92	100	0.8125
35	97	74	88	89	1.2663

APPENDIX B (continued)

Standardized Scores and Actual Discriminant Scores

Experimental/High-Potential Underachiever Group:

Subject Number	Total Listening Comprehension	Total Reading	Total Language	Total Math	Discriminant Score
36	126	109	110	103	0.7725
37	107	83	85	99	2.0607
38	110	98	88	90	1.0687
39	113	97	99	107	1.0467
40	105	95	101	97	0.0829

APPENDIX B (continued)

Standardized Scores and Actual Discriminant Scores

Control/Regular-Education Group:

Subject Number	Total Listening Comprehension	Total Reading	Total Language	Total Math	Discriminant Score
41	86	94	103	104	-1.6491
42	97	103	105	100	-1.3564
43	78	97	94	91	-2.2713
44	112	115	131	136	-1.6089
45	118	104	100	109	1.0736
46	136	136	131	136	-0.6011
47	116	100	125	121	-0.2355
48	86	87	86	83	-0.5543
49	103	112	109	108	-1.4287
50	83	87	82	75	-0.7414
51	89	89	92	84	-0.7543
52	115	105	114	112	-0.1073
53	64	87	92	90	-2.8872
54	93	103	114	118	-1.9555
55	112	108	114	119	-0.4350
56	98	105	97	93	-1.0094
57	93	105	90	84	-1.2142
58	99	90	72	77	1.2744
59	64	83	101	84	-3.3394
60	103	95	103	104	-0.0964
61	88	94	92	83	-1.1713
62	79	97	102	101	-2.4902
63	74	86	77	82	-1.0769
64	112	105	106	109	0.0601
65	95	95	103	114	-0.6578
66	104	106	107	104	-0.9223
67	112	120	104	98	-0.9364
68	115	96	96	111	1.5678
69	95	104	103	104	-1.3997
70	74	75	80	82	-0.6037
71	113	120	136	136	-2.1360
72	82	78	80	90	0.1323
73	87	96	100	96	-1.6416
74	82	100	100	81	-2.6545
75	89	89	91	93	-0.5125

APPENDIX B (continued)

Standardized Scores and Actual Discriminant Scores

Control/Regular-Education Group:

Subject Number	Total Listening Comprehension	Total Reading	Total Language	Total Math	Discriminant Score
76	64	72	75	74	-1.2098
77	64	72	75	82	-1.0516
78	86	93	96	102	-1.1807
79	100	114	120	122	-2.2608
80	96	110	117	122	-2.2067

APPENDIX B (continued)

Standardized Scores and Actual Discriminant Scores

Control/High-Potential Group:

Subject Number	Total Listening Comprehension	Total Reading	Total Language	Total Math	Discriminant Score
81	125	114	109	123	0.8347
82	109	103	114	106	-0.6744
83	106	122	126	136	-2.2819
84	121	96	92	105	2.2743
85	128	112	109	128	1.3391
86	115	103	92	121	1.5981
87	93	87	91	96	0.0474
88	109	117	106	115	-0.8314
89	125	120	121	109	-0.5721
90	113	101	95	100	0.9222
91	93	107	107	114	-1.8289
92	109	120	102	113	-0.7966
93	128	123	136	121	-1.1906
94	111	117	119	123	-1.3146
95	104	109	107	109	-1.0048
96	106	110	121	128	-1.3949
97	107	108	97	100	-0.1983
98	116	120	118	103	-1.3530
99	103	136	131	126	-3.9304
100	110	113	131	120	-1.9942
101	97	106	93	107	-0.6321
102	100	114	113	113	-1.9912
103	106	107	98	123	0.1581
104	106	109	118	126	-1.1821
105	110	128	113	99	-2.1655
106	116	120	116	115	-0.9879
107	109	125	120	121	-2.0915
108	96	114	118	136	-2.2357
109	114	120	118	131	-0.9892
110	116	109	105	106	0.2025
111	116	128	116	128	-1.2145
112	109	125	118	136	-1.6671
113	95	103	89	94	-0.6419
114	93	89	110	111	-0.9917
115	106	107	131	131	-1.7935

APPENDIX B (continued)

Standardized Scores and Actual Discriminant Scores

Control/High-Potential Group:

Subject Number	Total Listening Comprehension	Total Reading	Total Language	Total Math	Discriminant Score
116	114	123	122	136	-1.3274
117	107	125	125	126	-2.5021
118	107	114	131	126	-2.2207
119	102	125	128	136	-2.9707
120	100	100	94	112	0.0502

REFERENCES

Aaron, P. G., Phillips, S., & Larsen, S. (1988). Specific reading disability in historically famous persons. Journal of Learning Disabilities, 21(9), 521-581.

Abrams, J. C. (1987). The National Joint Committee on Learning Disabilities: History, mission, process. Journal of Learning Disabilities, 20(2), 102-106.

Adelman, H. S. (1988). Reaction to Aaron, Phillips, and Larsen. Journal of Learning Disabilities, 21(9), 538 & 545.

Adelman, K. A., & Adelman, H. S. (1987). Rodin, Patton, Edison, Wilson, Einstein: Were they really learning disabled? Journal of Learning Disabilities, 20(5), 270-279.

Alexander, P. A., & Muia, J. A. (1982). Gifted education: A comprehensive roadmap. Rockville, MD: Aspen Systems.

Algozzine, B., & Ysseldyke, J. E. (1986). The future of the LD field: Screening and diagnosis. Journal of Learning Disabilities, 19, 394-398.

Anastasi, A. (1988). Psychological testing (6th ed.). New York: Macmillan.

Ban, P. (1988, November). Life beyond test scores. Paper presented at the meeting for the Gifted and Talented, Honolulu, HI.

Berk, R. A. (1983). Learning disabilities as a category of underachievement. In L. H. Fox, L. Brody & D. Tobin (Eds.), Learning-disabled/gifted children: Identification and programming (pp. 51-76). Baltimore, MD: University Park Press.

Broedel, J. W., Ohlsen, M. M., Proff, F. C., & Southard, C. (1965). The effects of group counseling on gifted underachieving adolescents. In M. Kornrich (Ed.), Underachievement (pp. 514-528). Springfield, IL: Charles C. Thomas Publisher.

Burns, G. L. (1978). The behavioral interaction theory of intelligence: A social behavioral analysis of similarity intelligence test items. Unpublished doctoral dissertation, University of Hawaii at Manoa, Honolulu, HI.

Burns, G. L. (1980). Indirect measurement and behavioral assessment: A case for social behaviorism psychometrics. Behavioral Assessment, 2, 197-206.

Burns, G. L. (1986). Paradigmatic behaviorism's personality conception: Implications for behavioral analysis and assessment. International Newsletter of Social Behaviorism, 6, 9-18.

Butler-Por, N. (1987). Underachievers in school: Issues and intervention. New York: Wiley.

Clark, B. (1988). Growing up gifted (3rd ed.). Columbus, OH: Merrill.

Collette, M. A. (1979). Dyslexia and classic pathognomic signs. Perceptual and Motor Skills, 48, 1055-1062.

Collette-Harris, M. A. (1974). Cognitive behavior modification of specific dyslexia. Unpublished Master's thesis, University of Hawaii at Manoa, Honolulu, HI.

Collette-Harris, M. A., & Minke, K. A. (1978). A behavioral experimental analysis of dyslexia. Behavior Research and Therapy, 16, 291-295.

Daniels, P. R. (1983a). Teaching the gifted/learning disabled child. Rockville, MD: Aspen.

Daniels, P. R. (1983b). Teaching the learning-disabled/gifted child. In L. H. Fox, L. Brody & D. Tobin (Eds.), Learning-disabled/gifted children: Identification and programming (pp. 153-169). Baltimore, MD: University Park Press.

Davis, G. A., & Rimm, S. B. (1989). Education of the gifted and talented (2nd ed.). Englewood Cliffs, NJ: Prentice-Hall.

Doris, J. (1986). Learning disabilities. In S. J. Ceci (Ed.), Handbook of cognitive, social, and neuropsychological aspects of learning disabilities (Vol. 1, pp. 3-53). Hillsdale, NJ: Erlbaum.

Dunn, O. J. (1961). Multiple comparisons among means. Journal of the American Statistical Association, 56, 52-64.

Dunn, L. M., & Markwardt, F. C. (1970). Manual: Peabody Individual Achievement Test. Circle Pines, MN: American Guidance Service.

Dyer, C. O. (1985). Review of the Otis-Lennon School Ability Test. In J. V. Mitchell Jr. (Ed.), The ninth mental measurements yearbook (Vol. II, pp. 1107-1111). Lincoln, Nebraska: Buros Institute of Mental Measurement.

Elkind, J. (1973). The gifted child with learning disabilities. Gifted Child Quarterly, 17, 96-102.

Evans, I. M., & Eifert, G. H. (Eds.). (in press). Unifying behavior therapy: Contributions of paradigmatic behaviorism. New York: Springer.

Feldhusen, J., & Hoover, S. (1986). A conception of giftedness: Intelligence, self-concept and motivation. Roeper Review, 8(3), 140-143.

Fox, L. H. (1983). Gifted students with reading problems: An empirical study. In L. H. Fox, L. Brody & D. Tobin (Eds.), Learning-disabled/gifted children: Identification and programming (pp. 117-139). Baltimore, MD: University Park Press.

Fox, L. H. (1987). The learning-disabled gifted child. In K. A. Kavale, S. R. Forness & M. Bender (Eds.), Handbook of learning disabilities, Vol. 1: Dimensions and diagnosis (pp. 251-270). Boston, MA: College-Hill Press.

Fox, L. H., & Brody, L. (1983). Models for identifying giftedness: Issues related to the learning-disabled child. In L. H. Fox, L. Brody & D. Tobin (Eds.), Learning-disabled/gifted children: Identification and programming (pp. 101-116). Baltimore, MD: University Park Press.

Fox, L. H., Brody, L., & Tobin, D. (1983a). Conclusion: Future directions for research and practice. In L. H. Fox, L. Brody & D. Tobin (Eds.), Learning-disabled/gifted children: Identification and programming (pp. 275-280). Baltimore, MD: University Park Press.

Fox, L. H., Brody, L., & Tobin, D. (1983b). Introduction. In L. H. Fox, L. Brody & D. Tobin (Eds.), Learning-disabled/gifted children: Identification and programming (pp. 1-7). Baltimore, MD: University Park Press.

Fox, L. H., Brody, L., & Tobin, D. (Eds.). (1983c). Learning-disabled/gifted children. Baltimore, MD: University Park Press.

Frasier, M. M. (1987). The identification of gifted black students: Developing new perspectives. Journal for the Education of the Gifted, 10(3), 155-180.

Gagne, F. (1985). Giftedness and talent: Reexamining a reexamination of the definitions. Gifted Child Quarterly, 29(3), 103-112.

Galagan, J. (1985). Psychoeducational testing: Turn out the lights, the party's over. Exceptional Children, 52, 288-299.

Gallagher, J. J. (1987). Notes from the editor's desk. Journal for the Education of the Gifted, 10(3), 139-140.

Gallagher, J. J. (1988). National agenda for educating gifted students: Statement of priorities. Exceptional Children, 55(2), 107-114.

Gardner, E. F., Callis, R., Merwin, J. C., & Rudman, H. C. (1982a). Stanford Test of Academic Skills, Level 1: Basic battery test booklet. San Antonio, TX: Harcourt Brace Jovanovich.

Gardner, E. F., Callis, R., Merwin, J. C., & Rudman, H. C. (1982b). Stanford Test of Academic Skills, Level 2: Basic battery test booklet. San Antonio, TX: Harcourt Brace Jovanovich.

Gardner, E. F., Callis, R., Merwin, J. C., & Rudman, H. C. (1982c). Stanford Test of Academic Skills, Level 1 and Level 2: Directions for administering. San Antonio, TX: Harcourt Brace Jovanovich.

Gardner, E. F., Madden, R., Rudman, H. C., Karlsen, B., Merwin, J. C., Callis, R., & Collins, C. S. (1985). Stanford Achievement Test Series: Technical data report. San Antonio, TX: Harcourt Brace Jovanovich.

Gardner, E. F., Rudman, H. C., Karlsen, B., & Merwin, J. C. (1982a). Stanford Achievement Test, Advanced: Complete battery test booklet. San Antonio, TX: Harcourt Brace Jovanovich.

Gardner, E. F., Rudman, H. C., Karlsen, B., & Merwin, J. C. (1982b). Stanford Achievement Test, Advanced: Directions for administering. San Antonio, TX: Harcourt Brace Jovanovich.

Gardner, E. F., Rudman, H. C., Karlsen, B., & Merwin, J. C. (1982c). Stanford Achievement Test, Intermediate 1: Complete battery test booklet. San Antonio, TX: Harcourt Brace Jovanovich.

Gardner, E. F., Rudman, H. C., Karlsen, B., & Merwin, J. C. (1982d). Stanford Achievement Test, Intermediate 1: Directions for administering. San Antonio, TX: Harcourt Brace Jovanovich.

Gardner, E. F., Rudman, H. C., Karlsen, B., & Merwin, J. C. (1982e). Stanford Achievement Test, Intermediate 2: Complete battery test booklet. San Antonio, TX: Harcourt Brace Jovanovich.

Gardner, E. F., Rudman, H. C., Karlsen, B., & Merwin, J. C. (1982f). Stanford Achievement Test, Intermediate 2: Directions for administering. San Antonio, TX: Harcourt Brace Jovanovich.

Gardner, E. F., Rudman, H. C., Karlsen, B., & Merwin, J. C. (1982g). Stanford Achievement Test, Primary 1: Complete battery test booklet. San Antonio, TX: Harcourt Brace Jovanovich.

Gardner, E. F., Rudman, H. C., Karlsen, B., & Merwin, J. C. (1982h). Stanford Achievement Test, Primary 1: Directions for administering. San Antonio, TX: Harcourt Brace Jovanovich.

Gardner, E. F., Rudman, H. C., Karlsen, B., & Merwin, J. C. (1982i). Stanford Achievement Test, Primary 2: Complete battery test booklet. San Antonio, TX: Harcourt Brace Jovanovich.

Gardner, E. F., Rudman, H. C., Karlsen, B., & Merwin, J. C. (1982j). Stanford Achievement Test, Primary 2: Directions for administering. San Antonio, TX: Harcourt Brace Jovanovich.

Gardner, E. F., Rudman, H. C., Karlsen, B., & Merwin, J. C. (1982k). Stanford Achievement Test, Primary 3: Complete battery test booklet. San Antonio, TX: Harcourt Brace Jovanovich.

Gardner, E. F., Rudman, H. C., Karlsen, B., & Merwin, J. C. (1982l). Stanford Achievement Test, Primary 3: Directions for administering. San Antonio, TX: Harcourt Brace Jovanovich.

Gardner, E. F., Rudman, H. C., Karlsen, B., & Merwin, J. C. (1983a). Stanford Achievement Test, Advanced: Norms booklet: National. San Antonio, TX: Harcourt Brace Jovanovich.

Gardner, E. F., Rudman, H. C., Karlsen, B., & Merwin, J. C. (1983b). Stanford Achievement Test, Intermediate 1: Norms booklet: National. San Antonio, TX: Harcourt Brace Jovanovich.

Gardner, E. F., Rudman, H. C., Karlsen, B., & Merwin, J. C. (1983c). Stanford Achievement Test, Intermediate 2: Norms booklet: National. San Antonio, TX: Harcourt Brace Jovanovich.

Gardner, E. F., Rudman, H. C., Karlsen, B., & Merwin, J. C. (1983d). Stanford Achievement Test, Primary 1: Norms booklet: National. San Antonio, TX: Harcourt Brace Jovanovich.

Gardner, E. F., Rudman, H. C., Karlsen, B., & Merwin, J. C. (1983e). Stanford Achievement Test, Primary 2: Norms booklet: National. San Antonio, TX: Harcourt Brace Jovanovich.

Gardner, E. F., Rudman, H. C., Karlsen, B., & Merwin, J. C. (1983f). Stanford Achievement Test, Primary 3: Norms booklet: National. San Antonio, TX: Harcourt Brace Jovanovich.

Gardner, H. (1983). Frames of mind: The theory of multiple intelligences. New York: Basic Books.

Gardner, H. (1987). The theory of multiple intelligences. Annals of Dyslexia, 37, 19-35.

Gear, G. H. (1976). Accuracy of teacher judgment in identifying intellectually gifted children: A review of the literature. Gifted Child Quarterly, 20, 478-490.

Gleason, J. J. (1988). Spotting the camouflaged gifted student. Gifted Child Today, 11(3), 21-22.

Greenhouse, S. W., & Geisser, S. (1959). On methods in the analysis of profile data. Psychometrika, 24, 95-112.

Gregory, D. A. (1984-1985). Assessment of the gifted. Diagnostique, 10, 88-97.

Griffin, R. S. (1988). Underachievers in secondary school: Education off the mark. Hillsdale, NJ: Erlbaum.

Hallahan, D. P., Kauffman, J. M., Lloyd, J. W., & McKinney, J. D. (1988). Introduction to the series: Questions about the regular education initiative. Journal of Learning Disabilities, 21(1), 3-5.

Hamada, R. S., & Tomikawa, S. (1986). Discriminant validity of the Windward Rating Scale: Screening for learning disabilities. Educational and Psychological Measurement, 46(4), 1083-1093.

Hammill, D. D., Leigh, J. E., McNutt, G., & Larsen, S. C. (1981). A new definition of learning disabilties. Learning Disability Quarterly, 4, 336-342. [Reprinted in (1987). Journal of Learning Disabilities, 20(2), 109-113.]

Harris, J. D., Gray, B. A., Davis, J. E., Zaremba, E. T., & Argulewicz, E. N. (1988). The exclusionary clause and the disadvantaged: Do we try to comply with the law? Journal of Learning Disabilities, 21(9), 581-582.

Hayes, M. L., & Sloat, R. S. (1988). Learning disability and suicide. Academic Therapy, 23(5), 469-475.

Hishinuma, E. S. (1987, December). Paradigmatic behavioral analysis of learning disabilities: Implications for special education. In E. S. Hishinuma (Chair), Paradigmatic behaviorism: Diverse applications of a unified theory. Symposium conducted at the meeting of the Hawaii Psychological Association, Honolulu, HI.

Hishinuma, E. S. (1989, January). Paradigmatic behaviorism and traditional psychometric assessment: Implications and new directions. In E. S. Hishinuma (Chair), Paradigmatic behaviorism:

Recent theoretical-empirical applications and developments. Symposium conducted at the meeting of the Hawaii Psychological Association, Honolulu, HI.

Hufano, L. D. (1982). A social behaviorism theory of learning disabilities: The effect of emotional-motivational characteristics on attention. Unpublished doctoral disseration, University of Hawaii at Manoa, Honolulu, HI.

Iscoe, I. (1965). "I told you so": The logical dilemma of the bright underachieving child. In M. Kornrich (Ed.), Underachievement (pp. 174-178). Springfield, IL: Charles C. Thomas Publisher.

Jacobson, V. (1984). The gifted/learning disabled. Washington, DC: U.S. Department of Education, Office of Educational Research and Improvement, ERIC Reports.

Jordan, J. B., & Ramirez, B. A. (Eds.). 1986 special education yearbook. Reston, VA: ERIC Clearinghouse on Handicapped and Gifted Children, Council for Exceptional Children.

Kaufman, A. W. (1979). Intelligent testing with the WISC-R. New York: Wiley.

Kavale, K. A., Forness, S. R., Bender, M., & Nye, C. (1987). Dimensions of learning disabilities. In K. Kavale, S. Forness & M. Bender (Eds.), Handbook of learning disabilities, Vol. 1: Dimensions and diagnosis (pp. 271-284). Boston, MA: College-Hill Press.

Kendig, K. (1988). Practical techniques for dealing with underachievement and self-concept. Gifted Child Today, 11(3), 7-9.

Keppel, G. (1973). Design and analysis: A researcher's handbook. Englewood Cliffs, NJ: Prentice-Hall.

Kirk, S. A. (1962). Educating exceptional children. Boston, MA: Houghton Mifflin.

Klecka, W. R. (1980). Discriminant analysis. Newbury Park, CA: Sage Publications.

Kornrich, M. (Ed.). (1965). Underachievement. Springfield, IL: Charles C. Thomas.

Lerner, J. W. (1989). Learning disabilities: Theories, diagnosis, and teaching strategies (5th ed.). Dallas, TX: Houghtin Mifflin.

Levey, S., & Dolan, J. (1988). Addressing specific learning abilities in gifted students. Gifted Child Today, 11(3), 10-11.

Levine, M. D. (1987). Developmental variation and learning disorders. Cambridge, MA: Educators Publishing Service.

Madden, R., Gardner, E. F., & Collins, C. S. (1982a). Stanford Early School Achievement Test, Level 1: Directions for administering. San Antonio, TX: Harcourt Brace Jovanovich.

Madden, R., Gardner, E. F., & Collins, C. S. (1982b). Stanford Early School Achievement Test, Level 1: Test booklet. San Antonio, TX: Harcourt Brace Jovanovich.

Madden, R., Gardner, E. F., & Collins, C. S. (1982c). Stanford Early School Achievement Test, Level 2: Directions for administering. San Antonio, TX: Harcourt Brace Jovanovich.

Madden, R., Gardner, E. F., & Collins, C. S. (1982d). Stanford Early School Achievement Test, Level 2: Test booklet. San Antonio, TX: Harcourt Brace Jovanovich.

Madden, R., Gardner, E. F., & Collins, C. S. (1983a). Stanford Early School Achievement Test, Level 1: Norms booklet: National. San Antonio, TX: Harcourt Brace Jovanovich.

Madden, R., Gardner, E. F., & Collins, C. S. (1983b). Stanford Early School Achievement Test, Level 2: Norms booklet: National. San Antonio, TX: Harcourt Brace Jovanovich.

Mandel, H. P., & Marcus, S. I. (1988). The psychology of underachievement: Differential diagnosis and differential treatment. New York: Wiley.

Marland, S. P. (1972). Education of the gifted and talented. Report to the Congress of the United States by the U.S. Commissioner of Education. Washington, DC: U.S. Government Printing Office.

Mathews, F. N., & Burns, J. M. (1987). An assessment challenge: Developing screening procedures for the preschool gifted child. Journal for the Education of the Gifted, 10(3), 215-225.

Mauser, A. (1979). Prevalence of gifted children with special learning disabilities. Unpublished manuscript, Northern Illinois University, DeKalb, IL.

Meijer, C. J. W., & Foster, S. F. (1988). The effect of teacher self-efficacy on referral chance. The Journal of Special Education, 22(3), 378-384.

Mowrer, O. H. (1960). Learning theory and behavior. New York: Wiley.

National Joint Committee on Learning Disabilities. (1981, January). I. Learning disabilities: Issues on definition. Baltimore, MD: National Joint Committee on Learning Disabilities, The Orton Dyslexia Society.

Neeper, R., & Lahey, B. B. (1988). Behavioral approaches. In K. Kavale, S. Forness & M. Bender (Eds.), Handbook of learning disabilities, Vol. 2: Methods and interventions (pp. 3-17). Boston, MA: College-Hill.

Oakland, T. (1985). Review of the Otis-Lennon School Ability Test. In J. V. Mitchell Jr. (Ed.), The ninth mental measurements yearbook (Vol. II, pp. 1111-1112). Lincoln, Nebraska: Buros Institute of Mental Measurement.

Payne, J. S., Patton, J. R., Kauffman, J. M., Brown, G. B., & Payne, R. A. (1983). Exceptional children in focus (3rd ed.). Columbus, OH: Merrill.

Pitlik, M. (1988). Gifted-learning disabled students: Can this be real? Independent School, Winter, 22-29.

Psychological Corporation. (1983). Stanford Achievement Test series: Technical data report. San Antonio, TX: Harcourt Brace Jovanovich.

Raven, J. (1956). Progressive matrices. London, England: H. K. Lewis.

Raven, J. (1962). Advanced progressive matrices. London, England: H. K. Lewis.

Renzulli, J. S. (1978). What makes giftedness? Reexamining a definition. Phi Delta Kappan, 60, 180-184.

Renzulli, J. S. (Ed.). (1986). Systems and models for developing programs for the gifted and talented. Mansfield Center, CT: Creative Learning Press.

Renzulli, J. S., & Hartman, R. K. (1981). Scale for rating behavioral characteristics of superior students. In W. Barbe & J. Renzulli (Eds.), Psychology and education of the gifted. New York: Irvington Publishers.

Rescorla, R. A. (1987). A Pavlovian analysis of goal-directed behavior. American Psychologist, 42(2), 119-129.

Resnick, L. B. (Ed.). (1976). The nature of intelligence. Hillsdale, NJ: Erlbaum.

Rimm, S. B. (1986). Underachievement syndrome: Causes and cures. Watertown, WI: Apple Publishing.

Rosner, S. L. (1983). Diagnosis: A case-typing approach. In L. H. Fox, L. Brody & D. Tobin (Eds.), Learning-disabled/gifted children: Identification and programming (pp. 141-149). Baltimore, MD: University Park Press.

Rosner, S. L., & Seymour, J. (1983). The gifted child with a learning disability: Clinical evidence. In L. H. Fox, L. Brody & D. Tobin (Eds.), Learning-disabled/gifted children: Identification and programming (pp. 77-97). Baltimore, MD: University Park Press.

Ryback, D. (1969). Cognitive behavior modification: "Motivated learning" reading treatment with parents as therapy-technicians. Unpublished doctoral dissertation, University of Hawaii at Manoa, Honolulu, HI.

Ryback, D., & Staats, A. W. (1970). Parents as behavior therapy technicians in treating reading deficits (dyslexia). Journal of Behavior Therapy and Experimental Psychiatry, 1, 109-119.

Salvia, J., & Ysseldyke, J. E. (1988). Assessment in special education and remedial education (4th ed.). Dallas, TX: Houghton Mifflin.

Sapon-Shevin, M. (1987). The learning-disabled/gifted: The politics of contradiction. In B. M. Franklin (Ed.), Learning disability: Dissenting essays (pp. 178-203). London, England: Farmer Press.

Sattler, J. M. (1988). Assessment of children (3rd ed.). San Diego, CA: Jerome M. Sattler Publisher.

Senf, G. M. (1983). The nature and identification of learning disabilities and their relationship to the gifted child. In L. H. Fox, L. Brody & D. Tobin (Eds.), Learning-disabled/gifted children: Identification and programming (pp. 37-49). Baltimore, MD: University Park Press.

Shoff, H. G. (1984). The gifted underachiever: Definitions and identification strategies. Washington, DC: U.S. Department of Education, Office of Educational Research and Improvement, ERIC Reports.

Snart, F., Das, J. P., & Mensink, D. (1988). Reading disabled children with above-average IQ: A comparative examination of

cognitive processing. The Journal of Special Education, 22(3), 344-357.

Spring, C., & French, L. (1990). Identifying children with specific reading disabilities from listening and reading discrepancy scores. Journal of Learning Disabilities, 23(1), 53-58.

Staats, A. W. (with contributions from C. K. Staats). (1963). Complex human behavior: A systematic extension of learning principles. New York: Holt, Rinehart & Winston.

Staats, A. W. (Ed.). (1964). Human learning: Studies extending conditioning principles to complex behavior. New York: Holt, Rinehart & Winston.

Staats, A. W. (1968). Learning, language, and cognition. New York: Holt, Rinehart & Winston.

Staats, A. W. (1970). A learning-behavior theory: A basis for unity in behavioral-social science. In A. R. Gilgen (Ed.), Contemporary scientific psychology (pp. 183-239). New York: Academic Press.

Staats, A. W. (1971). Child learning, intelligence and personality. New York: Harper & Row.

Staats, A. W. (1972). Language behavior therapy: A derivative of social behaviorism. Behavior Therapy, 3, 165-192.

Staats, A. W. (1975). Social behaviorism. Homewood, IL: Dorsey Press.

Staats, A. W. (1977). Child learning, intelligence and personality (rev. ed.). New York: Harper & Row.

Staats, A. W. (1981). Paradigmatic behaviorism, unified theory, unified theory construction methods, and the Zeitgeist of separatism. American Psychologist, 36(3), 239-256.

Staats, A. W. (1983). Psychology's crisis of disunity: Philosophy and method for a unified science. New York: Praeger.

Staats, A. W. (1986a). Behaviorism with a personality: The paradigmatic behavioral assessment approach. In R. O. Nelson & S. C. Hayes (Eds.), Conceptual foundations of behavioral assessment (pp. 242-296). New York: Guilford Press.

Staats, A. W. (1986b). Unified positivism. International Newsletter of Uninomic Psychology, 2, 10-12.

Staats, A. W. (1986c). Unified positivism: A philosophy for psychology and the disunified sciences. Theoretical and Philosophical Psychology, 6(2), 77-89.

Staats, A. W. (1986d). Uninomic psychology: What's in a name? International Newsletter of Uninomic Psychology, 2, 1-3.

Staats, A. W. (1987a). Constructing unified theory: Methodology from philosophies in biological and psychological science. Chair of symposium at the 95th Annual Meeting of the American Psychological Association, New York. [Reprinted: Introduction. (1988). International Newsletter of Uninomic Psychology, 4, 1-3.]

Staats, A. W. (1987b). Personality and abnormal behavior: A unified theory. Unpublished manuscript.

Staats, A. W. (1987c). Unified positivism: Philosophy for the revolution to unity. In A. W. Staats & L. P. Mos (Eds.), Annals of theoretical psychology (Vol. 5, pp. 11-54). New York: Plenum.

Staats, A. W. (1987d). Unified positivism: Philosophy for uninomic psychology. In W. J. Baker, M. E. Hyland, H. van Rappard, & A. W. Staats (Eds.), Current issues in theoretical psychology (pp. 297-316). Amsterdam: Elseview Science.

Staats, A. W. (1987e). Unified positivism theory construction methodology: Unifying the disunified sciences. Paper presented at the meeting of the American Psychological Association, New York. [Reprinted: International Newsletter of Uninomic Psychology, 4, 13-25.]

Staats, A. W. (1988a). Paradigmatic behaviorism, unified positivism, and paradigmatic behavior therapy. In D. B. Fishman, F. Rotgers, & C. M. Franks (Eds.), Paradigms in behavior therapy: Present and promise (pp. 211-253). New York: Springer Publishing.

Staats, A. W. (1988b). Personality, basic behavioral repertoires, and bridging theory. International Newsletter of Uninomic Psychology, 6, 14-29.

Staats, A. W., & Burns, G. L. (1981). Intelligence and child development: What intelligence is and how it is learned and functions. Genetic Psychology Monographs, 104, 237-301.

Staats, A. W., & Heiby, E. M. (1985). Paradigmatic behaviorism's theory of depression: Unified, explanatory, and heuristic. In S. Reiss & R. Bootzin (Eds.), Theoretical issues in behavior therapy. New York: Academic Press.

Sternberg, R. J. (1977). Intelligence, information processing, and analogical reasoning: The componential analysis of human abilities. Hillsdale, NJ: Erlbaum.

Sternberg, R. J. (1979). The nature of mental abilities. American Psychologist, 34(3), 214-230.

Sternberg, R. J. (1981). A componential theory of intellectual giftedness. Gifted Child Quarterly, 25, 86-93.

Sternberg, R. J. (1985). Beyond IQ: A triarchic theory of human intelligence. New York: Cambridge University Press.

Sternberg, R. J. (1986). Intelligence applied: Understanding and increasing your intellectual skills. San Diego, CA: Harcourt Brace Jovanovich.

Sternberg, R. J., & Davidson, J. E. (Eds.). (1986). Conceptions of giftedness. New York: Cambridge University Press.

Sternberg, R. J., & Detterman, D. K. (Eds.). (1979). Human intelligence: Perspectives on its theory and measurement. Norwood, NJ: Ablex.

Sternberg, R. J., & Detterman, D. K. (Eds.). (1986). What is intelligence? Contemporary viewpoints on its nature and definition. Norwood, NJ: Ablex.

Stone, B., Cundick, B. P., & Swanson, D. (1988). Special education screening system: Group achievement test. Exceptional Children, 55(1), 71-75.

Suter, D. P., & Wolf, J. S. (1987). Issues in the identification and programming of the gifted/learning disabled child. Journal for the Education of the Gifted, 10(3), 227-238.

Tannanbaum, A. (1983). Gifted children: Psychological and educational perspectives. New York: Macmillan.

Tannenbaum, A. J., & Baldwin, L. J. (1983). Giftedness and learning disability: A paradoxical combination. In L. H. Fox, L. Brody & D. Tobin (Eds.), Learning-disabled/gifted children: Identification and programming (pp. 11-36). Baltimore, MD: University Park Press.

Terman, L. M. (1925). Mental and physical traits of a thousand gifted children. In L. M. Terman (Ed.), Genetic studies of genius (Vol. 1). Stanford, CA: Stanford University Press.

Terman, L. M., & Oden, M. H. (1947). The gifted child grows up: Twenty-five years' follow-up of a superior group. Stanford, CA: Stanford University Press.

Terman, L. M., & Oden, M. H. (1959). The gifted group at mid-life: Thirty-five years' follow-up of the superior child. Stanford, CA: Stanford University Press.

Thorndike, R. L. (1963). The concepts of over- and under-achievement. New York: Teachers College Press.

Torrance, E. P. (1962). Guiding creative talent. Englewood Cliffs, NJ: Prentice-Hall.

Torrance, E. P. (1963). Education and the creative potential. Minneapolis, MN: University of Minnesota Press.

Torrance, E. P. (1965). Rewarding creative behavior. Englewood Cliffs, NJ: Prentice-Hall.

Torrance, E. P. (1966). Torrance tests of creativity. Princeton, NJ: Personnel Press.

Torrance, E. P. (1971). Are the Torrance tests of creative thinking biased against or in favor of "disadvantaged groups"? Gifted Child Quarterly, 15, 75-80.

Torrance, E. P. (1972). Predictive validity of the Torrance Tests of Creative Thinking. Journal of Creative Behavior, 6, 236-252.

Torrance, E. P. (1977). Discovery and nurturance of giftedness in the culturally different. Reston, VA: Council for Exceptional Children.

Torrance, E. P. (1984). The role of creativity in identification of the gifted and talented. Gifted Child Quarterly, 28(4), 153-156.

United States Department of Health, Education, and Welfare. (1977). Federal Register: Education of Handicapped Children, Implementation of Part B of the Education of the Handicapped Act.

Vaughn, S. (1989). Gifted learning disabilities: Is it such a bright idea? Learning Disabilities Focus, 4(2), 123-126.

Wechsler, D. (1974). Wechsler Intelligence Scale for Children-Revised: WISC-R manual. New York: Psychological Corporation.

Whitmore, J. R. (1980). Giftedness, conflict, and underachievement. Boston, MA: Allyn & Bacon.

Whitmore, J. R. (1987). Conceptualizing the issue of underserved populations of gifted students. Journal for the Education of the Gifted, 10(3), 141-153.

Whitmore, J. R. (1988). Gifted children at risk for learning difficulties. Teaching Exceptional Children, 20(4), 10-14.

Whitmore, J. R., & Maker, C. J. (1985). Intellectual giftedness in disabled persons. Rockville, MD: Aspen.

Wiederholt, J. L. (1987). Editor's comment. Journal of Learning Disabilities, 20(5), 270.

Williams, K. (1988). The learning-disabled gifted: An unmet challenge. Gifted Child Today, 11(3), 17-18.

Wood, T. A., Buckhalt, J. A., & Tomlin, J. G. (1988). A comparison of listening and reading performance with children in three educational placements. Journal of Learning Disabilities, 21(8), 493-496.

Ysseldyke, J. E. (1983). Current practices in making psychoeducational decisions about learning disabled students. Journal of Learning Disabilities, 16, 226-233.

Zirkel, P. A., & Stevens, P. L. (1987). The law concerning public education of gifted students. Journal for the Education of the Gifted, 10(4), 305-322.