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The University of San Francisco

A COMPARISON OF GIFTED IDENTIFICATION METHODS USING MEASURES OF ACHIEVEMENT, ABILITY, MULTIPLE INTELLIGENCES, AND TEACHER NOMINATIONS

A Dissertation

Presented to

The Faculty of the School of Education

Learning and Instruction Program

In Partial Fulfillment

of the Requirements for the Degree

Doctor of Education

by
Jamie J. Worthington

San Francisco
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This dissertation, written under the direction of the candidate's dissertation committee and approved by the members of the committee, has been presented to and accepted by the faculty of the School of Education in partial fulfillment of the requirements for the degree of Doctor of Education. The content and research methodologies presented in this work represent the work of the candidate alone.

Jamie J. Worthington — 5-2-02

Candidate — Date

Dissertation Committee

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Chairperson

Robert B Burns — May 2, 2002

Deborah P. Black — May 2 2002

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Introduction

Statement of the Problem

The concept of giftedness has changed from *g* or global intelligence as measured by language and mathematical abilities on intelligence tests to multiple intelligences (Treffinger & Feldhusen, 1996). Although the definition of giftedness has evolved, the practice of identifying gifted students based on the new conception has not come to fruition. In many school districts, students continue to be selected for gifted programming based on how well they perform on standardized achievement and ability tests (U.S. Department of Education, 1993). In particular, Coleman and Gallagher (1992) reported that 49 states (all except Florida) rely on IQ and achievement tests to identify gifted students. A consequence of the discrepancy between how intelligence is defined and how it is measured may result in some gifted students not being identified for gifted and talented education (GATE).

For example, the report *National Excellence: A Case for Developing America's Talent* (U.S. Department of Education, 1993) documents the need for a multiple-criteria approach to identify gifted students (i.e., individuals with greater abilities than those of similar age and opportunity) and the importance of educating them at their level of aptness. According to the report, 73% of school districts have adopted a multiple-criteria definition of giftedness; however, few of them use it in their identification practice. Instead, they rely on standardized test scores that measure linguistic and mathematical skills.

In addition to standardized measurements that assess specific mental abilities, some districts consider teacher nominations that reflect students' general dispositions or learning styles, such as leadership, creativity, and reflectiveness (Hunsaker, Finley, & Frank, 1997). Even with the complementary methods of using tests and teacher nominations to identify gifted students, as many as 30% or more of the gifted population may be unrecognized (Brown, 1997; McCluskey & Treffinger, 1998). Yet, researchers have shown that academic achievement increases when gifted students are provided with advanced curricular activities (Baum, Renzulli, & Hébert, 1995; Diezmann & Watters, 1995; Reid, Udall, Romanoff, & Algozzine, 1999). It is difficult to educate students appropriately without identifying them. Therefore, in order for the full academic potential of gifted students to be realized, they must be identified for enrichment services so that their educational needs will be met (Maker, 1996).

In order to identify gifted students, it is necessary to use methods that measure a variety of intellectual gifts. Gardner's (1983) theory of multiple intelligences (MI) considers a wider range of mental abilities than past theories of intelligence. If students are to be educated according to their dominant intelligences, then it is important to identify those strengths. The Teele Inventory of Multiple Intelligences (TIMI) is one instrument that is being used in over 650 schools nationwide to examine students' dominant intelligences and to inform instruction and hence, might be effective in identifying gifted students. The Learning Styles Inventory (LSI) is an instrument that has been used in schools and research since 1976 to assess individual learning styles. In essence, both instruments assess student preferences and the LSI might provide validity evidence for the TIMI.

Purpose of the Study

The purpose of this study was to investigate whether existing methods of gifted identification weighted toward *g* differed from an alternative method based on multiple intelligences. Two methods of identification were compared. The current method used to identify students for the gifted program in the district where this study took place relies heavily on students' language and mathematical abilities. Test scores from the Stanford Achievement Test, 9th Edition (SAT9), Naglieri Nonverbal Abilities Test (NNAT), and teacher nominations were used to determine who is identified for gifted and talented education (GATE).

The alternative method that was used to identify gifted students incorporated Gardner's (1983) theory of multiple intelligences. In addition to scores from the three measures used currently to identify gifted students, the alternative method of gifted identification included scores from two additional assessments including the TIMI and a teacher questionnaire that elicited teachers' evaluations of students' multiple intelligences. The LSI was used for construct validation of the TIMI.

Theoretical Rationale

Current gifted-identification procedures weighted toward *g* may fail to consider individuals with intellectual abilities in areas outside of language and mathematics (Ramos-Ford & Gardner, 1991). In addition to linguistic and logical-mathematical intelligences measured by ability and achievement tests, Ramos-Ford and Gardner (1991) advocated a multiple intelligences approach to identifying students for GATE programs. They suggested considering the quality of products that children already have completed, a desire by students to participate in enrichment activities, and a trial period of interacting

with other gifted students. The researchers emphasized providing an environment that is conducive to assessing the seven multiple intelligences.

Although Gardner (1999) has named eight and possibly nine distinct intelligences, for purposes of this study, only the original seven were considered. The naturalist and existential intelligences are not measured in the TIMI, because Teele believed that those two intelligences are not sufficiently autonomous from the other intelligences to be considered separately (personal communication, December 4, 2000). Studying special populations allows scientists to distinguish certain intelligences by observing mental abilities and deficits. Prodigies and idiot savants are two groups who provide researchers an opportunity to understand differences between the 7 multiple intelligences. As certain conditions are linked to genetics or particular neural centers, it becomes convincing that a discrete intelligence exists.

The seven multiple intelligences are verbal-linguistic, logical-mathematical, spatial, musical, bodily-kinesthetic, intrapersonal, and interpersonal. What is the relationship between formal education and the development of each intelligence? How do the 7 multiple intelligences manifest themselves productively? The remainder of this section addresses these two questions.

Verbal-linguistic intelligence. According to Gardner (1983), there are four aspects of verbal-linguistic intelligence that contribute to one's overall ability to convey meaning through language. First, the rhetorical aspect is used to convince others to take action. Second, the mnemonic aspect refers to using letters as tools for memorizing information. Third, the explanation aspect allows communication and learning to occur

between individuals and groups. Fourth, the metalinguistic aspect is the use of language to analyze language.

People with verbal-linguistic intelligence have an intuitive sense about language and expression. They understand subtle meanings of words to an extent that they can evoke emotions or visualizations from others when articulating a certain combination of words. Semantics, phonology, syntax, and pragmatic aspects of language are considered when using this intelligence. According to Gardner (1993), the ability to remember passages and the automaticity of language history allows the highly proficient verbal-linguistic person to construct original, meaningful work. Examples of professions that require verbal-linguistic intelligence are poets, writers, literary critics, politicians, legal experts, and historians. To a great extent, academic work in school is geared toward these individuals.

One indicator of a distinct intelligence is whether tasks interfere with each other or transfer to one another under differing circumstances. For instance, talking and walking simultaneously are not usually a problem. Gardner (1999) believed these two intelligences are separate. Talking and writing complex material at the same time, however, becomes problematic for most people. If activities do not interfere with each other, it can be inferred that different mental abilities are being used. If activities do interfere with one other, as with talking and writing, it can be assumed that the same mental functions are in competition with each other.

Scientific evidence for verbal-linguistic intelligence may be found in studies with aphasic patients (Gardner, 1983). Although aphasia prevents individuals from reading well and expressing themselves in written form, they retain their normal abilities in other

areas such as music, art, and engineering. Depending on the symbolic code used by a specific culture, different problems present themselves to aphasic patients. For instance, in the West, reading is based on phonological systems and people rely on the part of the brain that processes linguistic sounds. In Asia, reading is based on idiographic systems and people rely on the part of the brain that construes pictorials. The Japanese incorporate syllabic reading (kana) with an ideographic system (kanji). Certain lesions will produce greater difficulties in decoding kana symbols or kanji symbols, depending on where the lesions are located in the left hemisphere of right-handed individuals.

Logical-mathematical intelligence. One reason Gardner (1993) believed that mathematicians can follow through with long and difficult steps in problem solving is because they follow logic that guides them to a solution. They understand patterns and their properties. The heart of logical-mathematical intelligence is the ability to identify and solve important problems. Generally, individuals gifted in this area are noticed early in their lives and their progress is rapid and can be achieved to a great extent, independently of others. The public-school system offers students opportunities to practice their basic mathematics skills. The system does not necessarily provide environments in which gifted students may advance and exhibit their mathematical intelligence.

Scientific evidence of logical-mathematical intelligence as separate from other intelligences may be found in the profiles of idiots savants. In most cases, idiots savants have very limited abilities overall compared with other individuals but possess a superior ability in performing calculations. According to Gardner (1983), idiots savants adept at calculations do not use mathematics to solve problems or discover new ones; they are

adept only at calculating remarkably long strings of numbers or remembering sequences of dates.

The Gerstmann syndrome is a disability that provides further evidence of logical-mathematical intelligence as an independent intelligence from others. People with this condition have much difficulty in learning elementary arithmetic, distinguishing between left and right, and in recognizing and identifying fingers. Although they may have minor problems writing and spelling, their language ability is otherwise normal. Gardner (1983) claimed that neurologists have hypothesized that Gerstmann syndrome may result from an impairment of the "association cortexes in the posterior areas of the dominant hemisphere" (p. 156), where pattern recognition occurs in the visual area of the brain.

Spatial intelligence. Spatial intelligence is used for orientation in familiar settings as well as settings that have changed, for recognizing faces, places, and shapes, and for observing details. It is more difficult to test than linguistic or mathematical intelligences. Children gifted with spatial abilities usually are not able to communicate their knowledge through outlets other than this particular intelligence. So although they may never become lost, they may be unable to render a factual map or provide accurate directions verbally or in writing for arriving at the same place they did.

In studies of normal people, they have been presented stimuli to either the right or left visual field and asked to complete a variety of tasks. The right hemisphere has proven to be more important than the left in performing the assignment. Examples of people with predominant spatial intelligence are painters, sculptors, art critics, engineers, and surgeons. Also they may be exemplary at geometry or chess. Regular education

classrooms in public schools usually do not offer adequate projects or programs for students gifted spatially (Gardner, 1993).

According to Gardner (1983), the posterior portion of the right hemisphere of the brain is where spatial intelligence is located predominantly. Clinical studies of patients who have suffered from strokes or brain trauma provide evidence of spatial intelligence as an autonomous intelligence. Damage to the right hemisphere precludes people from attending to space on their left half. Lesions to the right parietal areas cause problems in spatial ability, and the bigger the lesion, the more conspicuous the problem.

Musical intelligence. The vital components necessary to musical intelligence are pitch, rhythm, timbre, and harmony, but people who are gifted musically have more than technical ability. They are able to interpret music, identify the composer's intentions, express themselves through music, and deliver unique performances. Those who are musically gifted make able singers, composers, players of instruments, and directors of musicians. Performers often report that they did not do well in school (Gardner, 1993). There are few outlets, if any, in public educational institutions for students who are gifted musically (Gardner, 1993).

Musical intelligence, as an independent ability from other intelligences, has been recognized by Gardner (1983) and based in part on studies of people who have suffered brain damage or strokes. He claimed that many people who have been subjected to aphasia experienced no decline in their musical ability. Also, people who lose their musical ability and suffer from amusia do not necessarily become aphasic. Gardner (1983) explained that linguistic abilities are located mostly in the left hemisphere of the

brain in most right-handed people, and musical abilities are found mostly in the right hemisphere.

Connections between music and other intelligences such as logical-mathematical, spatial, and bodily-kinesthetic have been surmised, however, not substantiated with scientific evidence. There are certain basic mathematical properties germane to music, for example, proportions, ratios, and patterns of notes played together to create an enjoyable piece of listening entertainment. Gardner (1983) called the links between music and mathematics superficial and believed that the "core of operations of music do not bear intimate connections to core operations in other areas" (p. 126).

Bodily-kinesthetic intelligence. Bodily-kinesthetic intelligence results from the interaction of perceptual and motor systems. Some people have superior control over their bodies and can express feelings or achieve goals through both fine and gross motor skills. The ability to control motions and objects aptly is key to bodily-kinesthetic intelligence. A balance between mind and body is achieved. The body responds to the mind's intentions, while the mind simultaneously contemplates which out of many possibilities will result in exactly the right movement. Certain activities can occur at such a rapid pace in individuals accomplished in bodily-kinesthetic intelligence, that perceptual and motor feedback cannot be used to distinguish the perceptual thoughts and motor movements. Especially in highly skilled people, particular activities may be "preprogrammed" to an extent that the observable behavior occurs as a complete action rather than as a discrete sequence of perceptual-motor interactions (Gardner, 1983).

Examples of people whose gifts and talents are manifested in bodily-kinesthetic intelligence include mimics, mimes, dancers, and athletes. Athletes in select sports (i.e.,

baseball, basketball, and football) are given ample recognition and support through extracurricular activities, some of which are associated with high school. Prior to that time, students gifted in the bodily-kinesthetic domain are not given often an opportunity to develop their strengths in school (Gardner, 1993).

Gardner (1983) stated that damage to the left hemisphere of the brain results in isolated motor difficulties. For example, apraxia is a condition in which individuals can understand cognitively a request to do something physically and are able physically to respond to a request, but are unable to actually accomplish the task in question. Dressing apraxia prohibits someone from putting on a set of clothes. Limb-kinetic apraxia prevents one from completing a task with either hand. Ideomotor apraxia results in clumsy movements and using body parts as tools (e.g., using a fist rather than a hammer within reach and in visual view to pound a nail). Ideational apraxia deters a person from carrying out a sequence of events in the correct order.

Personal intelligences. Two types of personal intelligence are intrapersonal and interpersonal and are distinguished by the predominant focus on self or others, respectively. People gifted intrapersonally have a clear and precise understanding of their own personal histories, feelings, emotions, wants, and fears both singularly and when they are combined or conflicting. Examples of those with highly developed intrapersonal abilities are novelists and people who are sought out by others to share their experience and give advice. Students who are especially sensitive and thoughtful are not given ample opportunity to develop their gifts in regular-education classrooms (Gardner, 1993).

Those people with advanced interpersonal abilities are able to "read" people and act on that knowledge in achieving goals. They recognize many faces, voices, and personalities and then react to others in ways that will allow goal achievement. Politicians, religious leaders, therapists, salespeople, skilled teachers, and exceptional parents are those who utilize interpersonal intelligence. Although admired and sometimes envied by teachers, there are few authentic opportunities for gifted interpersonal students to develop their leadership qualities in public schools (Gardner, 1993).

Gardner (1983) stated that the frontal lobes of the brain are the primary areas where intrapersonal knowledge (including motivation, purpose, goals, desire for human contact, and feelings) and interpersonal knowledge (e.g., sights, sounds, tastes, and cultural or societal information) converge. The integration of personal knowledge has been examined in certain pathologies such as autism (Gardner, 1983). Autism is the inability to relate to people and self. The autistic individual is unable to know others let alone him or herself.

In establishing further neuro-anatomical evidence for the personal intelligences, Gardner (1983) relayed the experience of Zasetsky, a World War II veteran who suffered severe battle injuries to the left parietal-occipital lobe. Zasetsky's neuropsychologist, Alexander Luria, reported that Zasetsky was capable of only elementary verbal expressions. He could not write, perceive in the right half of his visual field, hammer a nail, play a game, keep from getting lost while outside, add numbers, or describe a picture. Although Zasetsky was incapable of a wide range of functions, he retained the capacity found in the frontal lobes for personal relationships.

Background and Need

The identification of gifted students has been based on a narrow definition of what constitutes giftedness, namely a single score on a test designed to measure language and mathematical competency. As early as 1974, Martinson supported a broad definition and identification method of giftedness. Researchers have continued to advocate for a broad definition and parallel identification practice in an effort to ensure that all gifted students' academic needs are met (Maker, 1996; Plucker, Callahan, & Tomchin, 1996; Ramos-Ford & Gardner, 1991; Sternberg & Clickenbeard, 1994).

Because underachieving gifted students oftentimes remain hidden in obscurity, it is difficult to estimate how many there are (Butler-Por, 1993; Gallagher, 1991). There is no such thing as a "typical" underachiever (Emerick, 1991). There are certain statistics, however, from which one might infer the prevalence of this population.

As many as 30% of high-school dropouts may be gifted underachievers who did not receive special services (Brown, 1997). In Washington state, Hanninen, Fascilla, and Anderson (1991) determined that 13% of the entering students of an alternative high school were gifted. They also estimated conservatively that 3% to 5% of the incarcerated youth in Washington state were gifted. Considering that only 1.5% of Washington's school-age population was served as gifted and talented, these statistics are alarming (U.S. Department of Education, 1999).

In Canada, 30% of the dropouts carried "A" or "B" averages and only 8% reported problems with coursework (McCluskey & Treffinger, 1998). Nearly one-third of the dropouts were successful students in terms of grades but obviously were not engaged sufficiently to remain in school. It is possible that if they had been challenged at

their potential, as would have been possible in gifted programs, they would have remained in school.

Society pays a high price for misdirected talent. McCluskey and Treffinger (1998) reported considerable fiscal impact caused by bright delinquents: $7.1 billion in lost tax revenue, $3 billion in increased welfare and unemployment costs, and $3 billion in increased crime.

In order to avoid the high costs associated with miseducation, it is important for all students to succeed academically. Although some gifted children mature into productive adults in spite of their school experiences, others need academic support in order to flourish. Some students who are not detected as gifted, consequently do not rise to the level of greatness expected of highly intellectual people. Oftentimes people gifted in the "other intelligences," such as the arts, music, intrapersonal, interpersonal, and bodily-kinesthetic areas, are not supported adequately in school and, as a result, either underachieve or fail academically (Gardner, 1993). If these particular students had received extra support in school, it is possible that they may have become productive at a level commensurate with their talents. Because the TIMI is being used to assess students' dominant intelligences and instruct them accordingly in over 650 schools across the United States of America, it would be helpful to teachers and administrators establish more evidence of validity than is available currently.

Research Questions

The first step in educating children appropriately is evaluating their academic needs. The purpose of investigating whether traditional methods of gifted identification weighted toward *g* differ from an alternative method based on MI was to discover if

certain children were not being educated according to their academic needs. The following questions were investigated.

1. To what extent does identification of students as gifted weighted toward *g* differ from identification based on multiple intelligences?

2. To what extent does the TIMI contribute to gifted identification?

Definition of Terms

This section contains operational definitions of key terms used in the study. The learning styles inventory categories are included because they are used to provide evidence of validity for the TIMI.

Ability: Ability is competence or proficiency one has in doing something. For purposes of this study, ability was measured by scores on the SAT9, NNAT, and TIMI.

Auditory learning style: Students who prefer verbal instruction are considered auditory learners. For purposes of this study, auditory preferences were measured by the LSI.

Bodily-kinesthetic intelligence: Some people have superior control over their bodies and can express feelings or achieve goals through both fine and gross motor skills (Gardner, 1983). For purposes of this study, bodily-kinesthetic intelligence was measured by students' preferences for bodily-kinesthetic activities on the TIMI and teachers' observations of students on the teacher questionnaire.

Enrichment: Enrichment includes curriculum and learning opportunities that are advanced beyond the basic reading, writing, and mathematics offered in regular education (U.S. Department of Education, 1993).

g: General mental ability as measured by cognitive ability tests (Gage & Berliner, 1992).

GATE: Gifted and talented education (GATE) is a formal program funded in part by the federal and some state governments in an effort to provide enrichment academic opportunities for students with gifted potential (U.S. Department of Education, 1993). Students receive instruction in separate classes containing only gifted students.

Gifted: Gifted students have demonstrated greater biopsychological potential than others of similar age and opportunity in one or more of the seven multiple intelligences described by Gardner (1983).

Gifted identification based on MI: The alternative method used to identify gifted students incorporated Gardner's (1983) theory of multiple intelligences. In addition to the criteria used currently to identify gifted students, the alternative method of gifted identification included scores from the TIMI. Scores of 6 to 8 on the TIMI subscales served as additional criteria for identifying children as gifted.

Gifted programs: Gifted programs are designed to provide academic enrichment opportunities for gifted students (U.S. Department of Education, 1993).

Interpersonal intelligence: People with advanced interpersonal abilities are able to "read" people and act on that knowledge in achieving goals (Gardner, 1983). For purposes of this study, interpersonal intelligence was measured by the students' preferences for intrapersonal activities on the TIMI and teachers' observations of students on the teacher questionnaire.

Intrapersonal intelligence: People gifted intrapersonally have a clear and precise understanding of their own personal histories, feelings, emotions, wants, and fears both singularly and when they are combined or conflicting (Gardner, 1983). For purposes of this study, intrapersonal intelligence was measured by the students' preferences for

interpersonal activities on the TIMI and teachers' observations of students on the teacher questionnaire.

Intrapersonal/Interpersonal learning style: Students who prefer to work alone are intrapersonal learners. For purposes of this study, preferences were measured by the LSI. Students with an intrapersonal learning style are identified by scores below 40 on the LSI. Students who prefer to learn in groups are interpersonal learners. For purposes of this study, students who have an interpersonal learning style are identified by scores of above 60 on the LSI.

Kinesthetic learning style: Students who prefer to learn by putting their bodies in motion are considered kinesthetic learners. For purposes of this study, kinesthetic preferences were measured by the LSI.

Learning styles: Learning styles are preferences for how a person is most comfortable in learning new material. For purposes of this study, visual, auditory, kinesthetic, tactile, and intrapersonal/interpersonal preferences were measured by the LSI.

Logical-mathematical intelligence: People with strong logical-mathematical abilities have a keen sense about objects and order (Gardner, 1983). For purposes of this study, logical-mathematical intelligence was measured by the students' mathematics achievement on the SAT9, students' preferences for logical-mathematical preferences on the TIMI, and teachers' observations of students on the teacher questionnaire.

Musical intelligence: Pitch, rhythm, timbre, and harmony are the components of music that people with musical intelligence use to express themselves with instruments (Gardner, 1983). For purposes of this study, musical intelligence was measured by the

students' preferences for musical activities on the TIMI and by the teachers' observations of students on the teacher questionnaire.

Spatial intelligence: Those with spatial intelligence are sensitive to their visual or kinesthetic percepts and precise locations of those percepts (Gardner, 1983). For purposes of this study, spatial intelligence was measured by nonverbal ability scores on the NNAT, students' preferences for spatial activities on the TIMI, and teachers' observations of students on the teacher questionnaire.

Tactile learning style: Students who prefer to touch something or keep their hands busy while gaining knowledge are considered tactile learners. For purposes of this study, tactile preferences were measured by the LSI.

Traditional gifted identification: The traditional method used to identify students for the gifted program in the district where this study took place relied on test scores from the SAT9 and NNAT and teacher nominations. The SAT9 was worth approximately 47%, the NNAT was worth approximately 33%, and the teacher nomination was worth 20% of the composite score. In order to have been identified for the 2001-2002 school year, students must have met the following criteria: They must have earned over 1,000 points from a maximum of 3,000. Students received 1,400 points for scoring in the 99^{th} percentile on the SAT9, 1 point for scoring in the 80^{th} percentile, and extrapolated points for every percentile in between. Students received 1,000 points for scoring in the 99^{th} percentile on the NNAT, 5 points for scoring in the 50^{th} percentile, and extrapolated points for every percentile in between. The teacher nomination was worth 600 points. The three total scores were added together for a final score.

Underachieving gifted: Students with achievement scores that are one standard deviation below their predicted scores based on IQ (Jensen, 1979).

Verbal-linguistic intelligence: People with exceptional abilities in verbal-linguistic areas have an intuitive sense about language and expression (Gardner, 1983). For purposes of this study, verbal-linguistic intelligence was measured by students' reading and language achievement on the SAT9, students' preferences for verbal-linguistic activities on the TIMI, and teachers' observations of students on the teacher questionnaire.

Visual learning style: Students who prefer to watch demonstrations are considered visual learners. For purposes of this study, visual preferences were measured by the LSI.

Summary

The problem, purpose, theoretical rational, and background and need were presented in this chapter. The literature indicates that although practitioners advocate a multiple intelligences philosophy toward education, they continue to teach and assess in terms of *g* (Coleman & Gallagher, 1992; Gardner, 1993; U.S. Department of Education, 1993). One reason for the discrepancy between theory and practice may be that there are few instruments with evidence of reliability and validity that measure the multiple intelligences in a way that is quick, inexpensive, and unobtrusive. The TIMI is one inventory being used throughout the United States of America to identify multiple intelligences and it is not time consuming, expensive, or obtrusive.

The purpose of this study was to consider whether the traditional method of gifted identification weighted toward *g* might differ from an alternative method based on multiple intelligences. If the findings revealed that some potentially gifted students were

not identified by the traditional approach weighted toward *g* and were identified by the alternative method, then that information would be useful to educators in the business of curriculum and instruction development and implementation. Also in question was the validity evidence and ipsative nature of the TIMI.

A review of the literature in Chapter II provides the basis for this study. The methodology, research design, procedures, and data analyses in Chapter III lead to the results in Chapter IV. A summary of findings, implications, and recommendations is discussed in Chapter V.

Chapter II

Review of the Literature

The education community once accepted *g* or global intelligence as giftedness. Standardized norm-referenced tests requiring linguistic and mathematical competence were administered, and students who scored above a certain cutoff point, usually in the top 3% to 5%, were considered gifted (U.S. Department of Education, 1993). One reason such a small percentage of students continue to be served is due to financial constraints on gifted programming budgets.

Upon further evaluation of test scores and performance in activities other than testing, it became apparent that some intelligent people, by virtue of their accomplishments outside of school, did not have high scores on the traditional assessments. Their intellectual abilities were not measured adequately by the standard tests. Because this observation has been documented by many (Feldhusen, Baska, & Womble, 1981; Gallagher, 1966, 1991; Gardner, 1983, 1999; Sternberg, 1982; Whitmore, 1985), researchers have expanded their concept of giftedness to describe more completely and thus more accurately the gestalt of giftedness than was done previously with a unidimensional definition and assessment of the intellect. For purposes of this study, giftedness is defined as having more ability than others of the same age and experience in the areas of verbal-linguistic, logical-mathematical, spatial, music, bodily-kinesthetic, intrapersonal, or interpersonal competence (Gardner, 1983).

The aim of this literature review is to (a) summarize the historical use of tests in the gifted identification process, (b) summarize the use of teacher nominations in the

gifted identification process, and (c) present the use of multiple intelligences theory for the purpose of gifted identification.

Tests Used in the Identification Process

Scores on achievement and ability tests are one of the criteria that have been used to identify children for gifted and talented education (GATE). Coleman and Gallagher (1992) reported that 49 states rely on IQ and achievement tests in their identification process of gifted students. Paper-and-pencil tests that are used by themselves to identify gifted students are problematic for at least four reasons. One problem with paper-and-pencil instruments is that they are timed, so the inference is that in order to be intelligent, one needs to be fast. Sternberg (1982) pointed out that, generally, reflective problem solving is preferable to impulsive problem solving because the responses yield more intelligent results. Reflection takes time to think about problems and possible solutions. In addition, persistence and engagement, two other time-consuming factors of intelligence, are sometimes required for the best possible solution. In a study involving insight problems, Sternberg and Davidson (1982) found a correlation of .75 between the amount of time spent on problem solving and IQ. A correlation of .62 was found between the amount of time spent and score on the test of insight problems. The higher a participant's IQ, the more likely it was that he or she spent more time than someone with a lower IQ on solving the insight problems. The more time one spent on problem solving, the higher the score that he or she received. Timed paper-and-pencil tests minimize the importance of effective problem solving. They separate fast problem solvers from slow ones but not necessarily the best from the rest (Sternberg, 1982).

A second shortcoming with paper-and-pencil instruments is that one year's intelligence score is the same as the previous year's achievement level. Sternberg's (1982) review of common intelligence assessments indicated that they require high levels of achievement in the test-takers. Sternberg's assertion is supported by the research of Ceci (1991), who reported the correlation between IQ and number of years in school as "frequently in excess of .80" (p. 705). Paper-and-pencil tests that require high levels of achievement might be acceptable if all children had the same enriched educational background, but that is not the case; therefore, paper-and-pencil instruments do not assess adequately intelligence in people outside the normed group and those gifted in areas other than language or mathematics.

A third drawback of paper-and-pencil instruments is that they can provoke artificially stressful and anxious testing conditions (Sternberg, 1982). Most people taking high-stakes tests understand the consequences of either doing well or not. Some people are inspired to perform well under this level of pressure, but others are test anxious, and their performance does not reflect accurately their mental abilities that contribute to their successes. Measuring performance directly under authentic circumstances may be a better gauge of intellect.

A fourth issue with paper-and-pencil IQ tests is that they account for only 10% to 25% of the variation in academic performance (Maker, 1996; Sternberg, 1982, 1997). Because so little of the variation can be attributed to performance in academic settings, one might expect that the tests would be one of many measures used for academic placement. Actually, "most" school districts use paper-and-pencil norm-referenced instruments to the exclusion of other measures, or they weight scores from these

instruments more heavily than other criteria in identifying students with gifted potential (Feiring, Louis, Ukeje, Lewis, & Leong, 1997; Maker, 1996).

In their review of the literature, Moon, Kelly, and Feldhusen (1997) found that "the instruments most frequently used in schools to identify intellectual and academic talent are group achievement tests" (p. 16). Standardized group achievement tests, however, have ceiling effects, assess only a narrow range of intellectual abilities, and do not measure cognitive processing abilities. Particular strengths, such as creativity, visual and performing arts, leadership, intrapersonal, and interpersonal abilities are difficult to assess psychometrically (Gardner, 1993).

Paper-and-pencil norm-referenced test scores are a good measure of certain aspects of linguistic and mathematical intelligence (Gardner, 1993; Sternberg, 1982). Using test scores to admit students talented in language and mathematics to GATE is quick, easy, and legally defensible. By themselves, however, results from these tests do not separate low-scoring students from high-scoring students who are gifted in areas outside language and mathematics. If the goal of public-school administrators was to continue to serve gifted children based on an identification procedure weighted toward *g*, then the norm-referenced instruments used to separate high achievers from low achievers in the areas of language and mathematics would suffice. The edict set forth by the U.S. Department of Education (1993), however, requires public schools to serve students with a wide range of gifts and talents based on multiple intelligences.

Teachers' Nominations Used in the Identification Process

A second measure used to identify students with gifted potential is teacher nominations. Whitmore's (1982) analysis of her underachieving gifted research resulted

in finding that many teachers do not look for clues of potential giftedness, do not provide environments that elicit gifted potential, and do not tap into students' strengths in an effort to improve weaknesses. She named four myths teachers hold that bias their consideration of underachieving students for gifted programs:

1. Gifted children are gifted in all areas. Teachers attribute inconsistent achievement levels to lack of motivation, not enough effort, and too little self-discipline. The reality is that most gifted people are not gifted across all academic areas. It is unrealistic for teachers to expect students to excel in every subject.

2. Gifted students are high achievers with high desires to achieve academically. If students' interests are aligned with the school requirements, then this assertion is true. Usually, underachieving gifted students' desires do not match classroom edicts. In that case, they are perceived by teachers as lazy, indifferent, and uncooperative.

3. Gifted students always achieve highly in language arts because reading and writing are central to giftedness. Students who do not produce oral and written work are often dismissed as having a disability. The fact is that some people's strengths are in areas outside language expression.

4. Gifted children are mature, independent, and self-directed. Teachers making gifted nominations oftentimes overlook students who do not exhibit these emotional and social qualities. The problem with this oversight is that some people have high aptitude in science, music, art, or other areas and simultaneously are not as advanced intrapersonally and interpersonally.

These four myths about giftedness account for many gifted students not being recognized for enrichment programs (Feiring et al., 1997; Whitmore, 1982).

Underachieving gifted students either resign themselves to boredom or become behavior problems, further promoting the myths surrounding intellectual giftedness. Ideally, teachers should relinquish their stereotypes about what constitutes giftedness and explicitly seek out potential giftedness in their students. Realistically, it is unlikely that teachers will put forth any more time and effort than they have previously toward educating themselves with respect to the needs of gifted students, especially those who are underachieving.

The purpose of Peterson and Margolin's (1997) ethnographic content analysis was to investigate how teachers' definitions of giftedness were influenced by ethnic and social-class assumptions, how those assumptions affected their nominations, and whether they excluded certain minority students from their gifted nominations. The researchers took field notes and audiotaped meetings in a school district where middle-school teachers discussed which students to nominate for the gifted program. Also, they interviewed for 30 to 50 minutes 55 of the teachers either individually or in small groups. Statements from the meetings and interviews were coded into meaningful themes. Once a statement was placed in a category, it was compared with other statements in the same category to reconceptualize the coding system when necessary. The researchers predicted that teachers would justify their selection bias in favor of middle-class, high-achieving, and conforming students and rationalize not nominating students who were "different," economically disadvantaged, low achieving, and nonconforming.

They found that, although no gifted definition had been provided and teachers had not received GATE identification training, they expressed confidence in their gifted nominations. Assumptions of what constitutes giftedness can be problematic when the

assumptions are inaccurate. For example, the researchers reported that teachers named good grades, receipt of scholarships, and winning academic contests as justifications for nominating students to the GATE program. Teachers presumed that slipping grades, not using one's talents, and low motivation were indicative of students who did not have gifted potential.

Teachers gave as reasons for nominating children to the GATE program students' English skills, vocabulary, and verboseness. Quietness was seen as a negative attribute. Some students' culturally appropriate social skills could get them nominated for GATE as well as other students' culturally inappropriate social skills could eliminate their nominations.

In their concluding statements, Peterson and Margolin (1997) determined from their investigation that teachers inadvertently made biased decisions when determining whom to nominate for GATE. The researchers' assumptions regarding teacher bias apparently stem from their observations that teachers nominated students who fit the cultural stereotype of what constitutes giftedness. Because the researchers did not state how giftedness was determined in the schools where the study occurred or explain how the accuracy of teacher nominations was calculated, it is difficult to evaluate to what extent "untintended reproduction" of the dominant culture influenced gifted nominations.

The possibility exists that because the teachers in the study believed their decisions were unbiased, it is unlikely that they would consider altering their mind set to include a broad definition and gifted identification process without intensive re-education. Selecting children for gifted programs based on inaccurate preconceived

notions regarding giftedness resulted in certain types of gifted students not being recognized for the GATE program. Unrecognized gifted students were unable to have their academic needs met in their regular-education classrooms. Students who did not conform to the teachers' preconceived notions of giftedness are precisely the ones who may benefit from enrichment services.

In an effort to examine whether gifted children have unique personality traits, Hall (1983) designed a checklist with four different personality types based on Drews' earlier work. The categories were (a) high achievers, (b) socially oriented, (c) creative, and (d) rebels. Teachers' and psychologists' written descriptions of 24 students were taken from their cumulative files. Cumulative files contain test results, report cards, health records, and other pertinent information for each student in the public school system. The checklist contained comments about 6 students who were deemed by the researcher to be high achievers, 6 students who were considered by the researcher to be socially oriented, 7 students who were determined by the researcher to be creative, and 5 students who were presumed by the researcher to be rebels. All students had attended a university-lab school for at least 8 years. They had IQs of at least 130 as measured twice by either or both the Stanford-Binet and the Wechsler Intelligence Scale for Children (WISC). None participated in GATE.

Eighty-four teachers were surveyed by asking them which of the 24 characteristics on the checklist were indicative of gifted, average, or below-average students. The characteristics that teachers believed were reflective of below-average students paralleled Whitmore's (1982) and Peterson and Margolin's (1997) findings. For instance, consider the descriptions of students judged by the researcher to be rebels:

"Makes excuses for not doing assignments, doesn't take an interest in things, passive, dependent"; "Doesn't get along with others, doesn't do his work, likes to tell jokes"; "Talks too much, doesn't listen, wastes time"; "Prefers to work alone, timid, lacks confidence"; and "Immature, quiet, withdrawn, short attention span" (Hall, 1983, p. 24). These statements are similar to the labels attached to the underachieving gifted students in Whitmore's (1982) report: "behavior-problem children, unmotivated, lazy, developmentally delayed pupils, culturally different" (p. 275). Peterson and Margolin (1997) cited similar statements made by teachers as they considered students for the GATE program: "He always knows the answer, but won't offer anything" and "Too many girls are complacent. They sit back and won't participate" (p. 92). "He doesn't socialize with the other kids"; "Not accepted...very insecure"; and "Awful social skills" (p. 93).

Teachers from the Hall (1983), Whitmore (1982), and Peterson and Margolin (1997) studies were unwilling to recognize students for GATE who were underachieving, had behavior problems, a low self-concept, or were culturally different from them. They did not consider nonconforming students as potentially gifted. Most teachers are not trained or experienced in what to look for in gifted students. Also, it is difficult for teachers to detach themselves from the dominant culture's values in determining the various combinations of gifted behaviors. Therefore, a number of underachieving gifted students continue to remain unrecognized and at risk for academic failure.

Providing checklists for teachers can affect the accuracy of their gifted student nominations. The purpose of Hunsaker, Finley, and Frank's (1997) study was to analyze the relationship between teacher nominations and students' subsequent success in a gifted

program. Schools with large numbers of low-income minorities were targeted for the study. Regular-education teachers used the 10 traits, aptitudes, and behaviors (TABs) checklist developed by Frasier and Passow (Hunsaker et al., 1997). The TABs is a form that lists characteristics believed to be associated with giftedness regardless of cultural background. Items include intense interests, motivation, insight, memory, communication, humor, inquiry, reasoning, problem solving, and imagination/creativity. No evidence of reliability or validity for the TABs was provided.

Whereas the TABs is designed to assess behaviors associated with gifted students from minority and low-income groups, the *Scales for Rating the Behavioral Characteristics of Superior Students* (SRBCSS) is designed to assess behaviors of gifted students from the general population. Teachers nominated students for GATE using the TABs and the SRBCSS. Also, data were gathered from aptitude and achievement tests, creative and motivation assessments, writing samples, and information from special circumstances. A committee then identified students based on their overall profiles for the gifted program. There were 121 students identified, and 55% were African American, 22% were European American, and 22% were from other ethnic groups. All received free or reduced lunch.

After the nominated students had participated in GATE for one semester, the *Scale for Rating Students' Participation in the Local Gifted Education Program* (referred to as the Renzulli-Westberg) was used to evaluate students' success in the gifted program. It consists of 10 items that can be rated between 0 and 5 depending on the strength of the behavior as it pertains to the GATE program goal that is listed. The Renzulli-Westberg is internally consistent (Cronbach's coefficient alpha = .94). The

teacher of GATE completed the Renzulli-Westberg for every student in the gifted program during the second semester of the year following identification.

Classroom teacher nominations of low-income or culturally-diverse students were predictive of success in GATE programs in the areas of creativity and social abilities. Teacher nominations were not accurate in predicting success in academic pursuits, including end-products, activities, and research related to core content areas. It is possible that, because regular-education teachers were unaware of the expectations and standards in GATE, they were unable to predict accurately the success of students who entered the special programs. Because teachers in this study were not accurate predictors of students' subsequent academic success in GATE, other measures may have been helpful in identifying children for gifted programs.

Teachers can recognize general personality styles, such as leadership, imagination, and reflectiveness, of students in the dominant culture (Peterson & Margolin, 1997). With the assistance of checklists, they can be effective in assessing certain affective, creative, and social competencies. Their subjective judgments, however, have been found to be biased against minorities, children who are behavior problems, or those who appear unmotivated (Reid et al.,1999; Whitmore, 1982). Although training and practice recognizing gifted behaviors has been shown to reduce these biases, many regular-education teachers do not nominate accurately students who are likely to succeed academically in GATE (Hunsaker et al., 1997).

Standardized achievement tests are effective in assessing two cognitive attributes, namely language and mathematics. For this reason, tests have been blamed for being too narrow to measure accurately a broad conception of giftedness (Moon et al., 1997). The

traditional underlying focus of both tests and teachers has been weighted toward *g*. Now that the focus of gifted identification has changed to include multiple intelligences, it is possible that the traditional practice of gifted identification may be missing a particular segment of the gifted population.

Use of Multiple Intelligences (MI) Theory for Gifted Identification

Empirical evidence supporting MI theory in practice is limited. One on-going program called Project Spectrum was developed to test multiple intelligences (MI) theory in practice. An evaluation was adopted to identify cognitive strengths in 4-year-old children in an effort by researchers at Harvard University's Project Zero, Tufts University, and Eliot-Pearson Children's School. There are four aspects of the evaluation that make it an authentic measure of multiple intelligences. First, students continually are assessed directly through performance evaluation rather than indirectly in a summative fashion on standardized tests. Second, the assessment is ecologically valid, meaning that it occurs in surroundings and with materials that are similar to the students' usual learning conditions. Third, the measure is "intelligence fair" (Gardner, 1999). For example, instead of asking students to solve a mathematics story problem requiring language skills (e.g., how many total bananas are there if Jill has 4 and Jack has 5), they might be asked to play a board game that requires them to demonstrate concretely their number sense by manipulating variables. Fourth, the Project Spectrum approach to identifying intellectual abilities considers working styles. The level of engagement, persistence, and a person's distractibility while working on an activity provide information useful for explaining why some people are more likely than others to excel in particular domains. Project Spectrum is an example of MI theory in practice.

Another gifted identification method based on MI theory, named DISCOVER and developed by Maker (1996), was designed in an effort to nominate larger numbers of minority students to GATE. Tasks requiring linguistic, mathematics, and spatial abilities were designed for students in kindergarten through second, third through fifth, sixth through eighth, and ninth through twelfth grades. Activities requiring these intelligences were created, because they are the three used most often in traditional school settings.

The DISCOVER process requires students to work in small groups of 4 to 6 students. Observers can be teachers, counselors, paraprofessionals, preservice teachers, administrators, or graduate students. They sit at tables with the children and take notes, look for evidence of problem solving, and interact with the groups in unobtrusive ways. After every activity, the observers rotate to a new table in an attempt to have each student observed by three people other than his or her teacher. The activities are designed to be "intelligence fair," so that little verbal ability is needed to complete the spatial and mathematical problems and mathematics are not required to solve the linguistic problems.

Immediately following the observations, the observers discuss student behaviors and agree on which children exhibited superior problem-solving abilities on a scale of "definitely," "probably," "maybe," or "unknown." All data are then transferred to a checklist that was developed by experienced observers familiar with Gardner's theory who analyzed the behavior of 5,000 students while they were engaged with the prescribed materials and activities. The checklist contains 82 behaviors (e.g., solves all puzzles without clues) and 68 characteristics of products (e.g., product is three dimensional). Maker (1996) did not present evidence of reliability or validity.

Another researcher, Sarouphim (1999), reported evidence of the interrater reliability of DISCOVER. In one study, observers viewed tapes of 25 Navajo children aged 9 to 13 years. Cohen's Kappa was used to determine that the raters agreed with each other's analyses of student behaviors 75% to 100% of the time. In another study involving a live setting, Cohen's Kappa was used to obtain 80% to 100% agreement between the researcher and six raters. The highest agreement was between expert observers and the researcher. Novice, moderate, and expert observers agreed 95% to 100% of the time when student behaviors were rated as "definitely" exhibiting superior problem-solving ability.

Sarouphim (1999) reported limited evidence of the concurrent validity of DISCOVER. The study included 257 kindergarten, second-, fourth-, and fifth-grade students who were mostly Navajo and Mexican American. The kindergarten and second-grade children took the Raven Colored Progressive Matrices assessment and the fourth- and fifth-grade students took the Raven Standard Progressive Matrices test. Raven scores were correlated with respective DISCOVER ratings (see Table 1). Pablo® materials are

Table 1

Correlations Between DISCOVER and Raven Scores (N=257)

DISCOVER Activity	r
Pablo®	.58*
Tangrams	.39*
Math	.35*
Storytelling	.20
Storywriting	.09

*Statistically significant at the .05 level.

cardboard pieces of different sizes, shapes, and designs. Judging elements include complexity of construction, resemblance of child's description to shape made, symmetry or asymmetry, uniqueness, the number of designs, and whether the designs are two or

three dimensional. Tangrams consist of 21 pieces of 3 different shapes including squares, parallelograms, and triangles. After being shown how to make geometric shapes from the pieces, students are asked to create a shape. Students in grades K to 2 make a square, students in grades 3 to 5 make a triangle, students in grades 6 to 8 make a parallelogram, and students in grades 9 to 12 make a rhombus. Evaluation includes the overall shape, completeness, and number of pieces used to complete a design.

The correlations are low to moderate. The activities requiring mathematics and spatial abilities have higher correlations than those necessitating linguistic ability. The fact that statistically significant relationships were found between DISCOVER and Raven scores is promising. Because limited evidence of validity for DISCOVER has been documented and due to the time and number of observers required for this assessment, it may be risky and expensive in terms of human resources to use on a wide scale.

Another study implementing MI theory in gifted identification practice was conducted in a large school district in the Southeastern United States. The purpose of Reid et al. (1999) study was to compare a group of second-grade youngsters identified for GATE by a procedure grounded in MI theory with a group identified by traditional methods. The focus of the research was on linguistic, mathematical, and spatial intelligences as measured by students' problem-solving abilities in those areas. Approximately 2,000 second-grade students were tested for gifted placement. Data from 600 of these students were selected randomly for the study. The ethnic distribution was as follows: 54% European American, 40% African American, and 6% Asian American, Hispanic American, and American Indian.

All students were administered the Problem Solving Assessment (PSA) and the Matrix Analogies Test-Short Form (MAT-SF) by trained teachers experienced in gifted assessment. The PSA was the alternative measure made up of open-ended, instructional tasks that took 4 hours to complete. The eight activities required less than 30 minutes each to finish. There were two mathematics sections (Math and Story Math), three linguistic parts (Contextual Clues, Story Writing, and Story Telling), and three spatial problem-solving activities (Tangrams, Maps of the Neighborhood, and Pablos®). The criterion for gifted status as measured by the alternative assessment was for students who were evaluated to show "always evident" or "strongly evident" in two out of three of the intelligences measured.

The MAT-SF was the traditional assessment used that measured nonverbal ability in a multiple-choice format by asking students to solve problems using 34 abstract designs. A stanine score of 9 was used as a cutoff point in identifying students for gifted programs.

Teachers nominated as gifted 61 students more than once and only 3 were from minority groups; 2 were Latino and 1 was African American. Teachers nominated 18 students more than three times and none were from minority groups. The student population consisted of 16% minorities of which 13.5% were Latino. Only 5.8% of the Latino population was nominated as gifted. Of the teachers who participated in the study, 7.2% were minorities.

Using the PSA, 50% of the children tested were recommended for placement in GATE. Using the MAT-SF, 22% of the students assessed would have been selected for the gifted program. A statistically significant relationship was found for ethnicity

between ethnic groups and the instrument that was used to identify them as gifted (chi-square = 30.50, df = 1). Using the PSA, 80% of the students identified for GATE were European American (see Table 2), which represents 61% of the European American sample. Using the MAT-SF, 89% of the identified students were European American, which represents 29% of the European American sample. When the PSA was the instrument of choice, approximately twice as many European American students as African American students were identified for GATE. By comparison, when the MAT-SF was used for identification purposes, almost 10 times as many European American as African-American students were recognized.

Table 2

Relationship Between Different Placement Decisions and Ethnicity

	Ethnicity	
Students Recommended	European American	African American
	PSA Decision	
Total	236	58
Percent Within Total Sample	80.3[a]	19.7[a]
Percent Within Ethnic Group	61.3	31.5
	MAT-SF Decision	
Total	107	13
Percent Within Total Sample	89.2	10.8
Percent Within Ethnic Group	28.9	7.6

[a]Change per directions of Dr. Bob Algozzine on August 19, 2001.
Adapted from "Comparison of Traditional and Problem Solving Assessment Criteria," by Reid et al., 1999, *Gifted Child Quarterly, 43,* p. 260.

Reid et al. (1999) did not investigate the success of the participants in the gifted program who were identified by the PSA. The researchers suggested that anecdotal evidence indicated most students did succeed. The work of Reid et al. (1999) showed that students with a wider range of abilities than those assessed by a traditional measure can be identified for enrichment services. The limitations of the PSA were that it used

trained testers requiring extra money and that it took 8 hours (not counting breaks) to administer.

Summary

Common education practice reflects an ongoing paradigm shift. The practitioners claim to support a multidimensional view of intelligence. Simultaneously, their decisions and actions appear to echo their reliance on using *g* as an underpinning of their understanding of intelligence. Consequently, it is possible that some gifted students are not being identified for GATE. There are isolated examples of MI theory being implemented in practice. The few programs in effect are expensive in terms of time, money, effort, and expertise. If an instrument with reliability and validity evidence that does not necessitate extensive use of resources can be used to identify gifted students who may be overlooked in the traditional gifted identification process, then administering that assessment to large groups may be helpful in closing the gap between theory and practice.

Chapter III

Methodology

The purpose of this study was to examine whether a traditional method of identification weighted toward *g* differed from identification based on multiple intelligences. A correlational strategy was used in this descriptive study to collect and analyze the data. The objective was to assess whether there were relationships between a traditional identification method and one based on multiple intelligences.

The existing process used currently in a school district that is representative of districts using the traditional approach was compared with a method of Gifted and Talented Identification (GATE) based on Gardner's (1983) theory of multiple intelligences. Specifically, results from the Stanford Achievement Test, 9th Edition (SAT9), Naglieri Nonverbal Abilities Test (NNAT), and teacher GATE nominations were compared with results from the Teele Inventory of Multiple Intelligences (TIMI). Results from the teacher questionnaire and Learning Styles Inventory (LSI) were used for construct validation evidence of the TIMI.

This chapter includes a list of research questions, a description of the school district where this study took place, a description of the sample, an explanation of the protection of human subjects, a section on instrumentation, an account of the existing method of identification used currently in that school district, a description of an alternative approach to identifying students for GATE, and data analyses.

Research Questions

The following two research questions were used to guide data analysis in this study.

1. To what extent does identification of students as gifted weighted toward *g* differ from identification based on multiple intelligences?

2. To what extent does the TIMI contribute to gifted identification?

Description of School District

The school district where this study was conducted is made up of five schools (kindergarten through sixth grade) in a suburban area of Northern California and serves approximately 2,150 students. The ethnicity is categorized by the district as 75% European American, 16% Hispanic American, 5% Asian American, and 4% American Indian, Alaska Native, Pacific Islander, Filipino American, or African American. English is the predominant language spoken in the homes of the children. One school is considered to be upper-middle class, two are middle class, and two are middle to lower-middle class. One of the two schools that are middle to lower-middle class receives Title I funding each year. There were 224 students in the district receiving free lunch and 116 receiving reduced-price lunch. There were 319 students enrolled in fourth grade during the 2001-2002 school year, of whom 146 were girls and 173 were boys.

Description of Sample

The Curriculum Director obtained active parental consent for students' test scores from the SAT9, NNAT, TIMI, LSI, teacher questionnaire, and teacher nomination form to be used for research purposes. All data were entered onto an EXCEL spreadsheet. The Curriculum Director matched numbers and names of test scores of students with active parental consent and then eliminated student and teacher names from the computer file that she gave to the researcher. From a total of 319 fourth-grade students, 276 received active parental consent to have their scores used for research purposes. Not all

students had data for all six instruments. Complete data from the SAT9, NNAT, TIMI, and teacher nominations were collected from 231 students. The average SAT9 reading Normal Curve Equivalent (NCE) of the sample who participated in this study was 61 with a standard deviation of 17. The average SAT9 language NCE was 64 with a standard deviation of 18 and the average SAT9 mathematics NCE was 62 with a standard deviation of 18. The national overall average of students who participated in norming the SAT9 was 100 with a standard deviation of 15. The average scaled NNAT of the sample who participated in this study was 608 with a standard deviation of 38. The national scaled average of students who participated in norming the NNAT was 621. The average of students who participated in this study was lower than the average of students who were involved in the norming of the SAT9 and the NNAT.

Protection of Human Subjects

To protect the human rights of all persons involved in the study, standard guidelines of the Institutional Review Board at the University of San Francisco were followed. The Curriculum Director obtained active parental consent to release the anonymous data to the researcher for research purposes. She coded the data by replacing names with numbers. Because this was an archival study, there was minimal risk to participants. The researcher did not have contact with teachers or students. She did not have access to names of people who filled out the inventories and she abided by the American Psychological Association's (1992) guidelines for the treatment of human participants.

Instrumentation

Data from six instruments including the SAT9, NNAT, TIMI, teacher questionnaires, teacher nominations, and LSI were obtained from the Curriculum Director. The SAT9 measures language arts and mathematics achievement and the NNAT measures reasoning ability. The TIMI is a self-assessment that measures linguistic, mathematics, spatial, musical, bodily-kinesthetic, intrapersonal, and interpersonal preferences. The teacher questionnaire measures the same seven multiple intelligences of students from their teachers' perspectives. It was used for construct validation evidence of the TIMI. The teacher nomination form solicits information from teachers about their GATE nomination choices. The LSI considers students' visual, auditory, kinesthetic, tactile, and intrapersonal/interpersonal preferences for learning. It was used for construct validation evidence of the TIMI.

Stanford Achievement Test, 9th Edition (SAT9). The SAT9 (Harcourt Brace, 1997b) is a group-administered, multiple-choice test. It was developed to measure the achievement of students in grades 1 through 9 in reading, language, mathematics, social studies, and science. Questions for the SAT9 are based on material from recent textbooks in the related areas and on objectives set forth by the International Reading Association, National Council of Teachers of Mathematics, National Council of Teachers of English, National Science Teachers' Association, American Association for the Advancement of Science, and National Council for the Social Studies. The state of California has adopted the SAT9 as the measure used to hold districts, schools, and teachers accountable for the education of students in public schools. For purposes of this study, normal curve

equivalent (NCE) and percentile scores in total reading, language, and total mathematics were used.

Evidence of reliability is the extent to which a test yields consistent results. The Kuder-Richardson Formula #20 provides an estimate of internal consistency (see Table 3). KR20 reliability coefficients (r) range from .90 to .95 on Form S and from .92 to .96 on Form T. All provide strong evidence of internal consistency.

Table 3

KR#20 Reliability Coefficients, Standard Errors of Measurement, and Related Data for the SAT9 Full-Length Battery, Grade 3, Spring Standardization Sample

	Number	Form S					Form T				
Content Area	of Items	n	Mean	SD	SEM	r	n	Mean	SD	SEM	r
Reading	84	2,341	54.5	16.3	3.73	.95	1,638	52.9	17.6	3.75	.96
Mathematics	76	2,303	49.5	14.0	3.58	.94	1,424	48.0	14.4	3.57	.94
Language	48	2,252	27.6	9.5	3.02	.90	1,576	28.5	10.5	2.95	.92

Adapted from "Stanford Achievement Test Series, 9th Edition Technical Data Report," 1997b, published by Harcourt Brace, p. 70.

Evidence of validity is the extent to which a test measures what it is purported to assess. Comparing the SAT9 with the curricula used to teach students lends evidence of content validity for the test for a particular class. Item difficulty can be represented by p values. The same problems should be easier for students in higher grades and more difficult for students in lower grades. As can be seen from Table 4, more fourth-grade students in the norming sample scored higher on the items than second- or third-grade students. The mean p values for Form S and Form T range from .57 to .65 indicating that the problems were in the appropriate range of difficulty for the third-grade children who participated in the sample. The p values indicate that the difficulty of the items in both forms of the SAT9 are comparable.

Table 4

Mean p Values for the SAT9 in Grades 2, 3, and 4

Content Area	2nd Grade	3rd Grade	4th Grade
Reading Vocabulary	.89	.91	.93
Mathematics: Problem Solving	.65	.69	.80
Language	.66	.68	.81

Adapted from "Stanford Achievement Test Series, 9th Edition Technical Data Report," 1997b, published by Harcourt Brace, pp. 279, 281, 283.

One measure of criterion validity is how well items separate high-scoring students from low-scoring students. Point-biserial correlation coefficients are presented in Table 5. The point-biserial correlation coefficients indicate that the items in both forms of the SAT9 do distinguish between high-scoring students and low-scoring students.

Table 5

Median Point-biserial Correlation Coefficients for the SAT9 Spring Standardization in Grade 3

Subtest	Number of Items	Form S	Form T
Reading Vocabulary	30	.67	.69
Reading Comprehension	54	.64	.65
Mathematics Problem Solving	46	.59	.59
Mathematics Procedures	30	.66	.69
Language	48	.57	.62

Adapted from "Stanford Achievement Test Series, 9th Edition Technical Data Report," 1997b, published by Harcourt Brace, p. 379.

Pearson product-moment correlation coefficients between the SAT9 and Stanford Achievement Test, 8th Edition (SAT8) provide evidence of criterion validity in that they measure the same content (see Table 6). Correlation coefficients ranging from .84 to .90 indicate that the scores on SAT9 and SAT8 are related strongly to each other. Between 71% and 81% of the variance in achievement on the SAT9 can be accounted for by differences in achievement on the SAT8.

Table 6

Pearson Product-moment Correlation Coefficients Between the SAT9 and SAT8 for Primary 3

Total	n	Number of Items	Mean	SD	Number of Items	Mean	SD	r
Reading	478	84	47.7	17.6	142	80.1	29.3	.90
Mathematics	744	76	48.7	13.6	116	72.3	23.1	.90
Language	413	48	23.7	10.2	60	33.5	13.1	.84

Adapted from "Stanford Achievement Test Series, 9th Edition Technical Data Report," 1997b, published by Harcourt Brace p. 404.

Intercorrelations between the SAT9 and Otis-Lennon School Ability Test, 7th Edition (OLSAT7) provide evidence of construct validity for the SAT9, because they appear to assess corresponding levels of school ability with school achievement (see Table 7). The relationship between the SAT9 Language and the OLSAT7 Verbal is .80; the correlation between the SAT9 Reading and the OLSAT7 Verbal is .81. These correlation coefficients indicate a strong relationship between school achievement and school ability. Sixty-four percent of the variation in achievement in SAT9 Reading scores and 66% of the variation in achievement in SAT9 Language scores can be accounted for by Verbal ability as measured by the OLSAT7.

Table 7

Intercorrelations Among SAT9 Totals for Primary 3 Form S and OLSAT7 in the Spring of Grade 3 (N = 2,146)

Test/Total	Variable	2	3	4	5	6
Reading	1	.78	.83	.77	.81	.61
Mathematics	2		.79	.80	.76	.71
Language	3			.80	.80	.66
OLSAT7 Total	4				.92	.92
OLSAT7 Verbal	5					.70
OLSAT7 Nonverbal	6					

Adapted from "Stanford Achievement Test Series, 9th Edition Technical Data Report," 1997b, published by Harcourt Brace p. 437.

The SAT9 Mathematics and OLSAT7 Nonverbal correlation coefficient is .71. This relationship is indicative of a moderate link between achievement and ability. Fifty percent of the variance in mathematics achievement on the SAT9 can be attributed to Nonverbal ability as measured by the OLSAT7.

Naglieri Nonverbal Abilities Test (NNAT). The NNAT (Harcourt Brace, 1997a) is a group-administered, multiple-choice test of reasoning ability that was adapted from the Matrix Analogies Test (Naglieri, 1985). It is considered a culture-, gender-, and ethnically-fair instrument, because no reading, writing, or verbal skills are required. Students must rely on their problem-solving abilities, reasoning skills, and spatial abilities to do well on this test. The NNAT measures general ability and predicts school success. In conjunction with the SAT9, it can be used to identify underachieving gifted students (Harcourt Brace, 1997a). Lidz and Macrine (2001) used the NNAT to identify culturally and linguistically diverse learners in first through fifth grade for gifted programming. Presumably, these students would not have been identified for GATE and consequently would not have had their academic needs addressed had they not scored highly on the NNAT.

The NNAT was developed with seven levels covering grades kindergarten (K) through 12. One level covers grades 3 and 4 and contains 38 items. The problems are divided into four areas: pattern completion (PC) has 6 items, reasoning by analogy (RA) has 10 items, serial reasoning (SR) has 8 items, and spatial visualization (SV) has 14 items. The object of each area is to determine from the relationships presented the correct outcome from 5 different options.

The developers (Harcourt Brace, 1997a) conducted two tryout experiments to test the items to ensure adequate floor and ceiling levels, ensure the plausibility of the multiple-choice alternatives, obtain sufficient reliability data, determine the difficulty of the items, obtain feedback from teachers who administered the test, figure out how many items could be given in a 30-minute period, and consider ethnic and gender biases. The test was standardized on approximately 6,000 students in grades K to 4, 6, 8, and 10. The standardized form was then developed and normed on 90,000 students in grades K through 12.

The tests can be hand scored and converted to scaled scores. The Nonverbal Abilities Index (NAI) has a mean score of 100 and a standard deviation of 15. For purposes of this study, percentile and scaled scores were used. The Kuder-Richardson Formula #21 reliability coefficient for a sample of 2,143 fourth-grade students was calculated (see Table 8). Correlation coefficients range from .42 to .84. The results indicate that the NNAT shows evidence of internal consistency.

Table 8

Kuder-Richardson #21 Reliability Coefficients, Means, Standard Deviations, and Standard Errors of Measurement for Subscales and Total Scores on the NNAT (N=2,143)

Subtest	Number of Items	Mean	SD	SEM	r
Pattern Completion	6	5.0	1.3	0.8	.84
Reasoning by Analogy	10	5.1	2.0	1.5	.57
Serial Reasoning	8	5.5	2.1	1.2	.42
Spatial Visualization	14	6.1	3.4	1.7	.70
Total Battery	38	21.7	7.2	2.9	.76

Adapted from "NNAT: Multilevel Technical Manual," 1997a, published by Harcourt Brace, p. 36.

Evidence of criterion validity was determined by computing correlation coefficients between total scores on the NNAT and total reading, total mathematics, language, thinking skills, and the total scores on the SAT9 Form S. The data show that correlation coefficients range from .59 to .68 between the total NNAT and the above-mentioned sections of the SAT9 (see Table 9). The relationship between scores on the NNAT and the SAT9 indicate that students' nonverbal abilities parallel their achievement.

Table 9

Correlations Between NNAT and SAT9, Form S Scores of Fourth-Grade Students (N=2,054)

	SAT9			NNAT			
Subtest	Number of Items	Mean	SD	Number of Items	Mean	SD	r
Total Reading	84	58.9	16.0	38	21.6	7.2	.59
Total Mathematics	76	51.9	14.0				.68
Language	48	30.7	9.4				.62
Thinking Skills	191	125.7	31.9				.65
Total Battery	358	238.3	58.5				.66

Note. SAT9 and NNAT were given at the same time in the Fall. Correlation coefficients are based on raw scores. Adapted from "Naglieri Nonverbal Ability Test: Multilevel Technical Manual," 1997a, published by Harcourt Brace, p. 40.

Teele Inventory of Multiple Intelligences. The TIMI (1997) is a forced-choice, nonverbal, self-assessment in which children select an activity that reflects one of Gardner's (1983) seven intelligences. Although the TIMI is not timed, it usually takes no more than 30 minutes to administer. Each intelligence is presented eight times. In every item, two pandas are presented that reflect two different intelligences. For instance, in question eight, one panda is reading and the other is swinging on a swing. Students choose their preference for either a linguistic activity (reading) or a bodily-kinesthetic activity (swinging). This preference implies students' strengths and relative weaknesses.

The preferences of one person cannot be compared with preferences of others. The ipsative nature of the TIMI does not allow normative interpretation (Anastasi & Urbina, 1996).

The TIMI is being used in over 650 schools throughout the United States to identify students' dominant intelligences and to inform instruction (Teele, 1997). In a dissertation, Scott (1996) assessed the usability of standardized tests to identify gifted African American fourth-grade students from two schools in an urban area. He correlated corresponding scores of 103 students who took the TIMI, the Otis-Lennon School Ability Test, 6th Edition (OLSAT6), the Assessment of Interpersonal Relations (AIR), which is purported to measure interpersonal intelligence, and the Intermediate Measures of Music Audation (IMMA), purported to measure musical aptitude. He determined that students scoring between 6 and 8 on any subscale of the TIMI would be identified as potentially gifted in that area. His purpose was to determine whether the TIMI could be used to identify a statistically significant greater number of students than the OLSAT6 for a GATE program. In addition, he correlated the TIMI-linguistic subscale with the OLSAT6-verbal score, the TIMI-mathematical subscale with the OLSAT6-nonverbal score, the TIMI-interpersonal subscale with the AIR, and the TIMI-musical subscale with the IMMA. According to Scott, the AIR measures interpersonal relations on three dimensions: social (male peers and female peers), academic (teachers), and family (mother and father). Only the TIMI-interpersonal subscale converged with the AIR-Female subscale, providing weak evidence of convergent validity for that subscale ($r = .19$, $p < .05$).

Test-retest reliability was calculated for three different time periods in first grade from an all European-American district in Kentucky and from first-grade classrooms with high minority populations in California (see Table 10). Teele (1997) found higher reliabilites for logical-mathematical, spatial, and musical intelligences with a 2-week interval than with either a 3- or 4-week interval between administrations. All coefficients were reported to be statistically significant. Because none of the coefficients were strong after the 4-week period, evidence of test-retest reliability for the TIMI is not strong.

Table 10

Test-Retest Reliability of TIMI for First-Grade Students

Intelligence	4 weeks (n = 619)	3 weeks (n = 812)	2 weeks (n = 52)
Verbal-linguistic	.63	.62	.65
Logical-mathematical	.66	.68	.81
Spatial	.49	.58	.77
Musical	.60	.66	.88
Bodily-kinesthetic	.52	.60	.59
Intrapersonal	.55	.50	.46
Interpersonal	.55	.62	.65

Adapted from "The Multiple Intelligences School: A Place For All Students to Succeed," 1997, published by Citrograph Printing, p. 34.

Teele (1997) provided evidence of face validity by field testing the instrument in an elementary school. Each picture was analyzed and changes were made to increase the inventory's face validity. There were no more details provided regarding face validity.

Evidence of convergent validity was provided by Teele (1997) from correlations between the verbal-linguistic and logical-mathematical TIMI scores and the respective Metropolitan Achievement Test, 6th Edition (MAT6) scores of at least 2 students. The MAT6 measures reading, mathematics, language, science, and social-studies achievement. In her profile of 2 third-grade boys, both scored an 8 on the logical-

mathematical and a 5 on the verbal-linguistic subscales of the TIMI. She compared these results with their scores on the MAT6. The first student scored 96% in total mathematics, 81% in total reading, and 85% in total language on the MAT6. Teele (1997) claimed there was a high correlation between the two instruments but did not report the correlation coefficients. The second boy scored 99% in total mathematics, 78% in total language, and 98% in reading on the MAT6. Although Teele claimed there was a positive correlation between the two instruments, that number was not given.

In this study, the purpose of correlating the TIMI with other measures was to contribute to the minor evidence of validity supporting the TIMI. It should be noted that preferences are not necessarily the same as strengths, intelligences, achievement, or ability. Corresponding TIMI subscales were correlated with the SAT9 total reading, SAT9 language, and SAT9 total mathematics subscales, the NNAT scores representing spatial ability, the teacher questionnaire representing the seven multiple intelligences, the teacher nominations, and the learning styles inventory including visual, auditory, kinesthetic, tactile, and intrapersonal/interpersonal subscales. In his dissertation, Scott (1996) used a cutoff of 6 to determine which students would be considered gifted in any of the multiple intelligences as measured by the TIMI. In the present study, it was expected that students who scored between 6 and 8 on the TIMI verbal-linguistic and TIMI logical-mathematical subscales would be the same students who were identified as gifted using the traditional approach. In addition, it was anticipated that those students who scored between 6 and 8 on the other five subscales would not have been identified as gifted by the traditional approach.

Learning Styles Inventory (LSI). In 1967, Dunn and Dunn (Price & Dunn, 1997) developed the first Learning Styles Questionnaire (LSQ) with 223 items. In 1974, Price conducted a content analysis on the instrument and isolated items with the greatest consistency. The second version of the LSQ was administered to a random sample of 1,596 students from a total sample of 4,669 students in grades 3 to 12 from several states and three provinces in Canada. The instrument was revised again, based on the results from the sample. The LSQ was analyzed again using principal-components analysis with unrelated factors. Thirty-two factors with eigenvalues greater than 1.00 explained 62% of the variance. From those results, the next generation instrument, the LSI, was created in 1975 (Price & Dunn, 1997). For purposes of this study, the LSI will be used for construct validation evidence of the TIMI.

The LSI was developed for students in grades 3 through 12 in an effort to determine individuals' learning style preferences in 22 different areas. For each question, students have a choice of marking "T" for true, "F" for false, and "U" for unsure. Resulting from the Inventory is a summary of learning preferences and not the skills used to learn new things. For purposes of this study, only the visual, auditory, kinesthetic, tactile, and intrapersonal/interpersonal subscales were considered for students in grade 4. As shown in Table 11, the reliability coefficients for the visual, auditory, kinesthetic, and tactile subscales are moderately strong. The reliability coefficient for the intrapersonal/interpersonal subscale is strong.

Students complete the Inventory within 30 minutes. The range of standard scores is 20 to 80 with a mean of 50 and a standard deviation of 10 (Price & Dunn, 1997). Standard scores are based on responses from over 500,000 students. Students who score

Table 11

Reliabilities and Standard Errors for the LSI in Grades 3 and 4 (N = 511)

Subscale	Reliability*	Standard Error
Visual	.79	1.81
Auditory	.79	1.81
Kinesthetic	.70	1.57
Tactile	.68	1.21
Intrapersonal/Interpersonal	.87	1.75

*Hoyt's Reliability (equivalent to KR-20)

Note. Adapted from *Learning Style Inventory: An Inventory for the Identification of How Individuals in Grades 3 through 12 Prefer to Learn*, by G.E. Price and R. Dunn, 1997, p. 79.

between 60 and 80 are considered to have a high preference for that subscale. Individuals who score between 20 and 40 are considered to have a low preference for a particular subscale. When a subscale falls between 40 and 60 for an individual, it is not considered critical. The circumstances, task, or interest level will play a greater role than the learning preference for that which is being learned. Only 6 or 8 of the subscales affect most people. For the results of the LSI to be meaningful, a consistency or lie score of 70% must be obtained. Consistency refers to the extent to which a respondent answers same questions similarly. Anything less than 70% indicates a lack of self-awareness, limited attention span, or carelessness. Data were not used from students in the district where this study took place who did not achieve a consistency score of at least 70%.

Teacher Nomination Form. The GATE Coordinator developed the Teacher Nomination Form with the intent of identifying students for the gifted program who did not score well on tests (see Appendix A). Teachers were asked to consider the following abilities of students whom they believe may have gifted potential: originality, leadership, maturity of thinking, flexibility of thinking, independent thinker, takes initiative, adds

something extra to projects, contributes to class discussions, keeps up with assignments and class work, uses free time productively, thinks beyond his or her age, creativity, and task commitment. Teachers provide an overall evaluation of yes or no for the GATE program.

Once teachers decide which students, if any, to nominate for the gifted program, they must fill out a teacher nomination form for those particular children (see Appendix A). Teachers do not complete forms for students whom they do not nominate for GATE. Eleven items are worth a maximum of 10 points each. Creativity, Task Commitment, and Overall Recommendation are worth a maximum of 30 points each. The GATE Coordinator multiplies the final teacher nomination score by 3. The teacher nomination form is worth a total of 600 points or 20% of the combined score for traditional gifted identification. The SAT9 and NNAT are worth a maximum of 2,400 points together or 80% of the composite score for traditional gifted identification.

Teacher questionnaire. A two-page teacher questionnaire was used to measure how teachers rated their students on the seven multiple intelligences (see Appendix C). The first page provides instructions on how to fill out the questionnaire and defines each of the multiple intelligences. The second page lists students' names and a Likert scale from 1 (*very* weak) to 5 (*very* strong) below each intelligence. Teachers circle the number that best represents a student's strength or weakness in that area. Corresponding subscales from the teacher questionnaire were compared with data from the TIMI and teacher nominations in an effort to provide evidence of validity for the TIMI.

Because four out of eight of the pandas in the forced-choice format on the TIMI that are supposed to represent spatial abilities are doing an art activity, the inventory may

be tapping each student's preference for art rather than his or her spatial preferences. If teachers' answers correlated to students' answers about themselves on the TIMI, these data would lend evidence of validity to that instrument. Although spatial abilities may manifest themselves in artistic endeavors, they are not limited by art aptitude. Therefore, the TIMI-spatial subscale would gain evidence of validity if correlated with the NNAT as well as the artistic subscale on the teacher questionnaire.

Traditional Gifted Identification Method

The traditional method used to identify students for the gifted program in the district where this study took place relied on scores from the SAT9, NNAT, and teacher nominations. The SAT9 was worth approximately 47%, the NNAT was worth approximately 33%, and the teacher nomination was worth 20% of the composite score. In order to have been identified for the 2001-2002 school year, students must have met the following criteria: They must have earned over 1,000 points from a maximum of 3,000. Students received 1,400 points for scoring in the 99th percentile on the SAT9, one point for scoring in the 80th percentile, and extrapolated points for every percentile in between. Students received 1,000 points for scoring in the 99th percentile on the NNAT, 5 points for scoring in the 50th percentile, and extrapolated points for every percentile in between. The teacher nomination was worth 600 points. The three total scores were added together for a final composite score. Students were rank ordered based on their composite scores and the top 15% were identified as gifted for purposes of this study.

The number of openings available for GATE is mostly a result of the number of GATE students in the graduating sixth-grade class. Each year, the GATE program enrolls 55 to 60 or 4 1/2% to 6% of students in fourth through sixth grade. The

researcher was informed of the students in the study who were eligible for the GATE program. Their eligibility was determined using the above formula.

An Alternative Gifted Identification Method Based on MI

The method used to identify gifted students incorporated Gardner's (1983) theory of multiple intelligences. In addition to the criteria used currently to identify gifted students, this method of gifted identification included scores from the TIMI.

The TIMI is purported to measure seven different intelligences. These include the verbal-linguistic, logical-mathematical, spatial, musical, bodily-kinesthetic, intrapersonal, and interpersonal potentials. Scores of 6 to 8 on the TIMI subscales indicate a student has gifted potential in that area (Scott, 1996).

Data Analysis

Each of the following analyses was conducted in order to determine whether the traditional approach of the existing method missed gifted students who were identified by the alternative identification method.

1. The traditional method of gifted identification was compared with that based on MI using Cohen's Kappa. Also each component of the school district's method was compared with each of the seven multiple intelligences using Cohen's Kappa. A data set of complete observations on SAT9, NNAT, teacher nominations, and TIMI was created and is composed of 231 students.

For purposes of validity evidence for the TIMI, additional analyses included the following:

2. The corresponding subscales on the TIMI were correlated with total reading, language, and total mathematics on the SAT9 using a correlation ratio.

3. The spatial subscores on the TIMI were correlated with NNAT scores using a correlation ratio.

4. The corresponding subscales on the TIMI were correlated with the LSI subscales using a correlation ratio.

5. The corresponding subscales on the TIMI were correlated with the teacher questionnaire items using Cramer's V. TIMI subscales were grouped into 3 categories of low 1 to 3, medium 4 to 5, and high 6 to 8. Teacher questionnaire items were grouped into 3 categories of low 1 to 2, medium 3, and high 4 to 5.

6. The teacher nominations were correlated with scores on the SAT9, NNAT, TIMI, and teacher questionnaire using a point-biserial correlation coefficient.

7. The data obtained between the corresponding subscales on the TIMI with the SAT9, NNAT, teacher questionnaire, teacher nomination scores, and LSI scores may or may not provide evidence of convergent validity for the TIMI.

Chapter IV

Results

The purpose of this study was to investigate whether a traditional method of gifted identification weighted toward *g* and measured by tests and teacher nomination forms identified different students than an alternative method based on multiple intelligences. Complete data from 231 fourth-grade students were obtained from four instruments including the Teele Inventory of Multiple Intelligences (TIMI), Stanford Achievement Test, 9th Edition (SAT9), Naglieri Nonverbal Abilities Test (NNAT), and Learning Styles Inventory (LSI). The fourth-grade teachers nominated 34 students from their classes to the GATE program by completing the teacher nomination form. Also, teachers completed the teacher questionnaire. Two-hundred-seventy-six out of 319 fourth-grade students received active parental permission for their data to be used anonymously in this study. Based on complete data collected from 231 fourth-grade students for the TIMI, SAT9, NNAT, and teacher nominations, 35 students or 15% were eligible for the GATE program using the traditional method of gifted identification.

Students were identified as gifted by the traditional method based on a point system. They received 1,400 points for scoring in the 99th normal curve equivalent (NCE) in each of the SAT9 total reading, language, and total mathematics scales, one point for scoring in the 80th NCE, and extrapolated points in between. Points for the total reading, language, and total mathematics scales were then averaged to determine the SAT9 points assigned to each student. Students received 1,000 points for scoring in the 99th scaled score on the NNAT, one point for scoring in the 80th percentile, and extrapolated points in between. Teacher nomination points were tripled for a maximum

possible of 600 points and added to the SAT9 points and the NNAT points. Students were rank ordered according to how many points they scored all together. Based on the recommendation of Renzulli and Reis (1991), the top 15% of the district's fourth-grade population was identified as gifted.

Traditional Identification Versus Identification Based on Multiple Intelligences and Other Criteria That are Part of the Traditional Criteria.

The traditional method of identification was compared with that based on multiple intelligences (MI). Two aspects of comparison were examined: (a) the identification based on traditional criteria was compared with identification from each of the seven multiple intelligences and (b) each component of the traditional method was compared with each of the seven multiple intelligences. The correlation coefficients, means, and standard deviations for all of the variables in this study can be found in Appendices E and F respectively.

The frequency and percentage of students with complete data from all instruments who were identified by the traditional criteria, the SAT9 reading only, SAT9 language only, SAT9 mathematics only, NNAT only, teacher nomination only, and each of the TIMI subscales only are given in Table 12. Traditional identification included a weighted average score of the combined SAT9 reading, SAT9 language, SAT9 mathematics, NNAT, and teacher nomination. Identification was based on criteria listed in Chapter III. For each of the SAT9 subscales and the NNAT, a cutoff of the top 15% was used for gifted identification. For each of the TIMI subscales, scores of 6 to 8 were used as the cutoff. No cutoff point was used for the teacher nominations. The largest

Table 12

Number and Percentage of Students Identified as Gifted Using the Traditional Criteria, SAT9, NNAT, Teacher Nominations, and TIMI (n = 231)

Method	f	%
Traditional Criteria	35	15.0
SAT9 Reading	66	28.6
SAT9 Mathematics	80	34.6
SAT9 Language	75	32.5
NNAT	18	7.8
Teacher Nominations	34	14.7
TIMI Verbal-linguistic	36	15.6
TIMI Logical-mathematical	71	30.7
TIMI Spatial	84	36.4
TIMI Musical	27	11.7
TIMI Bodily-kinesthetic	55	23.8
TIMI Intrapersonal	5	2.2
TIMI Interpersonal	63	27.3

percentage of students were identified by TIMI spatial followed by SAT9 mathematics and SAT9 language and TIMI logical-mathematical.

Traditional criteria compared with each of the seven multiple intelligences and other criteria that are part of the traditional criteria. Identification based on each component of the traditional criteria was compared with identification dependent upon each of the seven multiple intelligences (see Table 13). Thirty-five students were identified as gifted by a traditional method. The frequency and percentage of students represent those who would have been identified by each of the scores listed separately. For example, 29 or 83% of the students who were identified by their SAT9 reading scores were ultimately identified by the traditional criteria that consisted of a weighted average including SAT9 reading, SAT9 language, SAT9 mathematics, NNAT, and teacher nomination scores. Cohen's Kappa is a statistic that measures the overlap or the

agreement between two sets of data. More students were identified by the SAT9 than by any other method. Fewer students were identified by their TIMI verbal-linguistic, logical-mathematical, spatial, musical, bodily-kinesthetic, and intrapersonal preferences than by any other method. Approximately the same number of students were identified by the NNAT, teacher nominations, and the TIMI interpersonal preferences. In terms of agreement with traditional criteria, Cohen's Kappa values are the highest for NNAT, SAT9, and teacher nominations and lowest for TIMI, which is expected because the traditional components have the strongest relationship to each other and they make up the traditional criteria.

Table 13

Number and Percentage of Students Identified as Gifted and Subsequent Kappa Values Using the Traditional Criteria Compared With the SAT9, NNAT, TIMI, and Teacher Nominations (n = 35)

Method	f	%	Kappa
SAT9 Reading	29	83	.53
SAT9 Mathematics	28	80	.40
SAT9 Language	28	80	.44
NNAT	14	40	.55
Teacher Nominations	15	43	.40
TIMI Verbal-linguistic	8	23	.11
TIMI Logical-mathematical	10	29	.02
TIMI Spatial	5	14	-.13
TIMI Musical	2	6	-.06
TIMI Bodily-kinesthetic	10	23	.08
TIMI Intrapersonal	0	0	-.04
TIMI Interpersonal	14	40	.15

Each component of the school district's traditional gifted identification method versus the corresponding multiple intelligences. The SAT9 reading and SAT9 language subscales were compared with the TIMI verbal-linguistic scale because they measure the

same basic intelligence, preference, or achievement. For the same reason, the SAT9 mathematics and TIMI logical-mathematical scales were compared with each other and the NNAT and TIMI spatial scales were compared with each other. The students whose standardized test scores were in the top 15% were compared with the students whose TIMI scores were between 6 and 8 (see Table 14). For example, there were 37 students who scored in the 85th percentile or higher on the SAT9 reading or who scored 6 or higher on the TIMI verbal-linguistic scale. The Kappa value between students who scored in the top 15% of the SAT9 reading and the TIMI verbal-linguistic scale is .07, indicating very little agreement between students with high reading achievement scores and students with strong preferences for verbal-linguistic activities.

Table 14

Number and Percentage of Students Identified as Gifted and Subsequent Kappa Values Using Each Component of the Traditional Criteria Versus the Corresponding Multiple Intelligences

Method	f	n	%	Kappa
SAT9 Reading and TIMI Verbal-linguistic	13	37	35	.07
SAT9 Language and TIMI Verbal-linguistic	16	37	43	.10
SAT9 Mathematics and TIMI Logical-mathematical	30	71	42	.12
NNAT and TIMI Spatial	4	85	5	-.05

More students were identified as gifted based on their mathematics achievement and preference than on any other achievement, ability, or preference, which also had the highest Kappa value. Fewer students were identified as gifted based on their nonverbal

ability and spatial preferences than on any other achievement, ability, or preference, and that Kappa value is low and negative.

The teacher nomination points and the TIMI scores of students who were identified as gifted by a traditional method were compared with each other (see Table 15). The greatest amount of overlap in identification between teacher nominations and students choosing an activity representative of an intelligence 6 or more times on the TIMI scales is in the areas of logical-mathematical and bodily-kinesthetic intelligence. The Kappa values for these two scales are both low.

Table 15

Number and Percentage of Students Identified as Gifted and Subsequent Kappa Values Between Teacher Nominations Versus the Multiple Intelligences (n = 35)

	Teacher Nominations		
Multiple Intelligences	f	%	Kappa
Verbal-linguistic	4	11	-.04
Logical-mathematical	8	23	.17
Spatial	1	3	-.20
Musical	1	3	-.01
Bodily-kinesthetic	8	23	.17
Intrapersonal	0	0	--
Interpersonal	7	20	-.12

Evidence of Validity for the TIMI

Additional analyses were conducted with the intention of providing evidence of validity for the TIMI. Correlation ratios, Cramer's V, Pearson product-moment correlation coefficients, and point-biserial correlation coefficients were calculated and are explained below.

Relationship between the TIMI and SAT9. The corresponding subscales on the TIMI were related to the total reading, language, and total mathematics subscales on the

SAT9 using the correlation ratio (see Table 16). Only scores of students with complete data were analyzed. None of the relationships are statistically significant. Students who were identified as gifted based on their reading achievement, language achievement, or mathematics achievement as measured by the SAT9 are not the same students who were identified based on their multiple intelligences preferences as measured by the TIMI. Therefore, there is little association between the corresponding TIMI and the SAT9 subscales.

Table 16

Correlation Ratios Between Corresponding TIMI and SAT9 Subscales (n = 231)

	SAT9		
TIMI	Reading	Mathematics	Language
Verbal-linguistic	.21		.22
Logical-mathematical		.21	

Relationship between the TIMI and the NNAT. The TIMI spatial scale and the NNAT were related using the correlation ratio (see Table 17). Only scores of students with complete data were analyzed. The relationship is not statistically significant. Students who were identified as gifted based on their nonverbal ability as measured by the NNAT are not the same students who were identified based on their multiple intelligences preferences as measured by the TIMI. Therefore, there is little association between the corresponding subscales of the TIMI and the NNAT.

Table 17

Correlation Ratio Between Corresponding TIMI Subscale and the NNAT (n = 231)

TIMI	NNAT
Spatial	.17

Relationship between the TIMI and the LSI. The corresponding subscales on the TIMI were related to the LSI using the correlation ratio (see Table 18). Because auditory and visual learning styles are conducive to verbal-linguistic intelligence, those scales were compared with each other. A visual learning style also is helpful in fostering spatial intelligence, so those scales were paired for comparison. In the same way, the tactile learning style was compared with the bodily-kinesthetic intelligence, the kinesthetic learning style with the musical and bodily-kinesthetic intelligence, and the intrapersonal/interpersonal learning style was compared with the intrapersonal and interpersonal intelligences.

Table 18

Correlation Ratios Between Corresponding TIMI and LSI Subscales (n = 242)

	LSI				
TIMI	Auditory	Visual	Tactile	Kinesthetic	Intrapersonal/ Interpersonal
Verbal-linguistic	.10	.17*			
Musical	.10			.10	
Spatial		.17*			
Bodily-kinesthetic			.00	.14	
Intrapersonal					.14
Interpersonal					.17*

*Statistically significant at the .05 level.

Scores of all students who completed the TIMI and the LSI were analyzed. Students who had high preferences for particular learning styles as measured by the LSI are not necessarily the same students who made corresponding choices when asked their multiple intelligences preferences as measured by the TIMI. The correlation ratios range from .00 to .17, so there are weak relationships between intelligence preferences and learning styles preferences. Only the TIMI verbal-linguistic and LSI visual, the TIMI

spatial and LSI visual, and the TIMI interpersonal and LSI intrapersonal/interpersonal scales are statistically significant. Therefore, there is little association between the corresponding TIMI and the LSI subscales.

Relationship between the TIMI and the teacher questionnaire. The corresponding subscales on the TIMI were related to the teacher questionnaire items using Cramer's V (see Table 19). Scores of all students who completed the TIMI and all teachers who completed the teacher questionnaire were analyzed. All of the measures of association between the corresponding TIMI and teacher questionnaire scales are very small. None of the relationships between the corresponding TIMI and teacher questionnaire scales are statistically significant. Either teachers had a different perception of their students' strengths as measured by the teacher questionnaire than students had of themselves as measured by the TIMI or the TIMI and the teacher questionnaire do not measure the same construct. Either way, there is little association between the corresponding TIMI and the teacher questionnaire subscales.

Table 19

Cramer's V Between Corresponding TIMI and Teacher Questionnaire Subscales (n = 260)

Corresponding TIMI and Teacher Questionnaire Subscales	Cramer's V
Verbal-linguistic (V-L)	.09
Logical-mathematical (L-M)	.12
Spatial (S)/Artistic (A)	.10
Musical (M)	.04
Bodily-kinesthetic (B-K)	.05
Intrapersonal (Intra)	.12
Interpersonal (Inter)	.11

Relationship between the teacher nomination forms and the SAT9, NNAT, TIMI, and teacher questionnaire. The teacher nominations were correlated with scores on the

SAT9, NNAT, TIMI, and teacher questionnaire using a point-biserial correlation coefficient (see Table 20). Scores of all students who completed the TIMI, SAT9, NNAT, teacher questionnaire, and teacher nominations were analyzed. The statistically significant correlations range from -.13 between the teacher nomination and TIMI spatial scale to .46 between the teacher nomination and teacher questionnaire verbal-linguistic scale. One might expect results from teacher nominations to be related to results from achievement and ability measures. In this study, there was a small, negative, statistically significant relationship between the teacher nominations and the TIMI spatial scale.

Table 20

Point-Biserial Correlations Between Teacher Nominations and SAT9, NNAT, Teacher Questionnaire, and TIMI Subscales

	n	Point-Biserial
SAT9 Reading	246	.32*
SAT9 Mathematics	264	.25*
SAT9 Language	261	.31*
NNAT	276	.19*
Teacher Questionnaire Verbal-linguistic	269	.46*
Teacher Questionnaire Logical-mathematical	269	.33*
Teacher Questionniare Spatial	269	.19*
Teacher Questionnaire Musical	269	.29*
Teacher Questionnaire Bodily-kinesthetic	269	.07
Teacher Questionnaire Intrapersonal	269	.39*
Teacher Questionnaire Interpersonal	269	.15*
TIMI Verbal-linguistic	276	.09
TIMI Logical-mathematical	276	.04
TIMI Spatial	276	-.13*
TIMI Musical	276	-.03
TIMI Bodily-kinesthetic	276	-.05
TIMI Intrapersonal	276	.00
TIMI Interpersonal	276	.10

*Statistically significant at the .05 level.

Subsequent Analyses

Because different students were identified by the traditional method than by the multiple intelligences approach (TIMI), subsequent analyses were conducted to learn more about the differences between the groups. Groups were determined by students' identification status. Students who were not identified by either the traditional method or TIMI formed one group, students who were identified by the traditional method only formed a second group, students who were identified by the TIMI only formed a third group, and students who were identified by both the traditional method and TIMI formed a fourth group. The SAT9 reading and SAT9 language subscales were compared with the TIMI verbal-linguistic scale, because they measure the same basic intelligence, preference, or achievement. For the same reason, the SAT9 mathematics and TIMI logical-mathematical scales were compared with each other and the NNAT and TIMI spatial scales were compared with each other.

A comparison of SAT9 means between groups shows that students who were not identified by either method had similar mean achievement scores as students who were identified by the TIMI verbal-linguistic scale only (see Table 21); these mean achievement scores are similar to or slightly higher than the national average of 50 with a standard deviation of 15. Students who were identified by the traditional method only and students who were identified by both methods had similar achievement means that were two standard deviations above the national average. The eta square statistics are very large, indicating that group differences account for 31% of the variation in SAT9 reading scores and 28% of the variation in SAT9 language scores.

Table 21

Comparison of Means Between Corresponding SAT9 and TIMI Verbal-linguistic Subscales (n = 231)

	SAT9 Reading				SAT9 Language			
TIMI Verbal-linguistic	n	Mean	SD	η^2	n	Mean	SD	η^2
Not identified	170	57.22	14.97	.31	169	53.35	15.85	.28
Identified by SAT9 only	25	83.86	9.90		25	83.15	10.91	
Identified by TIMI only	26	53.72	15.65		26	53.34	18.77	
Identified by both measures	10	82.67	10.35		10	89.40	8.05	

The differences between the four groups of students are displayed in Figures 1 and 2. Overlap occurs between the students identified by the traditional method only and the students identified by both methods. Also, there is overlap between students not identified by either method and students identified by the TIMI verbal-linguistic scale only. There is no overlap between groups of students who were identified by the traditional method only or by both methods and the groups of students who were not identified by either method or by the TIMI verbal-linguistic scale only. Students' preferences as measured by the TIMI verbal-linguistic scale do not match students' reading achievement or language achievement as measured by the SAT9.

SAT9 mathematics means between groups show that students who were not identified by either method had similar means as students who were identified by the TIMI logical-mathematical scale only (see Table 22). Also, students who were identified by the traditional method only and students who were identified by both methods had similar achievement means that were two standard deviations above the national average of 50 with a standard deviation of 15. The eta square is very large, indicating that group differences account for 29% of the variation in SAT9 mathematics scores.

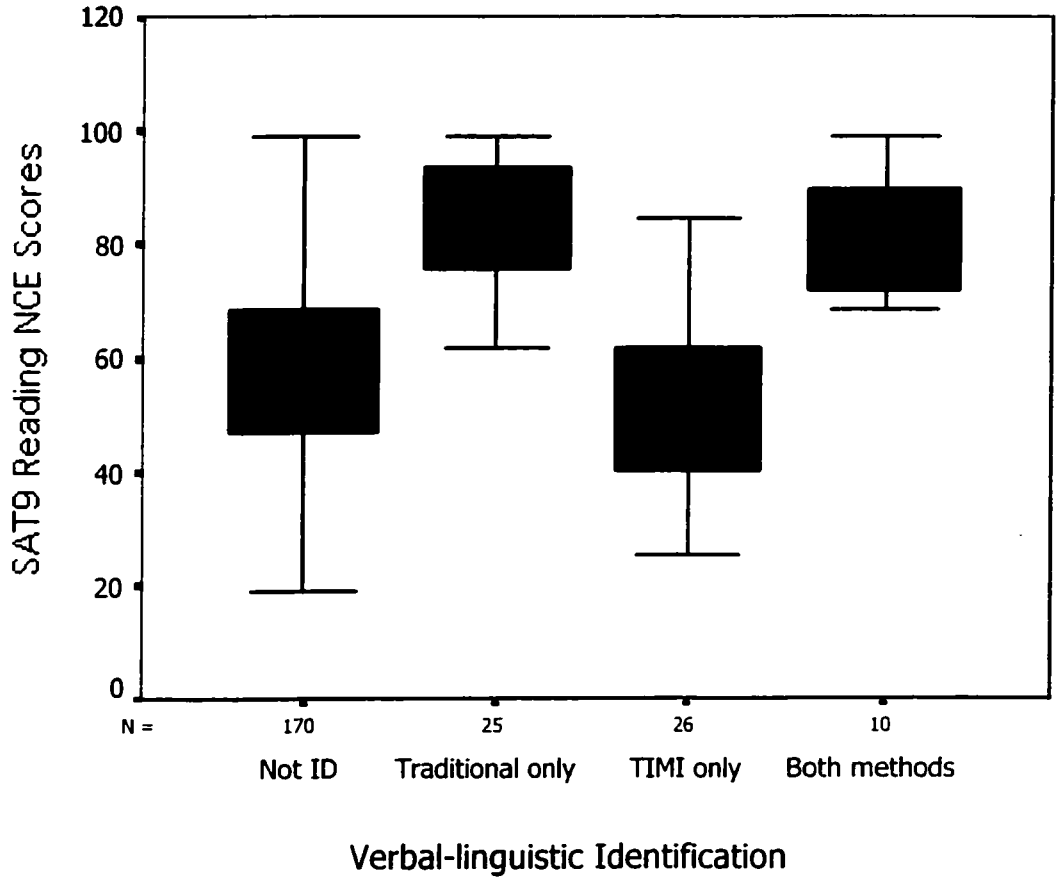


Figure 1. Comparison of SAT9 Reading and TIMI Verbal-linguistic Subscales.

In Figure 3, the most overlap occurs between the students identified by the traditional method only and the students identified by both methods. Also, there is overlap between students not identified by either method and students identified by the TIMI logical-mathematical scale only. There is no overlap between groups of students who were identified by the traditional method only or by both methods and the groups of students who were not identified by either method or by the TIMI logical-mathematical scale only. Students' preferences as measured by the TIMI logical-mathematical scale do not match students' mathematics achievement as measured by the SAT9.

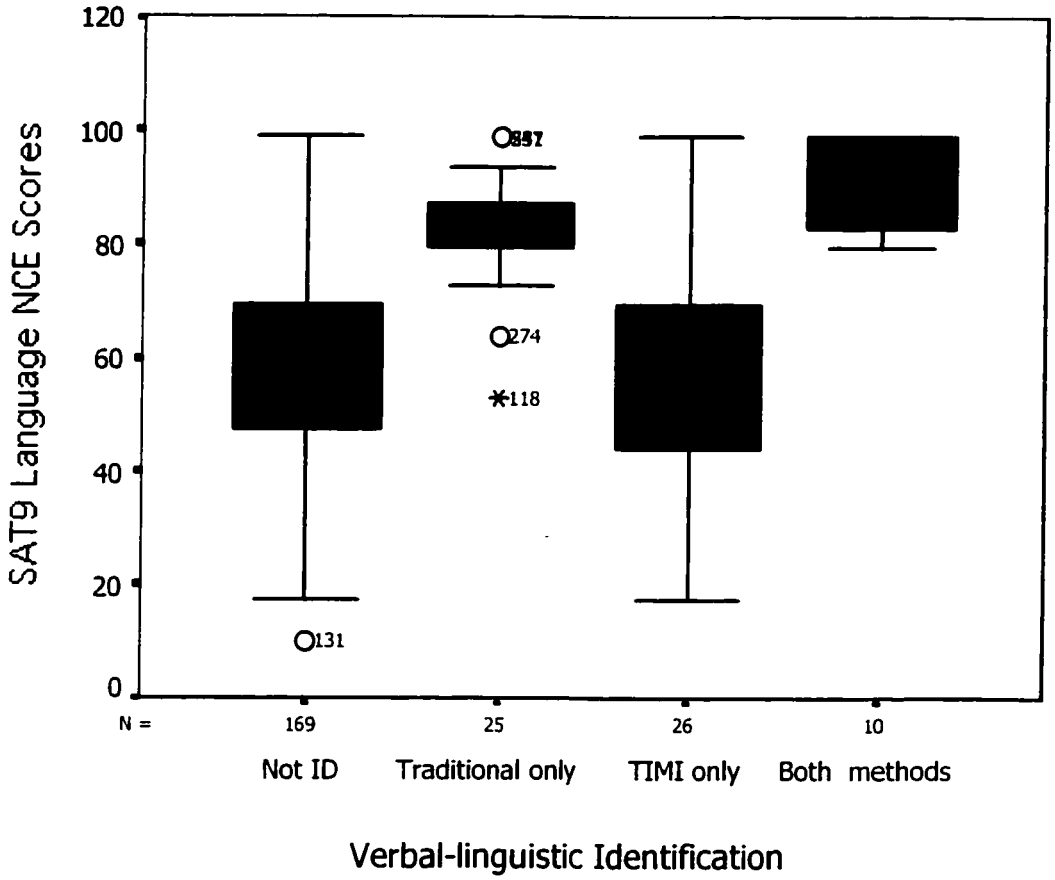


Figure 2. Comparison of SAT9 Language and TIMI Verbal-linguistic Subscales.

Table 22

Comparison of Means Between Corresponding SAT9 and TIMI Logical-mathematical Subscales (n = 231)

	SAT9 Mathematics			
TIMI Logical-mathematical	n	Mean	SD	η^2
Not identified	138	59.07	16.52	.29
Identified by SAT9 only	22	85.52	10.52	
Identified by TIMI only	58	62.76	15.65	
Identified by both measures	13	89.72	9.40	

The national scaled score on the NNAT is 621. A comparison of NNAT means between groups shows that students who were not identified by either method and students who were identified by the TIMI only had similar nonverbal ability means of approximately 600, which is one-half standard deviation below the national mean (see

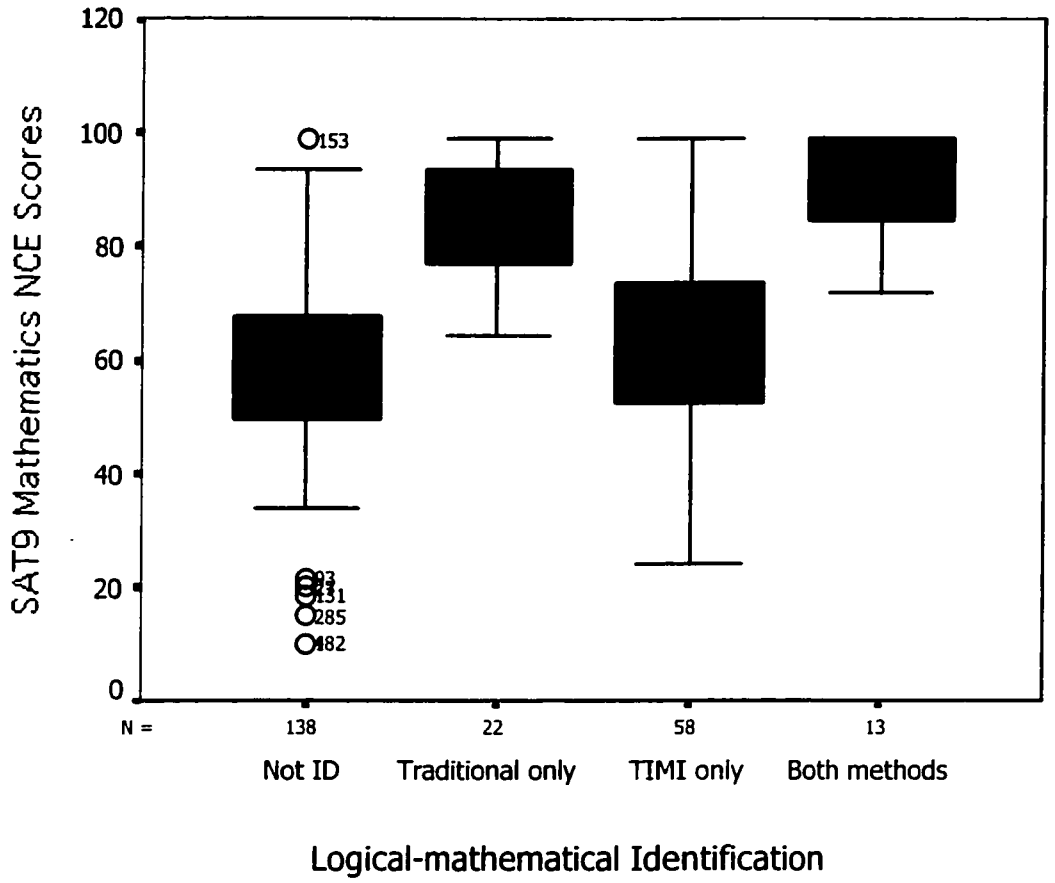


Figure 3. Comparison of SAT9 Mathematics and TIMI Logical-mathematical Subscales.

Table 23). Students identified by the traditional method only and students identified by both methods had similar NNAT means that were between 645 with a standard deviation two-thirds above the mean and 668 with a standard deviation of one above the mean. The eta square is very large and indicates that group differences account for 23% of the variation in NNAT scores.

In Figure 4, overlap occurs between the students identified by the traditional method only and the students identified by both methods. Also, there is overlap between students not identified by either method and students identified by the TIMI spatial scale only. There is very little or no overlap between groups of students who were identified

Table 23

Comparison of Means Between Corresponding NNAT and TIMI Spatial Subscales (n = 231)

		NNAT		
TIMI Spatial	n	Mean	SD	η^2
Not identified	119	599.61	34.12	.23
Identified by NNAT only	28	646.68	38.57	
Identified by TIMI only	77	600.74	30.82	
Identified by both measures	7	667.29	43.27	

by the traditional method only or by both methods and the groups of students who were not identified by either method or by the TIMI spatial scale only. Students' preferences as measured by the TIMI spatial scale do not match students' nonverbal ability as measured by the NNAT.

Summary

The purpose of this study was to investigate whether a traditional method of gifted identification weighted toward *g* and measured by tests and teacher nomination forms may miss some gifted students. Specifically investigated was the extent to which identification as gifted weighted toward *g* differ from identification as gifted based on multiple intelligences. Data analyses included investigating relationships between various measurements and exploring the differences between students identified by a traditional method and those students identified by a multiple intelligences approach (TIMI).

Correlation ratios between corresponding TIMI scales and SAT9 scales, NNAT scales, and teacher nominations range from weak to moderate. The strongest correlations are between teacher nominations and SAT9 reading, SAT9 mathematics, SAT9 language, NNAT, teacher questionnaire verbal-linguistic, teacher questionnaire logical-

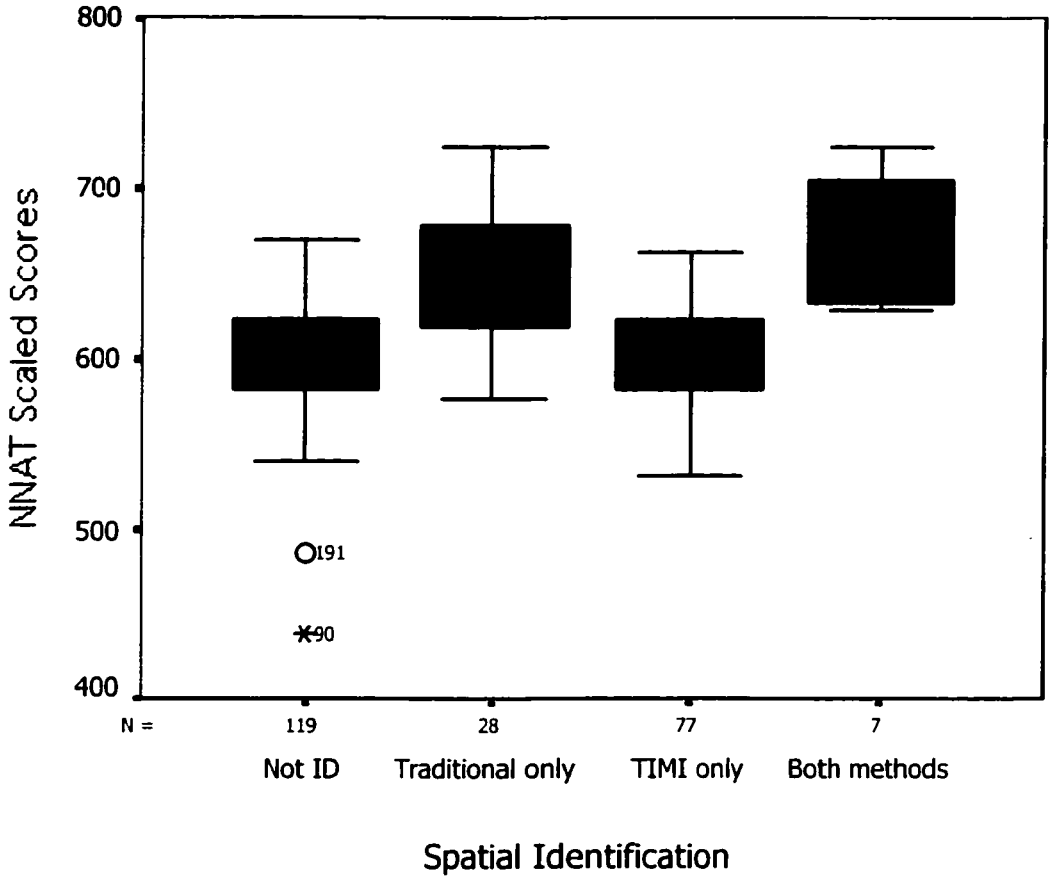


Figure 4. Comparison of NNAT and TIMI Spatial Subscales.

mathematical, teacher questionnaire spatial and teacher questionnaire musical scales. Findings revealed that different students were identified by the traditional method than by the TIMI. Students who were identified by the traditional method only and by both methods had similar means on the standardized tests. Students who were not identified by either method had similar means as students who were identified by the TIMI only. Students' preferences as measured by the TIMI did not match their achievement as measured by the SAT9 or their ability as measured by the NNAT.

Chapter V

Summary of Findings, Limitations, Discussion, Recommendations, and Conclusion

The purpose of this study was to examine whether the traditional method of gifted identification, weighted toward *g*, may miss some students when a method based on the theory of multiple intelligences is used. Comparisons were made between students identified as gifted based on their Stanford Achievement Test, 9th Edition (SAT9) scores, Naglieri Nonverbal Abilities Test (NNAT) scores, and teacher nominations versus students identified based on their "dominant intelligences" (Teele, 1997) as measured by the Teele Inventory of Multiple Intelligences (TIMI). Chapter V includes a summary of findings, limitations, discussion, recommendations, and conclusion.

Summary of Findings

The literature shows that any one method of identification will miss certain students for gifted programming, hence experts recommend a multicriteria approach (Baum, Renzulli, & Hébert, 1995; Gardner, 1999; Sternberg, 1999). Even when multiple criteria are used in traditional practice, some students are overlooked as evidenced by the percentage of gifted people who grow up to be high-school dropouts, incarcerated, or social and tax burdens (Brown, 1997; Hanninen, Fascilla, & Anderson, 1991; McCluskey & Treffinger, 1998; U.S. Department of Education, 1999). In an attempt to identify this overlooked group, researchers have used alternative instruments based on multiple intelligences to identify gifted students (Maker, 1996; Ramos-Ford & Gardner, 1991; Reid et al., 1999). The TIMI was the alternative instrument used in the present study to identify students as gifted.

The main research question driving this study was to investigate to what extent gifted-identification decisions weighted toward *g* differ from gifted-identification decisions based on multiple intelligences (MI). Findings showed that the traditional method using the SAT9, NNAT, and teacher nominations combined identified a different group of students than the method incorporating multiple intelligences as measured by the TIMI. Gifted-identification decisions were dependent on the method used to identify students. Kappa values ranged from -.13 to .15 when the TIMI was compared with the traditional criteria. Subsequent analyses showed that there were different levels of achievement between the groups identified by the traditional method and groups identified by the TIMI. A comparison of SAT9 and NNAT means showed that students' preferences for activities representative of the multiple intelligences did not match their respective achievement or ability.

Evidence of validity for the TIMI is lacking in this study. There are no statistically significant correlation ratios found between the TIMI and the SAT9 or the TIMI and the NNAT. There were small statistically significant correlation ratios found between the TIMI verbal-linguistic and LSI visual, the TIMI spatial and LSI visual, and the TIMI interpersonal and LSI intrapersonal/interpersonal scales (see Table 18). There were no statistically significant relationships found between corresponding TIMI and teacher questionnaire scales using Cramer's V. The only statistically significant correlation found between the TIMI and teacher nominations was with the TIMI spatial scale. The relationship was small and negative.

Limitations

The limitations of this study include the generalizability of the results. Fourth-grade students from lower-middle class to upper-middle class homes in a suburban school district located in California are not representative of the entire population of elementary-school children in the United States.

The self-report nature of the TIMI may be a limitation of the study. Some students may not have taken the instrument seriously, and some may not have had the maturity to reflect accurately on their preferences. These potential extraneous variables may have lead to inaccurate information used in the analyses.

The definition of gifted used in this study is particular to this work. In order for the results of the present study to be replicated or generalized, the same definition of gifted would need to be used in the same way the researcher did. Different researchers and practitioners use a variety of gifted definitions, so the generalizability of the results in this study may not be applicable to settings where people use a different definition or use the same definition in a different way than the researcher did.

Discussion

Regular-education classroom teachers provide a structure for reading, writing, and mathematics activities so that students may obtain basic literacy and mathematics skills. Oftentimes, teachers do not encourage individuals with mental abilities in the musical, spatial, bodily-kinesthetic, intrapersonal, and interpersonal areas to succeed (Gardner, 1993). There are, however, supplementary programs in which students with strengths in nonacademic areas may participate. For example, students with high musical intelligence may participate in Band or Chorus. Students with high bodily-kinesthetic potential may

be eligible for district- or community-sponsored sports teams including baseball, basketball, and football. At higher grades, students with interpersonal strengths can join debate teams, student government, or drama clubs. Teachers have initiated art docent programs in which local artists teach art lessons. Even with these supplemental activities, students' academic needs are not being met as consistently as they might in GATE. Because teachers generally do not vary their teaching style or provide supplemental work for students, GATE programming is necessary. The GATE program is the only one that emphasizes advanced curricula for students with above-average intelligence in academics.

Based on the recommendation of Renzulli and Reis (1991), this researcher chose the top 15% as the cutoff for identifying students for the gifted program. Because GATE programming is not mandated and because funding for GATE is extremely limited, many school districts do not serve the top 15% of the gifted population. For instance, the district in which this study occurred serves the top 4 1/2% to 6% of its fourth- through sixth-grade population. According to Renzulli (1978), "more creative/productive persons come from below the ninety-fifth percentile than above it, and if such cut-off scores are needed to determine entrance into special programs, we may be guilty of actually discriminating against persons who have the greatest potential for high levels of accomplishment" (p. 182). Therefore, school districts would serve better the students and their families if they educated the top 15% rather than considerably less than the top 15% of their populations according to their potentials (Renzulli, 1978; Renzulli & Park, 2000).

The SAT9 component of the traditional method is intended to measure reading, language, and mathematics achievement; the NNAT portion of the traditional method is intended to assess students' academic strengths in terms of nonverbal ability. The purpose of using teacher nominations is to measure a broader range than the standardized assessments of students' strengths, such as social skills, motivation, and creativity. In this study, however, statistically significant point-biserial correlations indicated that the teacher nominations were related to achievement test scores (SAT9) and nonverbal ability scores (NNAT) (see Table 20). These findings suggest that teachers tend to identify the same students who score highly on standardized test scores.

Whitmore (1982) found also that teachers tend to notice gifted students who are mature, independent, and self-directed to the exclusion of potentially gifted students who are not skilled in intrapersonal and interpersonal relationships. Whitmore's observation led this researcher to analyze the relationship between teacher nominations and the TIMI intrapersonal and interpersonal scales (see Table 20). There was no correlation between the teacher nominations and the TIMI intrapersonal scale and a very small positive correlation that was not statistically significant between the teacher nominations and TIMI interpersonal scale. The correlation ratios between the corresponding TIMI scales and the LSI intrapersonal and LSI interpersonal scales were small and not statistically significant. Also there was a small negative statistically significant correlation between the teacher nomination points and LSI intrapersonal/interpersonal scale ($r = -.13$, $p < .05$, $n = 242$). Therefore, Whitmore's claim that teachers tend to nominate as gifted students with strong intrapersonal or interpersonal preferences cannot be supported or refuted in this study.

The TIMI is an inventory of preferences that are supposed to be representative of the multiple intelligences. Preferences are not the same as intelligences, achievement, or ability. Usually, achievement and ability are aligned. Correlation coefficients for the national sample range from .59 to .68 between the total NNAT and SAT9 total reading, SAT9 language, and SAT9 total mathematics, indicating that students' nonverbal ability parallels their achievement (Harcourt Brace, 1997a). Pearson product-moment correlation coefficients for the participants in this study range from .50 to .51 between the SAT9 total reading, SAT9 language, SAT9 total mathematics, and the NNAT, indicating again, that in this study participants' nonverbal ability parallels their achievement. Eta square values for groups of students who were not identified, identified by the SAT9 only, identified by the TIMI only, and identified by both methods ranged from .23 to .31 between corresponding TIMI subscales and the SAT9 and NNAT. In this study, students' preferences as measured by the TIMI are not aligned with their achievement or nonverbal ability.

There are three possible explanations for students performing well in academic areas that are not the same as their preferences. One, the SAT9 and NNAT might not measure accurately achievement and nonverbal ability, respectively. Due to the plethora of validity evidence presented by Harcourt Brace (1997a, 1997b) for the SAT9 and NNAT, however, it is likely that these instruments do, in fact, measure accurately particular aspects of achievement and ability. A second explanation for students performing well in areas that are not their preferred intelligences may be that people's achievement, ability, and preferences are not aligned. Sternberg's (1999) and Sternberg and Clickenbeard's (1994) work, however, demonstrated that people taught according to

their strengths showed more improvement gains in achievement than students not taught according to their strengths. Therefore, in addition to consideration of student preferences, it is important to teach to their strengths. A third explanation why students' achievement and ability scores in this study did not correlate strongly or significantly with their preferences for respective activities measured by the TIMI is that the TIMI does not assess accurately student preferences.

Additional analyses attempted to provide evidence for validity for the multiple intelligences instrument used in this study. Correlation ratios were used to analyze the relationships between corresponding subscales of the TIMI and the SAT9, NNAT, LSI, and teacher questionnaire. Point-biserial correlations were used to analyze the relationship between the TIMI and teacher nomination form. There was little or no agreement between corresponding subscales of the TIMI and any of the other instruments used in this study. Because evidence of validity for the TIMI was not obtained in this study, one may consider the likelihood that the TIMI does not assess accurately student preferences for certain activities.

There are many aspects that may be assessed when measuring a particular intelligence. The TIMI may be assessing verbal-linguistic, logical-mathematical, and spatial intelligence from a different perspective than the SAT9 or NNAT. For instance, the SAT9 measures reading in terms of vocabulary (including synonyms, context, and multiple meanings) and comprehension (including recreational, textual, functional, initial understanding, interpretation, initial analysis, and process strategies). Language is assessed with regard to capitalization, punctuation, usage, sentence structure, content and organization, and study skills. The possibility exists that the TIMI assesses a different

aspect of verbal-linguistic intelligence than the SAT9 total reading or language subscales. If so, it cannot be determined from this study what aspect of verbal-linguistic intelligence the TIMI is measuring. If the TIMI does assess a strand other than those listed for the SAT9 total reading and language subscales, then one would expect different groups of students to be identified by the TIMI than by the SAT9 as having verbal-linguistic preferences or strengths. Perhaps asking students to provide a writing sample on a topic of their choice would provide a performance-based activity that could be measured systematically. Results from these activities may be indicative of students' competence as well as their preference for verbal-linguistic intelligence.

There are fundamental problems with the TIMI as an ipsative scale. The TIMI is a forced-choice inventory with the opportunity for an individual to choose each item an equal number of times. The consequence of choosing one item over another is that the number of times a person chooses a preference is not an absolute measure of what the person prefers but a measure of preference in relation to other preferences. Thus, forced-choice scales are ipsative and, therefore, problematic, because intercorrelations tend to be negative and mean correlations tend to be close to zero (Anastasi & Urbina, 1996). One way to analyze comparative data is to look at profiles and not correlations for the TIMI.

Implications

The premise behind the educational implications for teaching to the multiple intelligences is that if people are instructed according to their strengths, then they are more likely to learn the content presented than if the material is offered through one lens, namely, verbal or mathematical, as in a traditional setting. Strengths are presumed to be aligned with preferences, perhaps because success feels good and people repeat things

that feel good to them. In other studies, students taught according to their strengths showed more gains than those students not taught according to their strengths (Baum et al., 1995; & Sternberg & Clickenbeard, 1994). The TIMI is being used in districts throughout the United States with the intention of assessing dominant intelligences, developing curriculum, and driving instruction with respect to individuals' dominant intelligences (Teele, 1997). Scott (1996) used the TIMI to identify giftedness in fourth-grade minority students from an urban area. In an attempt to establish evidence of validity for the TIMI, he correlated corresponding TIMI scales with the Otis-Lenin School Ability Test, 6th Edition (OLSAT6) verbal, OLSAT6 nonverbal, the Assessment of Interpersonal Relations (AIR), and the Intermediate Measures of Music Audation (IMMA). He found only one small, albeit significant relationship between the TIMI interpersonal and AIR-Female subscale. In the present study, the eta square values (.23 to .31) between corresponding TIMI and the SAT9 and NNAT scales indicate students' preferences are not aligned with their strengths in achievement and ability. The discrepancy between the students' preferences and their ability and achievement is cause for reconsideration of further use of the TIMI until additional validation studies may be conducted.

In the meantime, the field of gifted education is in the midst of a paradigm shift with regard to identification. Schools are faced with a dilemma; they may use identification instruments that are authentic but expensive in terms of time, energy, and money; they may use identification instruments that are "slick" looking, making them very marketable, but relatively inexpensive in terms of time, energy, and money; or, they may rely on an identification method that is already being used for accountability

purposes for the public education system and that has proven to be defensible legally. Many educators continue to use traditional methods to identify students for GATE and some use instruments with little evidence of validity to make programming decisions. The gap between theory and practice may result in some gifted students not being identified for gifted programming. School districts need an instrument that identifies gifted students based on MI. The TIMI was selected because it is used in 650 school districts and because it is not costly, is not time consuming, and is not obtrusive.

There are also other measures being used in practice in conjunction with traditional measures. The 10 traits, aptitudes, and behaviors (TABs) developed by Frasier and Passow (Hunsaker, et al., 1997) and discussed in the literature review is designed to assess behaviors associated with gifted students from minority and low-income groups. The *Scales for Rating the Behavioral Characteristics of Superior Students* (SRBCSS) is designed to assess behaviors of gifted students from the general population. The Problem Solving Assessment (PSA) is an open-ended task-oriented measure. The TABS, SRBCSS, and PSA have been successful in identifying gifted students who would not have been identified using traditional measures alone. These assessments require large amounts of time, energy, and money to administer.

In light of the fact that the TIMI needs additional validation evidence, other assessments are time consuming, costly, and obtrusive and that teachers are not particularly effective in their nominations because they tend to nominate the same students that get identified by their scores on standardized achievement tests, there may be another way to identify gifted students. One possibility may be to enlist the assistance of students. If students were provided opportunities to learn about multiple intelligences

and explore their own talents, then they may be helpful in identifying themselves and others. Making students aware of their strengths may help them approach problem solving and unfamiliar situations from a position of strength. Knowing how to recognize those strengths and apply them toward understanding new things would be helpful to all students, whether they are gifted or not. This researcher visited a group of 16 fourth-grade students not involved with the study who were knowledgeable about the multiple intelligences. When asked what kinds of activity (e.g., swinging, drawing, reading, playing Yahtzee®, and interacting with friends) represented the various multiple intelligences, the students were confident in their correct responses. Although matching correctly the various activities with multiple intelligences is arguably easier than identifying potential giftedness, it would be interesting to investigate the potential contributions of same-grade peers in children as young as fourth grade.

The cost to society of not challenging a greater number of precocious students in reading, language, and mathematics than are currently being served in gifted programming, may result in lost talent in the crucial areas of science, medicine, engineering, and business. GATE is an opportunity for individual students to excel in academics and use that knowledge later in life to solve world-wide problems. By extension, when individuals succeed in academics, society benefits in having the greatest possible number of productive citizens.

Recommendations

The purpose of this study was to investigate whether the traditional method of identification identified different students than an alternative method based on multiple intelligences. Results were inconclusive in determining if the traditional method or if the

multiple intelligences method missed students. Because the data do not provide evidence of validity for the TIMI, more research needs to be conducted to uncover what the TIMI measures.

One drawback to using standardized instruments that are not normed on gifted populations is that they do not discriminate at the extremes and are subject to ceiling effects. If norms were available on gifted students, that information may be useful in identifying gifted students.

Due to the ipsative nature of the TIMI, it may be beneficial to redesign the instrument and use a Likert scale or fill-in-the blank inventory that measures multiple intelligences. Paper-and-pencil measures, however, may not be the best way to assess the process by which gifted people create and judge the products they generate.

There may be no substitute for observing students learning in hands-on situations and judging products made by students, as is done at Project Spectrum (Gardner, 1999). The most accurate assessments of multiple intelligences may, by the nature of what is being measured, require expensive, time consuming, obtrusive methods of evaluation. A study that compares observations of students in various learning environments and judgments of students' products with paper-and-pencil assessments that attempt to measure multiple intelligences would be beneficial to the field of gifted education.

In order to provide an opportunity for academically gifted students to excel, they must have special programming that offers an environment for those skills and abilities to be developed. This researcher proposes a setting whereby student-made products that are created in or out of school are assessed by educators experienced in gifted identification during an observation period of 6 months. In schools where gifted programs serve fourth

through sixth grades, the assessment period should occur in third grade. During the 6-month timeframe, the gifted identification educators could keep notes and products on file of potentially gifted students and narrow the list of students throughout the observation period. At the end of 6 months, students who remain in the potentially gifted group could be given a choice of performance-based activities that are "intelligence fair" and ecologically valid, as modeled by Project Spectrum. Gifted identification educators would determine students' eligibility for gifted programming in light of the students' engagement while working on the activity they choose for their final assessment and their products. Given the appropriate amount of time, energy, and resources, students identified as academically gifted would have an opportunity to explore and develop their scholastic gifts and talents at school.

Conclusion

The intention of comparing different methods of gifted identification was to investigate if the traditional approach may miss students. Clearly in this study, different students were identified for GATE by the traditional method than by the TIMI. The discrepancy of students identified between the traditional method and the multiple intelligences approach makes sense, because each method used different standards and measurements to establish students' strengths and preferences.

Because little or no evidence of validity was found in support of the TIMI measuring multiple intelligences, it cannot be determined in this study what, specifically, the TIMI measures. Therefore, the data are inconclusive as to whether the traditional method is missing students who may be eligible for GATE.

References

American Psychological Association. (1992). Ethical principles of psychologists and code of conduct. *American Psychologist, 47*, 1597-1611.

Anastasi, A., & Urbina, S. (1996). *Psychological testing* (7th ed.). New Jersey: Prentice Hall.

Baum, S. M., Renzulli, J. S., & Hébert, T. P. (1995). Reversing underachievement: Creative productivity as a systematic intervention. *Gifted Child Quarterly, 39*, 224-235.

Brown, T. W. (1997). The growing problem of gifted underachievers. *Communicator, 28* (6), 44-45.

Butler-Por, N. (Ed.). (1993). *Underachieving gifted students*. Oxford: Pergamon.

Ceci, S. J. (1991). How much does schooling influence general intelligence and its cognitive components? A reassessment of the evidence. *Developmental Psychology, 27*, 703-722.

Coleman, M. R., & Gallagher, J. M. (1992). *Report on state policies related to the identification of gifted students* (University of North Carolina, Chapel Hill, Gifted Education Policy Studies Program. Office of Educational Research and Improvement, 368)

Diezmann, C. M., & Watters, J. J. (1995, September). *Off with the fairies or gifted? The problems of the exceptionally gifted child.* Paper presented at the Annual Conference of the Australian Science Teachers Association, Brisbane, Queensland, Australia.

Emerick, L. J. (1991). The gifted underachiever...Another look. *California Association for the Gifted, 21*(4), 7-10.

Feiring, C., Louis, B., Ukeje, I., Lewis, M., & Leong, P. (1997). Early identification of gifted minority kindergarten students in Newark, NJ. *Gifted Child Quarterly, 41*(3), 76-82.

Feldhusen, J. F., Baska, L. K., & Womble, S. (1981). Using standard scores to synthesize data in identifying the gifted. *Journal for the Education of the Gifted, 4*, 177-186.

Gage, N. L., & Berliner, D. C. (1992). *Educational Psychology* (5th ed.). Boston, MA: Houghton Mifflin.

Gallagher, J. J. (1966). *Research summary on gifted child education*. Springfield, IL: State Department of Public Instruction.

Gallagher, J. J. (1991). *Issues in the education of gifted students*. Boston: Allyn and Bacon.

Gardner, H. (1983). *Frames of mind* (2nd ed.). New York: Basic Books.

Gardner, H. (1993). *Multiple intelligences: The theory in practice*. New York: Basic Books.

Gardner, H. (1999). *Intelligence reframed*. New York: Basic Books.

Hall, E. G. (1983). Recognizing gifted underachievers. *Roeper Review, 5*(4), 23-25.

Hanninen, G., Fascilla, P., & Anderson, J. (1991). Gifted students are at risk too. *California Association for the Gifted, 21*(5), 10-13.

Harcourt Brace. (1997a). *Naglieri Nonverbal Ability Test Multilevel Technical Manual*. San Antonio, TX: Author.

Harcourt Brace. (1997b). *Stanford Achievement Test Series, Ninth Edition: Technical Data Report*. San Antonio, TX: Author.

Hunsaker, S. L., Finley, V. S., & Frank, E. L. (1997). An analysis of teacher nominations and student performance in gifted programs. *Gifted Child Quarterly, 41*(2), 19-24.

Jensen, A.R. (1979). *Bias in mental testing*. New York: Free Press.

Lidz, C. S., & Macrine, S. L. (2001). An alternative approach to the identification of gifted culturally and linguistically diverse learners: The contribution of dynamic assessment. *School Psychology International, 22*, 74-96.

Maker, C. J. (1996). Identification of gifted minority students: A national problem, needed changes, and a promising solution. *Gifted Child Quarterly, 40*, 41-50.

Martinson, R. A. (1974). *The identification of the gifted and talented*. Washington, DC: National Institute of Education, Office of Education, Washington, DC.

McCluskey, K. W., & Treffinger, D. J. (1998). Nurturing talented but troubled children and youth. *Reclaiming Children and Youth, 6*, 215-219, 226.

Moon, S. M., Kelly, K. R., & Feldhusen, J. F. (1997). Specialized counseling services for gifted youth and their families: A needs assessment. *Gifted Child Quarterly, 41*, 16-25.

Naglieri, J. A. (1985). *Matrix Analogies Test, Short Form*. San Antonio, TX: The Psychological Corporation.

Peterson, J. S., & Margolin, L. (1997). Naming gifted children: An example of unintended "reproduction." *Journal for the Education of the Gifted, 21*, 82-100.

Plucker, J. A., Callahan, C. M., & Tomchin, E. M. (1996). Wherefore art thou, multiple intelligences? Alternative assessments for identifying talent in ethnically diverse and low-income students. *Gifted Child Quarterly, 40*(2), 81-92.

Price, G. E., & Dunn, R. (1997). *Learning style inventory (LSI): An inventory for the identification of how individuals in grades 3 through 12 prefer to learn.* Lawrence, KS: Price Systems, Inc.

Ramos-Ford, V., & Gardner, H. (1991). *Giftedness from a multiple intelligences perspective.* Boston: Allyn & Bacon.

Reid, C., Udall, A., Romanoff, B., & Algozzine, B. (1999). Comparison of traditional and problem-solving assessment criteria. *Gifted Child Quarterly, 43*, 252-264.

Renzulli, J. S. (1978). What makes giftedness? Reexamining a definition. *Phi Delta Kappan*, 60, 3, 180-185.

Renzulli, J. S., & Park, S. (2000). Gifted dropouts: The who and the why. *Gifted Child Quarterly, 44*, 261-271.

Renzulli, J. S., & Reis, S. M. (1991). The schoolwide enrichment model: A comprehensive plan for the development of creative productivity. In N. Colangelo & G. Davis (Eds.), *Handbook for gifted education* (pp. 111-141). Boston: Allyn and Bacon.

Sarouphim, K. M. (1999). DISCOVER: A promising alternative assessment for the identification of gifted minorities. *Gifted Child Quarterly, 43*, 244-251.

Scott, O. J. (1996). Multiple intelligences and the gifted identification of African-American students. (Doctoral dissertation, Old Dominion University, 1996). *Dissertation Abstracts International, A 57/07.*

Sternberg, R. J. (1982). Lies we live by: Misapplication of tests in identifying the gifted. *Gifted Child Quarterly, 26*, 157-161.

Sternberg, R. J. (1997). What does it mean to be smart? *Educational Leadership, 54*, 20-24.

Sternberg, R. J. (1999). A triarchic approach to the understanding and assessment of intelligence in multicultural populations. *Journal of School Psychology*, 37, 145-159.

Sternberg, R. J., & Clinkenbeard, P. R. (1994). The triarchic model applied to identifying, teaching, and assessing gifted children. *Roeper Review, 17*, 255-260.

Sternberg, R. J., & Davidson, J. E. (1982). The mind of the puzzler. *Psychology Today.* June 1982, 37-44.

Teele, S. (1997). *The multiple intelligences school: A place for all students to succeed.* Redlands, CA: Citrograph Printing.

Treffinger, D. J., & Feldhusen, J. F. (1996). Talent recognition and development: Successor to gifted education. *Journal for the Education of the Gifted, 19*, 181-193.

U.S. Department of Education. (1993). *National Excellence: A Case for Developing America's Talent.* Washington, DC: Government Printing Office.

U.S. Department of Education. (1999). *Digest for education statistics*. Washington, DC: National Center for Education Statistics.

Whitmore, J. R. (1982). Recognizing and developing hidden giftedness. *The Elementary School Journal, 82*, 274-283.

Whitmore, J. R. (1985). *Underachieving gifted students*. (ERIC Document Reproduction Service No. ED 262 526)

Appendix A

Letter from the Curriculum Director Agreeing to Provide Data

September 15, 2001

University of San Francisco
Institutional Review Board for the Protection of Human Subjects
Department of Counseling Psychology
School of Education
2130 Fulton Street
San Francisco, CA 94117-1080

Dear Members of the Committee:

On behalf of the District, I am writing to indicate formally our awareness of the research proposed by Ms. Jamie Worthington, a student of USF. I will provide data for students whose parents gave permission for their child's test scores to be used for research purposes. The data consist of results from the SAT9, the Naglieri Nonverbal Abilities Test, the Teele Inventory of Multiple Intelligences, the learning styles inventory, the teacher gifted and talented nomination forms, and the teacher questionnaires.

If you have any questions or concerns, please feel free to contact my office.

Sincerely,

Curriculum Director

Appendix B

GATE Teacher Nomination Form

GATE Program Teacher Evaluation

Student_____Grade____School_____Teacher_____

Please evaluate this student by circling the appropriate number below. Ten is the highest score.

Specific Abilities

Originality	1 2 3 4 5 6 7 8 9 10
Leadership	1 2 3 4 5 6 7 8 9 10
Maturity of thinking	1 2 3 4 5 6 7 8 9 10
Flexibility of thinking	1 2 3 4 5 6 7 8 9 10
Independent thinker	1 2 3 4 5 6 7 8 9 10
Takes initiative	1 2 3 4 5 6 7 8 9 10
Adds something extra to projects	1 2 3 4 5 6 7 8 9 10
Contributes to class discussions	1 2 3 4 5 6 7 8 9 10
Keeps up with assignments and class work	1 2 3 4 5 6 7 8 9 10
Uses free time productively	1 2 3 4 5 6 7 8 9 10
Thinks beyond his/her age	1 2 3 4 5 6 7 8 9 10

SUB-TOTAL_____

General Abilities

Creativity	1 2 3 4 5 6 7 8 9 10
Task Commitment (The ability to persevere in work)	1 2 3 4 5 6 7 8 9 10

Overall: I would recommend this student for the GATE program (10=Yes! 0=No!) 1 2 3 4 5 6 7 8 9 10

SUB-TOTAL_____ X3 = _____

TOTAL POINTS_____

Thanks for your help in evaluating this student. Are there any other factors (learning, emotional, language handicap) that should be taken into consideration? Please explain.

Appendix C

Teacher Questionnaire

Using the rating scale below and at the top of the next page, please rate each student in your class on the seven areas described below. If a student in your class is not listed, please add his or her name and rate his or her seven intelligences at the bottom of the page. Thank you.

Interpersonal skills refers to the extent to which student demonstrates leadership skills, friendship skills, and skill with working with other students in or out of class.

Musical skills refers to the extent to which student plays instruments, sings, or composes music. Third-grade students play flute, upper-grade students may be in band or chorus. To what extent does each student play, sing, or keep rhythm?

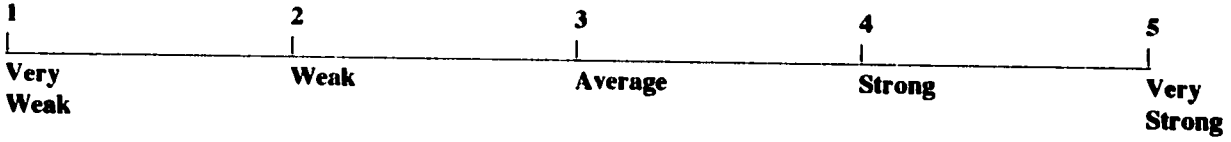
Artistic skills refers to the extent to which student draws, paints, sculpts, or sketches objects that resemble reality or exhibit creativity. He or she may use color, shadow, or perspective in art activities. A student's art may have been noticed under the direction of his or regular teacher, an art docent, or the fine arts teacher.

Bodily-kinesthetic skills refers to the extent to which student has hand-eye coordination, mind-body control, balance or endurance as exhibited in dance lessons, sports activities, physical education, or recess.

Intrapersonal skills refers to the extent to which student works independently and prefers to work alone.

Verbal-linguistic skills refers to the extent to which student reads, writes, expresses, and develops ideas in written or verbal form.

Logical-mathematical skills refers to the extent to which student understands patterns, logic, and mathematical concepts.



Please circle the appropriate number for each of the seven areas.

School:_____

Teacher:_____

1	2	3	4	5
Very Weak	Weak	Average	Strong	Very Strong

STUDENT NAMES	Interpersonal	Musical	Artistic	Bodily-kinesthetic	Intrapersonal	Linguistic	Mathematics
Student 1	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Student 2	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Student 3	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Student 4	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Student 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Student 6	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Student 7	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Student 8	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Student 9	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Student 10	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Student 11	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Student 12	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Student 13	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Student 14	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Student 15	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Student 16	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Student 17	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Student 18	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Student 19	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Student 20	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

Appendix D

List of Variables

Variable Number	Name of Assessment	Name of Variable	Comments
1	SAT9	Total Reading	These 3 variables will be measured in terms of percentiles and Normal Curve Equivalents (NCEs).
2	SAT9	Language	
3	SAT9	Total Mathematics	
4	NNAT	Pattern Completion Reasoning by Analogy Serial Reasoning Spatial Visualization	These 4 variables will be measured in terms of percentiles and Normal Curve Equivalents (NCEs).
5	Teacher Nomination	Originality Leadership Maturity of thinking Flexibility of thinking Independent thinker Takes initiative Adds something extra to projects Contributes to class discussions Keeps up with assignments and class work Thinks beyond his or her age Creativity Task Commitment Overall	The first 11 variables are worth 10 points each. The last 3 variables are worth 30 points each. Only students judged by their teachers to have gifted potential will be rated.
6	TIMI	Verbal-linguistic	These 7 variables will be assessed in terms of student preferences for an intelligence in a forced-choice format. Each intelligence is presented 8 times on a scale of 1 to 8.
7	TIMI	Logical-mathematical	
8	TIMI	Spatial	
9	TIMI	Musical	
10	TIMI	Bodily-kinesthetic	
11	TIMI	Intrapersonal	
12	TIMI	Interpersonal	
13	TQ	Verbal-linguistic	These 7 variables will be rated by the students' teachers on a scale of 1 to 5.
14	TQ	Logical-mathematical	
15	TQ	Spatial	
16	TQ	Musical	
17	TQ	Bodily-kinesthetic	
18	TQ	Intrapersonal	
19	TQ	Interpersonal	

Variable Number	Name of Assessment	Name of Variable	Comments
20	LSI	Visual	These 5 variables will be assessed in terms of students' preferences for each learning style. The scores will be standardized with points ranging from 20 to 80. A standard score of 60 or higher indicates that style is important to the student. A score of 40 or lower represents a style that is not important to the student. A score of 40 to 60 indicates that the particular circumstances, task, or interest level is more important than the learning style.
21	LSI	Auditory	
22	LSI	Kinesthetic	
23	LSI	Tactile	
24	LSI	Intrapersonal/ Interpersonal	

Appendix E

Correlation Coefficients of Variables Listed in Appendix D

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	1.00	.72	.80	.49	.36	.00	-.08	-.12	-.03	.04	-.02	.27	.63	.11	.13	.37	.20	.50	.35	-.18	-.20	-.08	-.02	-.03
2		1.00	.74	.47	.30	.08	.07	-.19	-.10	.09	-.16	.22	.50	.01	.15	.33	.34	.47	.42	-.14	-.15	-.04	-.01	-.03
3			1.00	.47	.34	.07	-.01	-.19	-.01	.02	-.08	.22	.63	.08	.21	.37	.16	.49	.45	-.18	-.15	-.09	.01	-.10
4				1.00	.16	.07	-.01	-.05	-.05	-.02	-.11	.15	.37	.03	.23	.23	.12	.33	.21	-.01	.00	-.13	.07	.04
5					1.00	.09	.04	-.13	-.03	-.05	.00	.10	.46	.33	.19	.29	.07	.39	.15	-.13	-.19	.11	.05	.06
6						1.00	.27	-.26	-.13	-.21	-.34	-.42	.08	-.05	.15	.09	.10	.11	.18	-.14	-.13	.18	-.05	.04
7							1.00	-.28	-.25	-.24	-.36	-.42	-.08	.00	-.10	-.03	.23	.04	.06	-.11	-.06	.18	-.02	.11
8								1.00	-.10	-.20	.04	-.12	-.19	.11	-.02	-.16	-.12	-.16	-.16	.11	.20	-.05	.20	.02
9									1.00	-.30	-.09	-.14	-.04	.05	.01	.04	-.14	.01	-.03	.02	.02	.00	-.06	.04
10										1.00	-.09	.21	-.01	-.09	-.08	-.01	.08	-.03	-.03	.07	-.02	-.09	-.04	-.09
11											1.00	.05	.04	.00	-.01	-.07	-.15	-.10	-.11	-.09	-.04	-.10	.05	-.09
12												1.00	.27	-.01	.03	.09	-.05	.11	.09	.11	.09	-.22	-.05	-.07
13													1.00	.10	.31	.47	.22	.54	.49	-.08	-.15	-.03	-.02	-.02
14														1.00	.02	.24	-.10	.08	-.01	-.08	-.07	.09	.11	.06
15															1.00	.35	.06	.22	.20	-.04	.01	-.14	.04	.10
16																1.00	.26	.43	.37	-.12	-.20	-.01	.03	.02
17																	1.00	.18	.42	-.01	-.05	-.14	-.02	-.05
18																		1.00	.32	-.11	-.16	.02	-.12	-.04
19																			1.00	-.13	-.08	-.05	-.03	-.05
20																				1.00	.25	.06	.15	.25
21																					1.00	-.39	.25	.16
22																						1.00	.06	.16
23																							1.00	.44
24																								1.00

Appendix F

Means and Standard Deviations of Variables Listed in Appendix D

Variable	Name of Assessment	n	Mean	SD
1	SAT9 Reading NCE	246	60.42	17.53
2	SAT9 Language NCE	264	64.23	18.66
3	SAT9 Mathematics NCE	260	62.84	18.72
4	NNAT Scaled Score	276	606.27	39.27
5	Teacher Nominations	287	0.14	0.35
6	TIMI Verbal-linguistic	277	3.82	1.58
7	TIMI Logical-mathematical	277	4.38	2.02
8	TIMI Spatial	277	4.78	1.63
9	TIMI Musical	277	3.42	1.65
10	TIMI Bodily-kinesthetic	277	4.44	1.46
11	TIMI Intrapersonal	277	2.60	1.36
12	TIMI Interpersonal	277	4.43	1.66
13	TQ Verbal-linguistic	269	3.41	1.05
14	TQ Logical-mathematical	269	4.63	9.30
15	TQ Spatial	269	3.47	0.92
16	TQ Musical	269	3.35	0.75
17	TQ Bodily-kinesthetic	269	3.60	0.82
18	TQ Intrapersonal	269	3.36	0.95
19	TQ Interpersonal	269	3.48	0.94
20	LSI Visual	242	45.30	6.71
21	LSI Auditory	242	31.79	7.27
22	LSI Kinesthetic	242	38.63	6.90
23	LSI Tactile	242	37.54	5.71
24	LSI Intrapersonal/Interpersonal	242	31.37	6.53

THE UNIVERSITY OF SAN FRANCISCO

Dissertation Abstract

A Comparison of Gifted Identification Methods Using Measures of Achievement, Ability, Multiple Intelligences, and Teacher Nominations

Although the definition of giftedness has changed from *g* or global intelligence as measured by language and mathematical abilities on intelligence tests, the practice of identifying gifted students based on the new conception has not come to fruition. The discrepancy between theory and practice evidenced in the literature framed the context of the present study. The purpose of this study was to investigate whether existing methods of identification for gifted programs may miss some gifted students.

In the district where this study took place, the Standard Achievement Test, 9th Edition (SAT9), Naglieri Nonverbal Ability Test (NNAT), and a teacher nomination sheet formed the traditional method used to identify gifted students. The Teele Inventory of Multiple Intelligences (TIMI) was the inventory used to assess students' multiple intelligences (MI) preferences and comprised the MI method.

A correlational strategy was used in this descriptive study to analyze data from 276 fourth-grade students. Results showed that students identified by the traditional method differed from students identified by the MI method. Because there was a difference in the students identified, they were organized into four groups: Students who were (a) not identified by any method, (b) identified by the traditional method only, (c) identified by the MI method only, and (d) identified by both methods. Subsequent analyses showed that student preferences for particular intelligences did not manifest in corresponding strengths in achievement or ability.

An attempt was made to obtain validity evidence for the TIMI by comparing corresponding TIMI scales with the SAT9 reading, SAT9 language, SAT9 mathematics, NNAT, teacher questionnaire measuring their students' MI, and a Learning Styles Inventory (LSI). The visual, auditory, kinesthetic, tactile, and intrapersonal/interpersonal subscales on the LSI were the only subscales of the inventory used. There was little or no agreement between the various measures and corresponding subscales of the TIMI.

Because little validity evidence was obtained for the MI measure used in this study, the data are inconclusive as to whether the traditional method is missing students who may be eligible for gifted programming. It is possible that the MI method missed more gifted students than the traditional method.

Jamie J. Worthington, Author

Dr. Patricia Busk
Chairperson, Dissertation Committee

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