PAMELA LYNN GREEN
Multiple Intelligences and Student Achievement in Elementary Classrooms
(Under the direction of L. DAVID WELLER)

The purpose of the study was to determine to what extent selected elementary schools in Georgia have incorporated multiple intelligences (MI) into classroom instruction. The study then compared the reading and mathematics achievement of 30 students in MI third grade and MI fourth grade classrooms to 30 matched students in non-MI third and fourth grade classrooms. Eight MI checklists were developed by the researcher and first used in a pilot study. Pilot study results revealed that MI teachers used MI to a higher degree than non-MI teachers. The eight checklists were then used in a research study of two third grade and two fourth grade classrooms to measure the extent that MI was implemented into instruction. Results revealed that the two MI teachers spent most of their instructional time implementing MI to medium and high degrees while the two non-MI teachers implemented MI to a low degree.

Reading and mathematics achievement scores were retrieved from 60 students' Iowa Test of Basic Skills (ITBS) from Spring 1999 and Spring 2000. When analyzing the results using the repeated measures analysis of variance, third grade reading, fourth grade reading and fourth grade mathematics did not reveal statistically significant differences at the .05 level. There was a statistically significant difference in the mean scores for mathematics total for the third grade groups. The non-MI third grade group performed better than the MI group.

INDEX WORDS: Multiple Intelligences, Elementary Education, Georgia Elementary Education

MULTIPLE INTELLIGENCES AND STUDENT ACHIEVEMENT IN ELEMENTARY CLASSROOMS

by

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DEDICATION

This is dedicated to my children Audrey Nicole Green and Ethan Thomas Green. I hope for them the best that life has to offer as they strive to be loving, thoughtful, people who embrace the opportunity to become life-long learners.

This is also dedicated to the memory of my son, Nathan Thomas Green, and to the other loved ones I have been privileged to know who have inspired me by how they have lived.

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CHAPTER 1

INTRODUCTION

Gardner (1983) explained intelligence as a biopsychological ability and that “all members of the species have the potential to exercise a set of intellectual faculties of which the species is capable” (pp. 36-37). In 1993, Gardner stated that intelligence is multi-faceted and cannot be thoroughly measured by tests or by a single attribute score. He identified eight intelligences as linguistic, musical, logical-mathematical, spatial, bodily-kinesthetic, interpersonal, intrapersonal, and the naturalist (Gardner, 1999). Individuals high in linguistic intelligence have the capability to use language in verbal, written, and visual forms. Those high in musical intelligence have quality singing voices, remember melodies, easily learn to play an instrument, and create music. Logical-mathematical intelligence people have scientific and mathematical strengths -- they enjoy experimenting with how things work. Individuals high in spatial intelligence can maneuver objects in three-dimensions. Those high in bodily-kinesthetic intelligence have the ability to solve problems using one’s whole body. Working with tactile experiences, dramatics, and physical activity are strengths for these individuals. Those strong in interpersonal intelligence have a keen understanding of others and what motivates them while those strong in intrapersonal intelligence form an accurate model of oneself.

It is important to note that since the publication of Gardner’s (1983) book, Frames of Mind, an eighth intelligence has

been introduced. In Intelligence Reframed, Gardner (1999) officially added the naturalist as the eighth intelligence. The naturalistic intelligence, as described by Gardner, referred to those individuals who have "the ability to recognize and classify plants, minerals, and animals, including rocks and grass and all variety of flora and fauna" (Checkley, 1997, p. 9). Fogarty (1997) further commented on "the behaviors of relating, discovering, uncovering, observing, digging, planting, comparing, displaying, and sorting as examples of the types of skills a teacher would have to help his or her students develop to nurture the naturalist intelligence" (p. 12).

Armstrong (1994) explained Multiple Intelligences (MI) theory as a "cognitive model that seeks to describe how individuals use their intelligence to solve problems and fashion products" (p. 14). Armstrong contended that the MI model focused on the idea that individuals possess all the intelligences but to various degrees ranging from highly developed to highly underdeveloped. He also concluded that individuals can develop each intelligence to an adequate level of competency, they can work intelligences together in complex ways, and that there is "no standard set of attributes that one must have to be considered intelligent in a specific area" (p.12).

Lazear (1991) supported the idea that intelligence is pluralistic and has stated that intelligence is "a multiple reality that occurs in different parts of the brain/mind system" (p. ix). Lazear also maintained that "the stronger intelligences tend to 'train' weaker ones to do their part in solving the problem or accomplishing the project" (1991, p. ix).

Statement of the Problem

The problem of this study was to determine if the implementation of the multiple intelligences approach to instruction had an effect on the reading and mathematics achievement of third and fourth grade students in Georgia as demonstrated on the Iowa Test of Basic Skills (ITBS). Few elementary schools in Georgia have implemented the multiple intelligences approach to instruction for three or more years. At the time this research was conducted, the researcher did not locate any studies conducted within Georgia elementary schools to detect if the implementation of the multiple intelligences approach increased students' reading and mathematics achievement scores on standardized tests. Elementary school teachers bring various styles and approaches to instruction in the classroom setting. Students in elementary schools become exposed to various methods that the teachers, administration, or school boards have determined to be effective in promoting academic achievement. Although achievement tests may be very restrictive as to the types of student skills measured by these tests, achievement tests have been utilized as one of the primary sources for detecting academic success in schools. Therefore, school administrators have tried to promote the inclusion of teaching approaches that will have significant positive results on standardized tests of achievement.

In Georgia, the most recent legislation known as the A Plus Education Reform Act of 2000 mandated the use of standardized tests for students to determine achievement in schools. The bill created the Office of Education Accountability which has the powers and duties "to develop accountability systems with

components that include but are not limited to expectations of student achievement [and] measurement of student achievement . . . .” (A Plus Education Reform Act of 2000, 17 § 20-14-26, p. 931). The bill encompasses specific criteria that schools must meet in order to receive satisfactory grades. Schools graded “D or F on student performance for the absolute student achievement standard or on progress on improved student achievement. . .” will be recommended by the Office of Accountability to the State Board of Education for “. . . appropriate levels of interventions for that school, based on a scale of increasingly severe interventions. . . .” (A Plus Education Reform Act of 2000, 17 § 20-14-41, p. 940). Schools with three consecutive years of D or F grades will have the State Board of Education to intervene by removing staff “including the principal and personnel whose performance has continued not to produce student achievement gains. . . .” (§ 20-14-41, p. 941).

The A Plus Education Reform Act of 2000 requires educators in Georgia to be accountable for the academic progress of their students. School systems in Georgia will be either rewarded financially or put on probationary status based upon the results of the required student assessments. Teachers will be encouraged to implement instructional methods that promote student achievement. The MI approach to instruction is a new method to Georgia and a limited number of schools have incorporated the MI approach based upon the eight intelligences as described by Gardner (1983, 1993, 1999). Teachers trained in the MI approach implement MI concepts into the instructional setting while focusing on students’ intellectual strengths.

The MI approach has been inclusive of various intelligences that students may demonstrate as strengths in the academic setting. Although standardized tests are primarily composed of the linguistic and mathematical modes, students have demonstrated strengths in other areas of intellect such as spatial and bodily-kinesthetic. Furthermore, the implementation of MI into classrooms have impacted students' reading and mathematics achievement (Gens, Provance, VanDuyne, & Zimmerman, 1998; Kuzniewski, Sanders, Smith, Swanson, & Urich, 1998). Students participating in music and art activities within instruction have received significantly higher reading and mathematics scores on standardized tests (Bezruczko, 1997; Dryden, 1992; Kelstrom, 1998). Students participating in music instruction have also received high scores in spatial reasoning (Rauscher, Shaw, Levine, Ky, & Wright, 1994). Students utilizing bodily-kinesthetic activities, in the form of art training specifically, have had positive correlations with their standardized reading and mathematics scores (Bezruczko, 1997). In addition, links to intrapersonal and interpersonal development have been noted in positive correlations that have existed between social skill development subscales of cooperation, self-control and assertion and achievement scores (Agostin & Bain, 1997). Therefore, it may be beneficial to the academic progress of elementary school students for educators to utilize the MI approach to instruction.

Purpose of the Study

The purpose of the study was to determine which elementary schools in Georgia have incorporated multiple intelligences (MI) into the curriculum and then to compare the reading and mathematics achievement of students in third and fourth grade MI

classrooms to matched students in non-MI settings. The purpose of the two sets of comparisons was to determine if there were any statistically significant differences in student achievement in the academic areas of reading and mathematics depending upon whether or not students received the MI method of instruction. One MI school and one non-MI school were selected for the study.

Definition of Terms

This section defines terms important to this study.

Bodily-Kinesthetic Intelligence: The ability to use "one's whole body of parts of the body" to solve problems (Gardner, 1999, p. 42). Individuals strong in this intelligence excel in physical activity, dramatic, and working with tactile experiences.

Dependent Variables: These variables will be the reading and mathematics scores on the ITBS for the third and fourth grade students in MI and traditional classrooms. The ITBS Spring scores from 1999 and 2000 will be analyzed as the pretest and posttest scores for third and fourth grade students.

Independent Variables: These variables will describe the types of instructional approach utilized within the third and fourth grade classrooms. Classrooms will be designated as utilizing the MI or traditional approach to instruction.

Interpersonal Intelligence: The ability to understand others and what motivates them. The capacity "to understand the intentions, motivations, and desires of other people and, consequently, to work effectively with others" (Gardner, 1999 p. 43).

Intrapersonal Intelligence: The ability "to understand oneself, to have an effective working model of oneself—including

one's own desires, fears, and capacities—and to use such information effectively in regulating ones' own life" (Gardner, 1999, p. 43).

Linguistic Intelligence: This intelligence is "sensitivity to spoken and written language, the ability to learn languages, and the capacity to use language to accomplish certain goals" (Gardner, 1999, p. 41). Individuals high in linguistic intelligence enjoy word games, speaking, and listening.

Logical-Mathematical Intelligence: The ability to "analyze problems logically, carry out mathematical operations, and investigate issues scientifically" (Gardner, 1999, p. 42). Individuals high in logical-mathematical intelligence enjoy experimentation and knowing how things work.

Mathematics Achievement: The level of mathematics ability at which an individual is estimated to be functioning at a particular time. Definition obtained from the Georgia State Department of Education (C. Keeber, personal communication, July 27, 2000).

Multiple Intelligences (MI): Gardner's (1983, 1999) pluralistic view of intelligence that integrates individual strengths in various levels of eight areas: linguistic, logical-mathematical, spatial, bodily-kinesthetic, musical, interpersonal, intrapersonal, and naturalistic. Gardner (1999) defined an intelligence as "a biopsychological potential to process information that can be activated in a cultural setting to solve problems or create products that are of value in a culture" (pp. 13-14).

Musical Intelligence: The ability to exhibit skill in the "performance, composition, and appreciation of musical patterns"

(Gardner,1999, p. 42). Those high in musical intelligence have good singing voices, remember melodies, easily learn to play instruments, naturally create and compose music and have a rhythmic speaking voice.

Naturalistic Intelligence: The "expertise in the recognition and classification of the numerous species--the flora and fauna--of his or her environment" (Gardner, 1999, p. 48). Individuals high in the naturalist intelligence have the ability to develop an understanding of different species, recognize patterns in nature, classify objects, and quickly grasp relationships in ecosystems.

Non-MI Classrooms: Classrooms where teachers do not knowingly or deliberately engage in MI instruction. These classrooms have not incorporated other specialty approaches, such as Montessori, into classroom instruction.

Reading Achievement: The level of reading ability at which an individual is estimated to be functioning at a particular time. Definition obtained from the Georgia State Department of Education (C. Keeber, personal communication, July 27, 2000).

Spatial Intelligence: The potential "to recognize and manipulate the patterns of wide space" as well as "the patterns of more confined areas" (Gardner, 1999, p. 42). Having the skills to visually depict information then recreate and manipulate it is important for pilots, sculptors, and surgeons. Those strong in spatial intelligence have the ability to make intricate graphic representations, work well with puzzles, and illustrating.

Stable Population: Having a very small percentage of the student population moving in or out of the current school setting.

Transient Population: In relation to the amount of movement students have from the current school system to another.

Research Questions

1. Was there a statistically significant differences in the mean reading achievement score of third grade students, as measured by the ITBS in Spring 2000, compared to the Spring 1999 reading achievement score, when students received the MI or non-MI approach to instruction?
2. Was there a statistically significant differences in the mean mathematics achievement score of third grade students, as measured by the ITBS in Spring 2000, compared to the Spring 1999 mathematics achievement score, when students received the MI or non-MI approach to instruction?
3. Was there a statistically significant differences in the mean reading achievement of fourth grade students, as measured by the ITBS in Spring 2000, compared to the Spring 1999 reading achievement score, when students received the MI or non-MI approach to instruction?
4. Was there a statistically significant differences in the mean mathematics achievement of fourth grade students, as measured by the ITBS in Spring 2000, compared to the Spring 1999 mathematics achievement score, when students received the MI or non-MI approach to instruction?

Significance of the Study

Results of the study may be beneficial to teachers and administrators of elementary schools. Data presented might

assist educators in making a decision whether or not to incorporate MI into the instructional process. Data obtained from the observations might assist educators in detecting to what degree MI was implemented within MI and non-MI third and fourth grade classrooms. Information obtained from the study may be utilized in the development of curriculum guidelines at the elementary level. Administrators at the county level may include information on the MI approach to instruction within the county standards set for student achievement.

Limitations of the Study

1. The researcher did not have control over teacher style and the amount of MI practiced in the delivery of the curriculum content.
2. The researcher did not have control over the intelligence or academic abilities of the students participating in the study. Students were matched as closely as possible according to school-wide factors such as student enrollment, soci-economic status, and ethnicity. However, students' individual ability levels were not analyzed.
3. The researcher did not determine the students' learning styles.

Organization of the Study

The study was organized in chapters. The first chapter explained the introduction and problem focus of the study. Chapter two provided a review of the literature. The third chapter described the method of the study and the data collection process. Chapter four described the research findings and gave an analysis. The fifth chapter presented the summary of the

research findings, conclusions, implications and discussion, and recommendations for further research.

CHAPTER 2

REVIEW OF THE LITERATURE

Introduction

Philosophers, psychologists, and educators have attempted to capture the essence of intelligence. Early written descriptions of general intelligence began with studies by Terman (1916) and Spearman (1927). Both psychologists conceptualized general intelligence, or the 'g' factor, as rooted in the nervous system and measurable by intelligence tests. Jensen (1998) expanded the 'g' theory to include reaction time and position emission tomography (PET) scanning. Other psychologists have denied that intelligence can be thoroughly measured by tests due to its multi-faceted nature (Gardner, 1993; Sternberg, 1988). Sternberg's (1988) "triarchic theory" hypothesized three unique intelligences--metacomponents, performance components, and knowledge acquisition. Gardner (1993) defined intelligence as a "biopsychological potential" that had several components of total intellect. He defined intelligence as "the ability to solve problems, or to fashion products, that are valued in one or more cultural or community settings" (p. 7). Furthermore, Gardner's work with Csikszentmihalyi and Feldman has led to the "distinction between intelligence as a biopsychological potential; domain as the discipline or craft that is practiced in society; and field, the set of institutions and judges determining which products within a domain are of merit" (p. 37).

Various theorists have established explanations of intelligence. While some authors view intelligence as a single

measurement of mental capacities others view intelligence as multi-faceted with specific components that may not always be measurable by standard means.

Overview of Intelligence

Galton was known as a differential psychologist. Although he never offered a formal definition of intelligence, he favored a term "mental ability" that comprised both general ability and a number of special abilities such as linguistic, mathematical, musical, artistic, and memorial (as cited in Jensen, 1998). In Galton's Inquiries into Human Faculty and its Development, originally written in London in 1907 and later revised in 1973, he described this ability as a combination of the conscious and the subconscious. Galton (1973) described mental ability when he stated that "there seems to be a presence-chamber in my mind where full consciousness holds court, and where two or three ideas are at the same time in audience, and an antechamber full of more or less allied ideas, which is situated just beyond the full keen of consciousness" (p. 146). He also described progression of the thought process as dependent upon the number of available ideas an individual has in the antechamber, the capacity of the individual to restrict the ideas pertaining to the topic, and the pertinence or "justness of the logical mechanism" that summoned the thought (p. 146).

Terman believed in a general *g* factor of intelligence that could be measured through testing. Terman (1916) stated that "no adequate definition can possibly be framed which is not based primarily on the symptoms empirically brought to light by the test method" (p. 44). He indicated that intelligence existed in degrees and should be measured accordingly. He explained that it

was necessary to have an accurate diagnosis of intelligence or "one which will differentiate more finely the many degrees and qualities of intelligence" (p. 23). His belief that an individual's level of intelligence has the utmost importance to future success was clearly apparent when he stated that "with the exception of moral character, there is nothing as significant for a child's future as his grade of intelligence" (p. 20).

Spearman (1927) gave the label *g* to describe intelligence and focused on *g* as mental energy that could be applied to every kind of mental task. Spearman's two-factor theory, was first published in London in 1932. In his research, he contended that mental tests measured intelligence by a "general factor" denoted by *g* and a "specific factor" denoted by *s* (1970, p. 75). Spearman described *g* as "general mental energy" and *s* as "the efficiency of specific mental engines" (p. 137). The theory described *g* as varied from individual to individual although remaining the same for any one individual in respect to correlated abilities. The *s*, however, varied in individuals from ability to ability. The specific factor in individuals was linked to the energy served in the cortex. Drawing from his original work from London in 1923, he suggested that such neural groups would "function as alternative 'engines' into which the common supply of 'energy' could be alternatively distributed" (1973, pp. 5-6). Spearman (1970) indicated that mental activity consisted of energy "in ever varying manifestations" (p. 133). However, he indicated that "all energy needs to be supplemented by some engine or engines in which to operate" (p. 414). Therefore, according to Speaman, mental energy could only work when delivered to specific engines that would mediate the individual's performance.

Jensen (1998) defined the term intelligence as in application to “the whole class of processes or operating principles of the nervous system that make possible the behavioral functions that mediate an organism’s adaptation to its environment. . . .” (p. 46). He correlated intelligence tests to *g* and the speed-of-processing measured by response time (RT) in various elementary cognitive tasks (ECT). He explained that *g* and response time have been noted to be related to one another because they “depend on the basic speed and efficiency of information processing” (p.243-244). In addition, Jensen’s RT studies found that subjects with the highest intelligence quotients (IQ) had the most rapid reaction time. A second finding was the variability of RT with an even larger negative correlation with the intelligence quotient (IQ) than speed. Smarter subjects were not only faster but more consistent. While Jensen stated that although biologically normal persons have the same neural “hardware,” he contended that the intellectual differences were not structural but “rather a matter of how efficiently the ‘hardware’ functions....” (p. 256).

Jensen also attempted to link *g* and IQ with the position emission tomography (PET) scan. The data collected in his studies revealed a significant interaction between IQ level and mental effort by measuring the glucose metabolic rate (GMR), or brain food, utilized during tasks. High IQ subjects and average IQ subjects did not differ on GMR when given easy tasks to perform. However, the high IQ subjects had increased GMR on difficult tasks suggesting that “more neural units are involved” in their level of performance (Jensen, 1998, p. 159).

Theorists such as Galton (1973), Terman (1916), Spearman (1970, 1973), and Jensen (1998) have attempted to explain intelligence as a factor, known as *g*. These researchers have attempted through their research to define *g* by according to their standards of measurements for mental abilities.

Early Intelligence Assessments and the Relation to 'g'

Binet (as cited in Wolf, 1973) viewed intelligence as having two principles. He explained that intelligence consisted of the perceptions of the external world and then the reconsideration of these perceptions into memory. Binet conceived intelligence as "an act, a process, a force - that takes in external stimuli, organizes, directs, chooses, adapts them, all in ways that differ greatly among individuals (as cited in Wolf, 1973, p. 160). Although Binet held the conviction that "intelligence is embedded in the total personality," his tests gave intelligence a more independent type of existence (as cited in Wolf, 1973, p. 159). Binet (as cited by Jensen, 1998) invented the first valid and practical intelligence test in 1905. Binet borrowed a few of Galton's more promising tests but expanded these to include the higher mental processes. "Test scores scaled in units of mental age derived from Binet's battery proved to have practical value in identifying mentally retarded children and in assessing children's readiness for schoolwork" (as cited in Jensen, 1998, p. 15). Binet's final revision came in 1911. Although he made no changes in schema, he had "shifted his central emphasis" from judgment in orientation to how a person makes adjustments to the environment (as cited in Wolf, 1973, p.209).

Wechsler (1958) operationally defined intelligence as "the aggregate or global capacity of the individual to act

purposefully, to think rationally and to deal effectively with his environment" (p. 7). Wechsler (1958) believed in the global nature of intelligence and that it could only be evaluated quantitatively by the measurement of the various aspects of abilities. He created intelligence assessment tests entitled the Wechsler Intelligence Scale for Children Revised (WISC-R), the Wechsler Preschool and Primary Scale of Intelligence (WPPSI), and the Wechsler Adult Intelligence Scale-Revised (WAIS-R).

Binet and Wechsler defined intelligence through measurements for intellectual assessment. These researchers established a means to measure aspects of individual abilities. Scores derived from the intelligence tests correspond to an overall number for general intelligence level.

Arguments Against 'g' and Intelligence

Guilford's (1967) Structure-of-Intellect (SOI) model claimed that three categories of ability exist. The contents, products, and operations areas of intellect each comprise specific abilities in a cube-shaped configuration. These abilities, in turn, then have been derived by the intersection of one form of each of the three facets. For example, auditory digit span memory would fall into the cell created by the intersection of contents-auditory multiplied by products-units multiplied by operations-memory. Guilford's theory did not recognize the existence of *g* and stated that it "does not give support to a hierarchical conception of their (the factors') interrelationships" (p. 61).

Thorndike's (1949) theory of connectionism contended that learning consisted of selecting and connecting stimuli (S), or satisfiers, which lead to responses (R). Thorndike hypothesized

that these S-R connections, called bonda, differed among individuals. Jensen (1998) remarked that it appeared that Thorndike believed that individuals varied in "the total number of potential bonds they are able to acquire through learning and experience" (p. 118). Thorndike (1949) defined mental ability as "a probability that certain situations will evoke certain responses, that certain tasks can be achieved, (and) that certain mental products can be produced by the possessor of the ability" (p. 157). Thorndike stated that mental ability is defined by "the situations, responses, products, and tasks, not by some inner essence" (p. 157). Thorndike described how specific mental abilities had common elements that combined to form clusters; identified as social, concrete, and abstract intelligences. Jensen (1998) commented that Thorndike believed that "successful performance on any mental test item would involve the activation of some limited set of the S-R bonds" (p. 118).

Thomson's (1951) understanding of factor analysis gave way to his formalization of Thorndike's interpretation in mathematical terms. Thomson's formulation became known as the sampling theory of intelligence. He argued that although Spearman's *g* could indeed be extracted from the matrix of test intercorrelations by means of factor analysis, his hypothesis that *g* reflected general level of mental energy was not necessarily an explanation of g. Thomson (1951) contended that correlations could more likely be explained by the overlap of the multiple uncorrelated causal elements that enter into performance on all mental tests.

A theory which further challenged Spearman's *g* contention of intelligence was described by Cattell as the identification of

intelligence as the combination of fluid (Gf) and crystallized (Gc) abilities. Cattell (1963) argued that intelligence is comprised of crystallized ability loads in which “skilled judgement habits have become crystallized” (p. 2-3). In addition, fluid ability required “adaptation to new situations” (p. 3). Cattell explained that “crystallized ability has a form determined by, and representing, history” where as fluid ability “is due to an influence (that is) present and operative” at the time of the experiment (p. 5). While Cattell referred to fluid intelligence as biologically determined, he associated crystallized intelligence with acquired knowledge that is dependent upon exposure to culture. Sternberg (1996) has explained that fluid intelligence has required “the understanding of abstract and often novel relations as (required) in inductive-reasoning tests” such as the completion of number series or analogy tasks (p. 98). The Gc, however, has been more reflective of scholastic and cultural knowledge acquisition. The crystallized intelligence has been represented by the accumulation of knowledge. Persons high in Gf tended to acquire more Gc from their opportunities in learning that persons lower in Gf. Furthermore, a study by Cattell and Horn (1965) refined the theory of Cattell and revealed that the observed variance in intellectual performances could be understood in terms of six indicators. Fluid intelligence and crystallized intelligence were indicators one and two. The third indicator was general visualization or “representing processes of imagining the way objects may change as they move through space” (p. 268). General speediness, indicator four, could be measured “in simple writing and checking tasks” (p. 268). Cattell and Horn’s fifth and sixth

indicators included the ability to bring words “from long-term memory into immediate awareness” and “the factor indicating unwillingness to make a mistake” which were described as facility in using concept labels and carefulness (p. 268).

Sternberg has not posed anything instead of *g* but has attempted to explain it and supplement it through his triarchic theory. Sternberg (1988) described his theory as an integrative approach in the attempt to deal with the “interplay of intelligence with the internal world of the individual, with experience, and with the external world of the individual” (p. 58). He explained that the individual’s “relationship of intelligence to the internal world” through the mental processes referred to as “metacomponents, performance components, and knowledge acquisition components” (p. 59). He contended that the “components of intelligence are interactive” and are applied to the experience factor in order for the individual “to serve three contextual functions--adaptation, selection, and shaping” (p. 66). The experience factor presented the ability of the individual to deal with novelty and automatize information. Sternberg explained that the “more intelligent people will tend to be more adept at responding to the initial novelty and will also automatize the task more efficiently” (p. 63). He related the *g* factor to his internal world area of the theory entitled metacomponents, or higher-order processes needed for problem solving.

Sternberg (1996) also described his theory of being successfully intelligent as “the kind of intelligence used to achieve important goals” (p. 12). Sternberg related that individuals with successful intelligence know their strengths and

weaknesses, capitalize on their strengths, and compensate for or correct their weaknesses. Sternberg (1997) commented on his unsatisfactory view of intelligence tests when he remarked that "people have been measuring what they believe is intelligence without having a really firm understanding of what it is that they are measuring" (p. 90). He explained that many theorists in psychology believe that "conventional tests of intelligence measure only a relatively narrow aspect of intelligence" (p. 90).

In his book, Frames of Mind, Gardner (1983) explained that intelligence was pluralistic in nature. Gardner (1993) defined intelligence as "the ability to solve problems, or to fashion products, that are valued in one or more cultural or community settings" (p. 7). Through his research, Gardner (1983, 1993) originally identified seven intelligences that had met specified criterion in order to be qualified as such. The seven intelligences were described as linguistic, musical, logical-mathematical, spatial, bodily-kinesthetic, interpersonal, and intrapersonal. Gardner (1999) has recently updated his theory of multiple intelligence in his book, Intelligence Reframed, to identify the naturalist as the eighth intelligence. Fogarty (1997) explained seven of the intelligences. Individuals high in linguistic intelligence have strengths in language and literacy. Those high in musical intelligence have the sense of melody, rhythm, and rhyme. Logical-mathematical intelligence people have the ability to reason and think in abstractions. Individuals high in spatial intelligence can visually depict and appreciate information and ideas. Those people high in bodily-kinesthetic intelligence have muscle memory in using one's whole body. Individuals high in interpersonal intelligence have a keen

understanding of interrelational character while those strong in intrapersonal intelligence comprises the inner self and soul. Roth (1998) stated that Gardner's description of those individuals with naturalist intelligence have a real mastery of taxonomy, have an understanding of different species, can recognize patterns in nature, classify objects, and quickly grasp relationships in ecosystems. Gardner (1999) explained that a naturalist "demonstrates expertise in the recognition and classification of the numerous species—flora and fauna—of his or her environment" (p. 48).

Armstrong (1994) stated that Gardner's theory of multiple intelligences suggested that intelligence should be determined based upon an individual's capacity to solve problems and fashion products in a context-rich and naturalistic setting rather than one that is unfamiliar to his/her natural learning environment and requires the completion of isolated tasks. Armstrong explained that each person possesses all of the intelligences, that they can develop each intelligence to an adequate level of competency, the intelligences work together in complex ways, and there are many ways to be intelligent in each category. In addition, according to Lazear (1991), individuals have each of the intelligences but not all of them have been developed equally. He contended that even though one intelligence may be stronger than another, this condition would not need to remain permanent. Lazear (1991) suggested that "we have within ourselves the capacity to activate all of our intelligences" (p.xvi).

Gardner's theory has been critical of *g* theory and tests that have been mainly reflective of *g*. He contended that recent

neurological research on brain modules support his theory. However, Jensen (1998) argued that the consideration of several sources of evidence used by Gardner to establish the existence of independent intelligences "may be used to support the existence of a superordinate general intelligence factor" (p. 130).

Several researchers (Guilford, 1967; Thorndike, 1949; Thomson, 1951; Cattell,1963; Gardner, 1983 & 1999) have disputed arguments that *g* exists as a single intelligence factor. Through Guilford's (1967) categories of abilities, Thorndike's (1949) clusters of intelligence, and Thomson's (1951) belief in multi-causal events these researchers have explained their views of intelligence as pluralistic. The studies of Cattell (1963) have revealed specific components of intelligence dealing with acquired and biological knowledge. While Sternberg (1985) defined intelligence in a triarchic method, he has also included being successfully intelligent as important to the definition of intelligence. Gardner (1983, 1999), Lazier (1991), Armstrong (1994), and Fogarty (1997) have also written their views of multiple intelligences. These authors have claimed that intelligence is multi-faceted with individuals exhibiting varying amounts of strengths in each intellectual arena. Gardner (1999), who originated the multiple intelligences theory, stated that eight intelligences exist and that individuals possess all of these eight intelligences to varying degrees.

Arguments Against Multiple Intelligences

Gardner's theory has been attacked by other theorists (Sternberg, 1994; Jensen, 1998) who do not share his view of intelligence as pluralistic, but they identify his theory as

subcomponents of intelligence, as an explanation for individual learning styles/talents or practical intelligence, or as not even a theory at all. Researchers have questioned if Gardner's theory has been validated and if the theory could have been created to explain individual talents.

Gardner (1983) stated that the plurality of intelligence has not been delegated for every skill found in human behavior due to the theory attempting to articulate only a manageable number of intelligences that appear to form naturally. However, several subcomponents will naturally combine in the areas of intelligence. Gardner has not presented his list of eight intelligences as exhaustive. Each intelligence, however, has been required to meet certain biological and psychological specifications. Sternberg (1994) contended that Gardner has presented no new research to test his theory. Sternberg stated that "we need to think of abilities more broadly than we have. . . ." (p.562). Jensen (1998) responded that the interpersonal and intrapersonal may be viewed as "aspects of personality rather than abilities" (p. 260). He further argued that the bodily-kinesthetic could be more appropriately considered as "aspects of motor skills and coordination" (Jensen, 1998, p. 260).

Challenging the idea that MI theory is a learning style, Gardner (1993) stated that children may well exhibit one style with one kind of information while exhibiting a contrasting style with other information. For example, he stated that students being reflective when working on a puzzle may be impulsive when in the musical realm. According to Armstrong (1994) a learning style can be explained as the intelligences put to work. He

remarked that learning styles have been “pragmatic manifestations of intelligences” which have operated in natural learning contexts (p. 13). Sternberg (1997) argued that a style “is not an ability, but rather, a preferred way of using the abilities one has” (p. 8). He stated that styles have been preferences in the use of abilities and not abilities themselves. Styles of thinking include various functions, forms, levels, scopes, and leanings. He contended that people differ in the strength of their preferences and that styles are measurable.

While Gardner stated that individuals have intellectual strengths, Sternberg suggested that the intellectual domains could be described as talents. Sternberg (1996) proposed that many talented people have been overlooked because of the way that intelligence has been measured. He and his colleagues have designed measurement instruments to test what Sternberg refers to as “tacit knowledge.” Sternberg stated that practically intelligent people use tacit knowledge or a more action-oriented knowledge “typically acquired without direct help from others and which allows individuals to achieve goals they personally value” (p. 236). Through his research on performance on measures of tacit knowledge predicting performance in management, Sternberg found correlations of “.2 to .4 between tacit-knowledge scores and salary, years of management experience, and whether the manager worked for a company at the top of the Fortune 500” (p. 239). Another study by Sternberg concluded that tacit knowledge was “significantly correlated with managerial compensation (.39) and level within the company (.36)” (p.239).

Sternberg and Wagner (1986) suggested intelligence should be thought about in more practical terms. Neisser (1976) has also

argued that tasks found on typical IQ tests are only measures of academic intelligence. Neisser (1976) described a more practical form of intelligence by taking an ethological approach in which intelligence is measured by performances in natural settings.

Furthermore, practical intelligence behavior has been defined by Charlesworth (1976) as “behavior under the control of cognitive processes and employed toward the solution of problems which challenge the well-being, needs, plans, and survival of the individual” (p.150). Sternberg and Wagner (1986) stated more than academic intelligence is needed for success in real-world settings since “correlation(s) between occupational performance and performance on either IQ or employment tests falls at about the .2 level” (p.52) Sternberg (1996) has defined his own theory of successful intelligence as the ability “to think well in three different ways: analytically, creatively, and practically” (p. 127). He described the three aspects of successful intelligence as being related to one another and that through this balance, intelligence becomes more important in everyday life. Sternberg stated that successfully intelligent people don’t just have abilities, they reflect on when and how to use these abilities effectively” (p. 128).

When addressing the issue as to whether the multiple intelligence theory is actually a theory at all, Gardner (1993) responded that MI can be confirmed “only through experiments and other kinds of empirical investigations” (p. 38). Sattler (1992) explained that Gardner’s MI theory is not a novel idea and has corresponded to the concept of crystallized intelligence and fluid intelligence. In addition, Sattler (1992) stated that

Gardner generally overlooked the related issues “involved in the reliability and validity of observational recordings. . .” (p. 56). In conclusion, Sattler (1992) has remarked that Gardner has not provided data “about the reliability and validity of components within his assessment approach” (p. 56).

Authors (Jensen, 1998; Sattler, 1992; Sternberg, 1996) have disputed the existence of the MI theory. Jensen (1998) has remarked that Gardner’s theory could be an explanation for coordination and personality rather than intelligences. Sternberg has related the MI theory to learning style and practical intelligence. Sattler (1992) and Sternberg (1996) have also expressed their concerns in Gardner’s lack of utilizing conventional measures the presentation of data in his assessment approach.

Merits of Multiple Intelligences

Gardner developed his theory of multiple intelligence upon brain research and the biological foundations of intelligence. Gardner (1983) explained his theory of multiple intelligences as brain systems that have met specific criteria. According to Gardner “it is the very nature of intelligences that each operates according to its own procedures and has its own biological bases” (p. 68).

Gardner (1983, 1999) has established eight prerequisites for formulating an intelligence. The first two criteria came from biological sciences. First, there must be potential isolation by brain damage where the intelligences can be dissociated from the others. Through his work with individuals who suffered damage to specific portions of the brain, Gardner argued that the existence of several relatively autonomous brain systems exist. Secondly,

the intelligence must have evolutionary history and plausibility. Gardner stated that “a specific intelligence becomes more plausible to the extent that one can locate its evolutionary antecedents” (1983, p. 65).

The third and fourth criteria of the prerequisites were derived from logical analysis. The third criterion required of the intelligence is an identifiable set of core operations that can deal with specific types of input and the fourth aspect is having susceptibility to encoding in a symbol system.

The two prerequisites that came from developmental psychology are the fifth and sixth criteria. The fifth criteria being that the intelligences each have their own developmental histories. The sixth criteria is that there is an existence of exceptional people such as savants and prodigies who exhibit unusual profiles of intelligence in certain areas.

The final two prerequisites, the seventh and eighth, are drawn from traditional psychological research. These criteria are support from experimental psychological tasks and from psychometric findings. Gardner (1999) explained that psychologists can measure the extent that two operations are related by watching how people complete two activities simultaneously. He contended that “if one activity doe not interfere with the other, researchers can assume that the activities draw on discrete brain and mental capacities” (p. 40). Although Gardner (1983) argues that “intelligence tests do not always test what they are claimed to test,” he does believe that “experiments provide a source of information relevant to intelligences” (p. 66).

Lazear (1991) contended that MI theory could be utilized to encourage individuals to enhance their intellectual abilities. He stated that recent discoveries about intelligence, such as MI theory, have suggested that individuals have the ability to enhance and amplify intelligence and not only can intelligence change, it can also be taught to others. In addition, he commented that intelligence occurs in different parts of the brain system and that the "stronger intelligences tend to 'train' the weaker ones" (p. ix). He further explained that someone can be called intelligent if he/she "can solve problems that face them in their lives and if they are able to produce things that are of value to our culture" (p. xi).

The incorporation of multiple intelligence theory into the classroom could also be beneficial to students with learning problems. Gardner (1980) suggested possibilities why students with learning difficulties have strengths in various intelligences outside of the linguistic arena. He described the structures within the hemispheres of the brain as key components to cognitive abilities. He stated that by school age the achievement of brain dominance, typically left hemisphere, has been essentially completed. A child's linguistic capacities have been established and become increasingly dominant. By implication then, right-hemisphere dominant capacities such as visual and spatial functions begin taking a back seat in cognitive terms. Gardner hypothesized that children with learning difficulties, specifically those with reading problems, tended to have late-occurring or mixed dominance. He also noted that these children were often observed as having an especially in depth involvement with graphic expression.

Multiple intelligences approaches have been used as interventions to assist students in developing skills leading to better class participation and using time wisely. Ellingson, Long, and McCullough (1997) studied third grade and middle school students who had MI interventions. The researchers found that middle school students, on one school site, demonstrated a 9% increase in staying on task and an 8% increase in using time wisely. Students also showed a 4% increase in beginning tasks in one minute or less. Students on a second school site had an average increase of 16% in classroom participation behaviors throughout the semester. The third grade students who were studied showed increases in all areas of time usage and participation.

The theory of MI has also expanded the traditional view of intelligence to include interpersonal and intrapersonal domains as possible areas for strength. Salovey (1990) defined emotional intelligence as being related to Gardner's personal intelligences when including these abilities into five domains. The domains have included: knowing one's emotions, managing emotions, motivating oneself, recognizing emotions in others, and handling relationships. Goleman (1995) explained that people differ in their abilities in each of these domains and that "intellect cannot work at its best without emotional intelligence" (p. 28). Goleman contended that lapses in emotional skills can be remedied when he stated, "to a great extent each of these domains represents a body of habit and responses that, with the right effort, can be improved on" (p. 44). In addition, Block (as cited in Goleman, 1995) compared individuals high in IQ to those high in emotional intelligence. Block stated that individuals

high in IQ may be “adept in the realm of mind but inept in the personal world" (as cited in Goleman, 1995, p. 44). A longitudinal study by Block found a modest correlation between emotional intelligence or “ego resilience” as it related to IQ. Block reported that male individuals high in emotional intelligence exhibited certain behaviors by being “socially poised, outgoing and cheerful, not prone to fearfulness or worried rumination” (as cited in Goleman, p. 45). Block also stated that women high in emotional intelligence tended to be “assertive and express their feelings directly, and to feel positive about themselves” (as cited in Goleman, p. 45).

Multiple intelligences theory has been utilized to enhance the development of specific areas of intelligence. Students strong in areas of intelligence other than linguistic or mathematics would have the opportunity to develop these strengths. Hoerr (1994b) suggested that before the introduction of MI within the school curricula, children who exhibited gifts in other areas were considered talented but not highly intelligent. However, developing specific areas of intelligence may be dependent upon students’ interests and maturation level. According to Gardner (1983), Soviet researchers Davydov, Elkonin, and Markova suggested that at each age of schooling, children exhibit different set of interests. These interests were described as: infancy when the dominant activity involved emotional contact, age two when the child has been absorbed in manipulation of objects, ages three to seven when role playing and symbolic activities are dominant, ages seven to eleven with formal school study, and adolescence with intimate personal relations and career-oriented exploration being the main thrust.

Gardner stated that educational programs should keep biases in mind since profiles of interest “may differ significantly across cultures” (p. 389). Gardner suggested a matching method for students to intellectual strengths. According to Gardner, such a system would “help ensure that a student can rapidly and smoothly master what needs to be mastered, and thus be freed to proceed further along both optional and optimal paths of development” (p. 389).

The merits of the MI theory were explained by several authors. Gardner based each intelligence upon brain research. To be an intelligence, eight criterion must be met. Lazear described the approach as being inclusive of intelligence occurring in different parts of the brain’s system. Salovey and Goleman’s (1995) work in emotional intelligence gives merit to the interpersonal and intrapersonal intelligences. Researchers such as Ellingson, Long, and McCullough (1997) studied the positive affects that MI has on class participation and time on task. Finally, MI could be utilized to enhance students’ strengths in various intellectual interests.

Multiple Intelligences and Achievement

Developing interpersonal and intrapersonal intelligences has been linked to academic success in school. A study of 184 kindergarten students by Agostin and Bain (1997) revealed that behaviors such as positive social skills, as well as social emotional factors, were important in predicting successful academic achievement and promotion in the early grade school years. Significant positive correlations existed between social skill subscales (cooperation, self-control, and assertion) and achievement scores. The researchers suggested that positive

social skills, such as self-control and cooperation, be included in screenings to identify children at risk for school failure. They stated that “screening measures should be chosen not only for their ability to estimate developmental readiness, but also to determine if the child has the social competence to perform in the early grades” (Agostin & Bain, 1997, p. 225).

Musical intelligence has been related to higher spatial scores on achievement subtests. In a study by Rauscher, Shaw, Levine, Ky, and Wright (1994) from the University of California, college students who listened to music by Mozart for ten minutes scored eight to nine points higher on the spatial reasoning subtest of the Stanford-Binet Intelligence Scale. The conclusion of the study was that music and spatial task performance were causally related. A study of 270 fifth grade students by Dryden (1992) investigated the impact of music instruction on academic achievement. Results revealed that band participants scored significantly higher in reading vocabulary and reading total scores. Male students scored statistically higher in reading vocabulary than females. Similarly, a series of studies by the College Board (as cited in Kelstrom, 1998) found that “music/art students scored significantly higher on both the mathematics and verbal sections of the SAT” (p. 36). In addition, a study by Rauscher (1993) with three-year-old children from an inner-city day care and from the school for the arts were given music training involving group singing classes or keyboard lessons. The study revealed that after music lessons, the spatial reasoning scores of both groups of children nearly doubled. As reported by Kelstrom (1998), music was reported as beneficial to eye-hand coordination which can transfer to writing skills and

develop perceptual skills. Outis (1994) studied groups of sixth grade students. Test scores revealed that when a multiple intelligences emphasis was put onto music activities, students showed increased effort, had higher achievement in music class, demonstrated higher self-esteem, and gained an understanding of the relevancy of music.

The body-kinesthetic intelligence could be integrated into the MI classroom in order to enhance thinking. Abstract concepts can become more concrete as students reflect upon them and kinesthetically interpret them into the physical education curriculum. The physical education program can integrate "authentic tasks related to the cognitive content from across the curriculum" (Westerhold, 1998, p. 17). A six-year longitudinal study by Bezruczko (1997) revealed that third grade students, trained in the technical aspects of art, produced clay models more prominent in features such as shaping and detailing and had a significant positive correlation with standardized reading and mathematics scores. Sixth graders participating in the art-trained school had a score of .63 standard deviation units above the overall grade six mean. These students had significantly higher mathematics achievement scores than students in non-art schools.

Implementation of multiple intelligences into the curriculum has been successful in increasing student reading comprehension skills in English and mathematics. Kuzniewski, Sanders, Smith, Swanson, and Urich (1998) studied students in ninth through eleventh grades who had been documented as unable to meet the demands of the Illinois Goal Assessment Program. Teachers utilized MI/cooperative learning techniques as interventions.

Posttest data indicated an increase in student reading comprehension skills in English and mathematics and an increase in student learning expectations. Forty-four percent of the students raised their scores at least one grade level on the mathematics applications section of the Stanford Achievement Test. After the treatment, Kuzniewski et al. (1998) found that "46% of the students scored below the ninth grade level as compared to the 63% below the ninth grade level on the pretest" (p. 33). On the Gates MacGinitie Post Test, freshman had an 18% improvement on the post test with only 2% failing to reach the fourth grade level. Sophomores had an 8% improvement on English post tests.

Gens, Provance, VanDuyne, and Zimmerman (1998) studied students in first and second grades with low reading comprehension scores. Post-intervention data revealed that students increased reading vocabulary and comprehension test scores. The nineteen first graders studied had an average increase in vocabulary development of .67 years and an increase in comprehension of .59 years. The sixty, second grade students, showed an average increase in vocabulary of .71 years and an increase of .93 years in reading comprehension. After six months of school and twelve weeks of MI intervention, the Stanford Achievement Test revealed that the first grade students demonstrated a grade equivalent score of 1.8 in reading and the second grade students had a grade equivalent score of 3.1.

Russell Elementary School in Lexington, Kentucky, (as cited in Campbell & Campbell, 1999) implemented MI in 1991 in order to improve student achievement. This K-5 school's population consisted of 195 students with 35% white and 65% African

American. Ninety-four percent of the students qualified for free or reduced lunch. After MI was implemented into the curriculum test scores began to improve. By 1996 the student test scores "had doubled from their baseline in 1992" (as cited in Campbell & Campbell, 1999, p. 24). On the performance-based test Kentucky Instructional Results Information System (KIRIS), not one student at Russell scored on the beginning "novice" level. As explained by Campbell and Campbell (1999), this was a feat that only two other elementary schools out of 35 in the county had accomplished. Another accomplishment was that there was no longer any discrepancy between black and white students' scores.

The implementation of MI into the curriculum has enhanced student achievement in various academic settings. Kuzniewski et al. (1998) found that reading comprehension and mathematics scores on standardized tests improved when MI was implemented within the high school level. Gens et al. (1998) revealed that first and second grade students with the MI approach had increased reading vocabulary and comprehension scores. Bezruczko stated the positive effects that art had on mathematics achievement scores for third grade students while research with kindergarten students by Agostin and Bain (1997) revealed positive social skills could predict academic achievement. Other authors such as Kelstrom (1998), Dryden (1992), and Outis (1994) explained the positive effects that the introduction of musical concepts into the curriculum had on spatial reasoning for college students, reading vocabulary for fifth grade students, hand-eye coordination for three-year-olds, and student effort for sixth graders.

MI Implementation in Classrooms

MI within a classroom environment has considered traditional instructional processes and redesigned the structure of effective teaching. Gardner (1993) stated that education has functioned on the basis that "there is one way of teaching, one way of learning, and individuals can be arrayed in terms of their skills at this mandated form" (p. 288). He further stated that educators should embody the ambitious goal of "producing education for understanding" (p. 299). Gardner (1993) continued by relating that only through careful research and education taking multiple intelligences seriously will we "be in a position to know which of these 'thought' and 'action experiment' make sense and which prove to be impractical or ill-advised" (p.250). Gardner stressed that educators should take individual differences very seriously. He commented that "you cannot be a good MI teacher if you don't want to know each child and try to gear how you teach how you evaluate to that particular child" (Checkley, 1997, p. 11). Therefore, implementation of the MI approach into the curriculum should be thought of as an avenue to enhancing academic progress by encouraging individual ways of learning.

The implementation of MI into the curriculum accentuated the importance of staying focused on the needs of the learner. Weller (1999) stated that "curriculum should respond to the nature of the learner, the society in which the learner functions, and the knowledge and skills most appropriate for the age of the learner" (p. 150). Furthermore, the implementation of MI into the curriculum has raised the question of how the assessment of the progress of the intelligences could be

measured. Hatch (1993) commented from his research with Gardner at Harvard Project Zero, a program implementing MI into the curriculum at the preschool level, that “both the curricula and assessments need to reflect the kinds of activities-the ‘authentic’ activities-that students are likely to experience outside of school” (p. 198). Lazear (1994) commented that in order to assess the full extent of students’ knowledge, “we must ask them to show us what they know in a wide variety of ways through tests that are couched in the unique language of each intelligence” (p. 108). When stating his views on the topic of authentic assessment, Lazear expressed his belief that intelligence-based assessment has suggested an evaluation process that is “brain-compatible and that applies state-of-the-art brain/mind research to the examination process” (p.92).

Wiggins (1992) proposed that academic tests should be authentic and meaningful with performance standards being genuine benchmarks. Wiggins explained that such assessments have called for students to perform exemplary tasks that are required to demonstrate one’s mastery of a particular discipline. Exhibits, performances, journals, demonstrations, products, problem-solving processes, graphic organizers, and projects have been recommended as tools to utilize when assessing the intelligences, according to Bellanca, Chapman, and Swartz (1997). The implementation of MI into the curriculum has created the need for more authentic means of assessment to be utilized to provide realistic pictures of student progress. Feldhusen (as cited in Weller, 1999) made a similar contention that “test scores do not measure hard work or good work habits and they do not take into account personality

styles nor the element of creativity which varies widely in definition and is found in successful people" (p. 356).

Gardner emphasized the importance of taking individual differences seriously. The MI approach focuses on the needs of the learner creating an educational setting with understanding as the focus. Authentic assessments, based upon brain-compatibility to curriculum, may present a more realistic view of students' progress. Educators may utilize exhibitions, projects, and other assessment products in order to analyze students' academic progress.

MI Schools in the United States

Kornhaber and colleagues (as cited in Gardner, 1999) investigated 41 schools and have identified a set of conditions proven successful in implementing MI practices. First, schools launched a readiness process by already having had in place the beliefs and practices aligned with MI. Second, MI practices emerged from settings supportive of diverse cultures. Third, there were meaningful options for curriculum and assessment have been present as well as opportunities for exchanges within the school and with others who share concerns. A fourth condition was that MI approaches were used to foster high-quality student work. Finally, the arts were noted as significant within the curriculum conducive to MI approaches.

Schools and classrooms within the United States interpreted the intervention of multiple intelligences in various ways and have designed curricular plans to emphasize and develop the intelligences. Key School and New City School are two schools that have developed curriculum designs based upon the intelligences. Furthermore, specific classrooms have implemented

MI treatments under the supervision of Project Zero, an educational research center at Harvard. Project Spectrum, a pilot preschool program, incorporated the intelligences and was then assessed by Project Zero researchers.

The Key School and New City School have addressed the implementation of MI in different ways. The Key School in Indianapolis emerged as an experimental elementary school in which students participate in classes in the various intelligences through the flow room activities. According to Balanos (1990), principal of the Key School, the school's curriculum was designed by educators who were dissatisfied with the low priority given to the arts. The team proposed that the elementary studies be given equal weight to the seven general areas of mental competence. Students participated in elective courses or pods and experience activities in the flow room. The flow room was equipped with books, games, and puzzles with the only expectation being that "each child remain engaged in some activity that interests her and that loud noise be avoided" (as cited in Whalen & Csikszentmihalyi, 1991, p. 4). Benefits of such semi-structured free play have included the "enhancement of memory, mental acuity and strategic self-monitoring during problem-solving, the development of effective goal-setting, the establishment of self-confidence and the encouragement of experimentation, interest and conscious relaxation" (as cited in Whalen & Csikszentmihalyi, 1991, p.6). The school curriculum featured periodic themes and student projects. Student projects served as "an excellent showcase for a child's interests, themes, and configuration of intelligences" (Gardner, 1999, p. 107). Bolanos (1990) stated that students have been assessed by

independent or collaborative projects and video portfolios as the primary means of documentation of student progress.

The New City School in St. Louis developed curricular themes that have incorporated all of the identified intelligences. The school was structured to especially accentuate the development of the interpersonal and intrapersonal intelligences. Hoerr (1994a) stated that the faculty of New City School have found multiple intelligences to be more than a theory of intelligence. It has become "a philosophy about education with implications for how kids learn, how teachers should teach, and how schools should operate" (p. 29). Students who were three years old through sixth grade experienced MI themes. According to Hoerr (1997), having an MI approach has meant that teachers considered all of the intelligences in planning units and themes and that throughout the week, all of the child's intelligences have been brought into classroom activities.

Multiple intelligences was used to maximize and celebrate students' talents, interests, and strengths. Hoerr (1994a) reported that student assessment has been measured by standardized tests along with portfolios, projects, exhibitions, and performances in order to offer "a rich, comprehensive picture of a student's progress" (p. 31). Teachers at New City School utilized progress reports as a means of communicating to parents the intrapersonal and interpersonal attributes of students. Student profiles were incorporated and sent home each year in the spring in the form of a report to the parents. New City School tried learning pods similar to those in Key School; however, they were abandoned. Hoerr and his staff selected to focus more on the intrapersonal approach where the students would be challenged

to know their strengths and weaknesses. Hoerr explained that if students wait to challenge their intelligences until high school, it may be too late. Students may be perceived as having talent but are not smart. Hoerr (as cited in Lockwood, 1993) stated that “we’re trying to back up and help (students) see their strengths before they reach high school” (p. 9).

Spectrum, a preschool program incorporating MI, was described as having classes that have been “richly stocked with materials designed to stimulate the several intelligences” (Gardner, 1999, p. 104). Children were encouraged to interact with the materials and exercise their ranges of intelligences. Students’ intellectual strengths and weaknesses were documented and noted for continued monitoring of the development of the intelligences. Gardner and Hatch (1990) reported their observations of the assessment of the preschool children participating in Project Spectrum. Student assessment was based upon data observed on ten activities (story telling, drawing, singing, music perception, creative moment, social analysis, hypothesis testing, assembly, calculation and counting, and number logic) in relation to results obtained on the Stanford-Binet Intelligence Scale-Fourth Edition. Results of the Spectrum study revealed that children did not perform at the same level across all activities and suggested that distinct intellectual profiles did exist. Thus, students exhibited relative strengths and weaknesses across the activities.

Schools around the United States have implemented the MI approach in a variety of ways. The Key School in Indianapolis was created as an experimental elementary school in which students participate in classes in the various intelligences

through the flow room activities. The flow room was equipped with books, games, and puzzles with the only expectation being that students keep engaged. Some of the benefits that students have received by participating in the flow room were the enhancement of memory, mental acuity and strategic self-monitoring during problem-solving, the development of effective goal-setting, and the establishment of self-confidence.

The New City School in St. Louis developed curricular themes to incorporate all of the intelligences. The school has been structured to especially accentuate the development of the interpersonal and intrapersonal intelligences. According to Hoerr (1997), incorporating the MI approach means that teachers consider all of the intelligences in planning units and themes and that throughout the week, all of the child's intelligences are brought into classroom activities.

Children of the Spectrum preschool setting were encouraged to interact with the materials and exercise their ranges of intelligences. Students' intellectual strengths and weaknesses were documented and noted for continued monitoring of the development of the intelligences.

MI Implementation Within Georgia Classrooms

While MI has been implemented within schools across the United States, schools within Georgia have had limited MI implementation. Information obtained from the Georgia State Department of Education revealed that studies on MI implementation had not taken place. There was not a list of schools having received training for MI implementation at the time of the study. Information obtained by telephone call to all

GLRS systems in Georgia confirmed that little MI was being implemented within the state.

The Atlanta West GLRS center at the Griffin (L. Black, personal communication, April 23, 1998) confirmed by telephone that Fayette County received the most training on MI through staff development courses within the past five years. After speaking to all of the principals of the elementary schools in Fayette County, it was determined that only two schools had MI implementation in place for at least three years. All five elementary schools implementing MI were located in Fayette County. However, only two of the Fayette County Schools had received training in MI and had been implementing this approach over the past three years. This information was collected in order to locate a school utilizing the MI approach for three or more years.

MI Implementation and Students with Learning Problems

The incorporation of multiple intelligences could be utilized as an avenue for students who have learning difficulties with traditional curriculum presentations. Teele (1994) researched how an elementary school with MI implementation has conducted classes with special needs children. She stated that a consultative in-class collaborative model was utilized where the resource specialist teacher went into the regular classroom and assisted special needs students by instructing them through their dominant intelligences. Such an inclusive mode “encouraged collaborative partnerships between regular and special educators in a team teaching format that emphasized improved instruction rather than classifying and labeling students” (Teele, 1994, p. 78). The school studied linked special education with multiple

intelligences and viewed the two perspectives as “working toward the same goal” (Teele, 1994, p. 78). Most special education students at this particular school were dominant in bodily-kinesthetic and spatial intelligences. Therefore, the special education teacher adapted instruction to mastery of the concept implementing these two dominant intelligences before moving ahead to linguistic and/or logical-mathematical intelligences. Teele stated that the relationship of special education to the theory of multiple intelligences needs to be studied. Teele (1994) presented the idea that if the very nature of schooling were to change to encompass multiple intelligences, “the criteria used to identify special education students may have to be revised”(p. 157).

In addition, Hearne and Stone (1995) stated that the results from studies utilizing the Torrance Test of Creativity indicated that “students with LD were higher than their NLD (non LD) counterparts in originality, and that the NLD students were significantly higher in elaboration” (p. 433). Therefore, learning disabled students demonstrated strengths in originality that were noteworthy. The researchers Hearne and Stone warned educators to avoid structuring school activities for students “based upon their weaknesses rather than their strengths” (p. 441). Kornhaber (1994) researched how students with learning difficulties were involved in MI classes in three schools. Special needs students were observed to detect intellectual strengths. Teachers worked to give the intelligences equal weight, utilized a hands-on approach to curriculum, and implemented lesson integration of diverse abilities. Kornhaber reported that teachers who had altered the curriculum in order to

utilize MI framework had made “greater efforts to integrate all the intelligences into their themes and projects” (p. 41). She explained that “good project work is synchronous with MI because it draws on many intelligences” (p. 16). Kornhaber concluded that rather than “viewing various abilities as ‘extras’, . . . diverse abilities came to be more valued, sought out, and used to advance students’ development” (p. 23).

Further research with students with learning disabilities and MI was presented in Armstrong’s (1987) doctoral study. Armstrong investigated the strengths of students with learning disabilities in the theoretical framework of Gardner’s multiple intelligences. According to his documentation, he concluded that students with learning disabilities tended to show strengths in areas most neglected by our culture--that of spatial and bodily-kinesthetic. Strengths were noted the least often in categories most highly prized in our culture--those of linguistic and logical-mathematical. He reported that it was very difficult to limit a skill or ability to just one intelligence category. Students often comprised strengths in multiple areas during one activity. Armstrong stated that the implications for educators should be to explore new ways to assess strengths and form new instructional strategies when working with students with learning disabilities. In this way, instruction may focus on students’ strengths and abilities instead of their disabilities. Armstrong (1994) encouraged educators to “view disabilities against the background of the seven intelligences” so that they may see “disabilities occur in only part of a student’s life” (p. 138). Therefore, he contended, educators may begin “to focus more

attention on the strengths of special-needs students as a prerequisite to developing appropriate remedial strategies" (p. 138).

A case study by Beltzman (1994) determined that by employing multiple intelligence theory when planning assignments, "new entry points can be tried that tap the different intelligences that can produce success more readily than trying to repeat the same lesson several times" (p. 93). The study suggested that students with learning disabilities have many strengths and that teachers "should seek to identify student strengths in order to incorporate appropriate strategies that would provide optimal learning experiences" (p. 96).

According to several researchers, (Kornhaber, 1994; Armstrong, 1987; Teele, 1994; Beltzman, 1994) students with learning difficulties have had success in classrooms utilizing MI. Research of three schools by Kornhaber concluded that teachers accommodated students with special needs in order to give the intelligences equal weight, utilized a hands-on approach to curriculum, and implemented lesson integration of diverse abilities. Kornhaber stated that teachers who had altered the curriculum in order to utilize MI framework integrated intelligences into their projects. Kornhaber commented that the diverse needs of students should be valued. Teele reported that students with special needs in one school were dominant in bodily-kinesthetic and spatial intelligences. Therefore, the special education teacher adapted instruction by utilizing the students' strengths. Through their work, Armstrong and Beltzman contended that the strengths of the students with learning

disabilities should be sought out in order to incorporate strategies to promote optimal learning.

Multiple Intelligences and the Future

Multiple intelligences in the classroom setting could be implemented in order to encourage academic success of students by focusing on their strengths. Sylwester (1995), stated that "the classroom of the future might focus more on drawing out existing abilities than on precisely measuring one's success with imposed skills. . . ." (p. 23). Sylwester (1995) explained that teachers should "use imaginative teaching and management strategies to enhance the development of their students' adaptable attention processes" (p. 83). In addition, Hatch (1993) has expanded the idea of encouraging MI implementation within the educational structure of our society by recommending a change in the way schools of education develop programs of study in order to "help people to become agents of education reform: to prepare them to develop collaborative relationships with teacher; to create, manage, and sustain new initiatives; and to support the reflections and progress of school personnel" (p. 202).

Intelligence-fair or brain compatible assessment would also be an important aspect of MI implementation. Teele (1996) explained that when teachers are thinking of assessment, "procedures should be matched to instruction and reflect the different ways students learn. . . ." (p. 68). According to Teele educators must "provide a system that enables all students to achieve at their own pace. . . ." (p. 75). Therefore, a mindshift would need to be integrated into the curriculum if MI is expected to give students an avenue for academic success. Hatch (1993) expressed his thoughts that many people "have seen

first hand how the conventional educational system has failed to address the diverse needs and strengths of students" (p. 198). Trying to expand upon student strengths by implementing MI curriculum could be one avenue in the pursuit of educational change leading to students' success in school. Similarly, during a two-year study of MI within the elementary classroom, Ching (1996) reported that the recognition of children's literacies has helped others to form "richer, meaningful understandings of students because we highlight those attributes that were once hidden or not valued" (p. 211). In conclusion, Gardner (1999) warned of the haphazard implementation of MI when he stated that MI ideas and practices "cannot be an end in themselves" (p. 143). He further contended that "every educational institution must reflect on its goals, mission, and purposes continuously and, at least at times, explicitly. Only after such reflection can MI ideas be usefully implemented" (p. 143).

Summary

Intelligence has been defined in a variety of ways. The work of theorists such as Terman (1916), Spearman (1970), and Jensen (1998) has attempted to explain intelligence as a factor, known as *g*. Through their research, definitions of *g* have included specific standards of measurements for mental abilities. Binet and Wechsler have also developed instrumentation to assess intelligence. However, several authors have disputed arguments that *g* exists as the single intelligence factor. Through Guilford's categories of abilities, Thorndike's clusters of intelligence, and Thomson's belief in multi-causal events, these authors have explained their views of intelligence as multi-faceted. Studies by Cattell (1963) have revealed specific

components of intelligence dealing with acquired and biological knowledge. While Sternberg has defined intelligence in a triarchic method, he has also included being successfully intelligent as important to the definition of intelligence. Gardner (1983, 1999), the theorist who established the idea of multiple intelligences, stated that eight intelligences exist and that individuals possess all of these eight intelligences to varying degrees. Other authors of MI theory application, such as Lazier (1991), Armstrong (1994), and Fogarty (1997), have also written their views of intelligence as pluralistic with individuals exhibiting varying degrees of strength in each intellectual area.

Authors such as Sternberg and Wagner (1986) disputed the existence of the MI theory. Jensen (1998) remarked that Gardner's theory could be an explanation for coordination and personality rather than intelligences. Sternberg stated that the MI theory could be learning style or practical intelligence. Sternberg (1988) also expressed his concern with Gardner's lack of utilizing conventional measures in the data presentation of his assessment approach.

Lazear (1991), Armstrong (1994), and Fogarty (1997) also explained the merits of the MI theory. Gardner based each intelligence upon brain research in which eight criterion must be met. Lazear (1991) described the approach as being inclusive of intelligence occurring in different parts of the brain's system. Salovey and Goleman's (1995) work in emotional intelligence gave merit to the interpersonal and intrapersonal intelligences. Researchers such as Ellingson et al. (1997) studied the positive affects that MI implementation has on class participation and

time on task. Finally, MI could be utilized to enhance students' strengths in various intellectual interests.

The implementation of MI into the curriculum has enhanced student achievement in various academic settings. Kuzniewski et al. (1998) found that high school students' reading comprehension and mathematics scores on standardized tests improved when MI was implemented. Gens et al. (1998) revealed that students in first and second grade increased reading vocabulary and comprehension scores with MI. Bezruczko (1997) stated the positive effects that art had on mathematics achievement scores for third grade students while research with kindergarten students by Agostin and Bain (1997) revealed positive social skills could predict academic achievement. The positive effects that the introduction of musical concepts had on spatial reasoning for college students, reading vocabulary for fifth grade students, hand-eye coordination for three-year-olds, and student effort for sixth graders were explained by Rauscher (1994), Dryden (1992), and Outis (1994).

Students with learning problems can be encouraged to have academic success when the MI approach is implemented within the curriculum. Teele (1994) suggested teaching special education students through their dominant intelligence in order for students to achieve academic success. Sylwester (1995) stated that students could be assessed by drawing upon their strengths and existing abilities.

Schools that have implemented MI for a number of years, such as New City School in St. Louis and Key School in Indianapolis, utilize the strengths of the students to develop the intelligences within instruction. In Georgia, however, the

concept of implementing MI into instruction is fairly recent. Two Fayette County schools in Georgia have incorporated MI for three years or more.

The success of future MI schools will be dependent upon the ability of the educational system to create a mindshift in education reform. MI schools will continue to be challenged to develop collaborative relationships with teachers in order to ensure that instruction addresses the diverse needs and strengths of students. Schools that have embedded MI teaching techniques will provide students with an instructional approach that focuses on the eight intelligences while promoting intelligence-fair assessments. Therefore, students' intellectual abilities will be better understood and valued.

CHAPTER 3

RESEARCH METHODS

Purpose of the Study

The purpose of the study was to identify and observe elementary school classrooms in Georgia which incorporated multiple intelligences (MI) into the instruction and then to compare the reading and mathematics achievement of students in third and fourth grade MI classrooms to matched students in classrooms not receiving MI instruction. The purpose of the comparison was to determine if there was a statistically significant difference in the mean reading and mean mathematics scores, as measured by the ITBS, for third and fourth grade students depending upon whether or not students received the MI or non-MI approach to instruction.

Research Design for the Study

The study followed a nonequivalent pretest posttest control group design. In this design, as described by Creswell (1994), the experimental Group A and the control Group B were selected without random assignment, both groups took a pretest and posttest, and only the experimental group received the treatment. Campbell and Stanley (1963) described the nonequivalent control group design as “one of the most widespread experimental designs in educational research. . . .” (p. 47). The schools were closely matched, or as stated by Campbell and Stanley (1963), “as similar as availability” permitted (p. 47). The control groups were the third and fourth grade non-MI classrooms and the

experimental or treatment groups were the third and fourth grade MI classrooms.

Procedures

The procedures for the study included the identification of the two MI and two non-MI classrooms to be observed, the selection of third and fourth grade classrooms to be observed, completing classroom observations, and gathering and analyzing data from the MI checklists to assess the extent to which MI instruction was incorporated into classroom instruction. An examination of teachers' lesson plans, county curriculum guides, and teacher and administrator interviews provided information on whether or not MI was implemented within instruction of the third and fourth grade classrooms. Data from students' achievement tests, the Iowa Test of Basic Skills (ITBS), were collected and analyzed to determine if significant differences existed in the mean total reading and mean total mathematics scores of students in MI classrooms when compared to those students in non-MI classrooms.

The two MI classrooms in Fayette County and the two non-MI classrooms in the Clayton County were observed by the researcher for one week each in the Spring of 2000. That is, one third grade classroom and one fourth grade classroom were observed in the MI school and then one third grade and one fourth grade in the non-MI school. All four classrooms were observed for twelve hours each. The researcher utilized the eight checklists in order to record the degree to which the intelligences were presented in each of the four classrooms. Data collected on each of the eight MI checklists were analyzed by counting the tallies of the five-minute time intervals to determine the degree to

which MI was being incorporated into the four classrooms. The degree to which MI was incorporated in the classrooms was rated to a low, medium, or high extent.

Population/Sample

In order to complete the study, several steps were taken to identify elementary schools with MI implementation and to obtain permission from the schools to participate in the study. The researcher first contacted the Georgia State Department of Education to get a list of schools where MI had been implemented. The Georgia State Department of Education did not have any information relative to which schools had received training in MI instruction. The Department did not have any information on studies that had been completed on schools implementing MI into instruction. Telephone calls to all Georgia Learning Resource Service Centers (GLRS) in Georgia confirmed that only a few schools in Georgia were implementing MI. Contact was made with the Atlanta West Georgia Learning Resources Services Center in Griffin, Georgia (L. Black, personal communication, April 23, 1998) to confirm the information that Fayette County had received the most training of any county in Georgia on MI through staff development courses within the past five years. After the researcher telephoned all of the principals of the elementary schools in Fayette County, Georgia, it was determined that only two schools had been implementing MI in their classrooms over the past three years.

The two MI elementary schools in Fayette County considered for participation in the study had received MI staff development over the last five years and had implemented MI for at least three years. The administrator of the first MI school contacted

for permission to participate in the study declined to provide the researcher access to student information including test scores from the Iowa Test of Basic Skills (ITBS) and the number of years students had attended that school. The administrator of the second MI school contacted agreed to participate in the study and provided the researcher with permission to observe classrooms, obtain students' ITBS test score data, retrieve information on the number of years the students had attended that school, interview teachers and administrators, and to view teachers' lesson plans and curriculum guides. Therefore, the students in one third grade class and one fourth grade class within this one school in Fayette County became the MI classrooms to be observed for the study.

After one MI elementary school had been selected, one matched elementary school that was identified as not utilizing MI instruction in the third and fourth grade classrooms was located in a surrounding county. The MI and non-MI schools were matched according to the total number student enrollment, the socio-economic status (SES) of the student population, ethnicity, and type of community environment. The SES was determined by the number of students receiving free and reduced lunches. An elementary school in Clayton County, a county in close proximity to Fayette County, that had not implemented MI within the curriculum was selected and agreed to participate in the study as the non-MI school. The Clayton County School System and principal agreed to provide the researcher with permission to observe classrooms, obtain students' ITBS test score data, retrieve information on the number of years the students had

attended that school, interview teachers and administrators, and to view teachers' lesson plans and curriculum guides.

The population of the study consisted of students in one MI third grade classroom and one MI fourth grade classroom from one elementary school in Fayette County and one non-MI third grade and one non-MI fourth grade in one elementary school in Clayton County, Georgia. The two third grades and two fourth grades were matched according to similarities in student enrollment, socio-economic status (SES) or number of students on free or reduced lunch, the community environment including the degree to which the student population was determined to be stable versus transient, and the students' ethnicity.

The total student enrollment for the MI school was 720 students. The SES for the school population was described as 15% of the students on free and reduced lunches. The MI school was in a suburban environment and the principal described the student population as primarily stable with a small number of transient students. The ethnicity of the student population was 80% Caucasian, 11% black, 3.6% Asian, 3.1% multi-racial, 2.2% Hispanic and .1% Native American.

The total student enrollment for the non-MI school was 850 students and the SES for the school population was reported as 28% of the student population on free and reduced lunches. The school was in a suburban environment and the principal described the student population as having a small number of transients. The ethnicity of the student population was 63.2% Caucasian, 29.1% black, 2.7% Hispanic, 1.8% Asian, .1% Native American, and 3.1% multi-cultural.

A total of 30 third grade and 30 fourth grade students participated in the study. Students from four classes participated in the study. Fifteen students from the MI third grade and 15 students from the non-MI third grade participated in the study. Fifteen fourth grade students in the MI classroom and 15 fourth grade students in the non-MI classroom also participated in the study.

From the one MI school in Fayette County, 15 third grade students and 15 fourth grade students received MI instruction. The MI one third grade classroom consisted of 15 students, eight males and seven females. The one MI fourth grade classroom consisted of 15 students, six males and nine females. Selection criteria were as follows: (1) the students had received at least three years of instruction from this MI school, (2) the students were not attending special education classes, and (3) the students had returned signed permission forms from parents or guardians stating that student information could be retrieved for the purposes of completing the study.

From the non-MI school in Clayton County, 15 third grade students and 15 fourth grade students were selected. Fifteen third grade students, eight males and seven females, participated in the study. Fifteen fourth grade students, eight males and seven females, also participated in the study. Selection criterion were as follows: (1) the students had received instruction for at least three years within this non-MI setting and had not previously attended any school in Georgia with MI implementation, (2) the students were not attending special education classes, and (3) the students had returned signed permission forms from parents or guardians stating that student

information could be retrieved for the purposes of completing the study.

Variables

The dependent variables for this study were the third and the fourth grades Iowa Test of Basic Skills (ITBS) for reading and mathematics achievement in 1999 and 2000 for each of the four classes. The pretest and posttest scores on the ITBS were analyzed to determine if any statistically significant differences in the mean mathematics and mean reading achievement occurred between students in the MI classrooms and students receiving instruction in non-MI classrooms.

The independent variable for the study was the type of instructional approach utilized within the third and fourth grade classrooms. Types of instructional approach were designated as either MI or non-MI.

Data collected from the two MI classrooms and two non-MI classrooms were: (1) observation data collected on the eight MI checklists, (2) students' mathematics and reading test scores from the ITBS for Spring of 1999 and Spring of 2000, and (3) an examination of lesson plans, curriculum guides, and teacher and administrator interviews in order to verify if MI was or was not being implemented within the instruction of the third and fourth grade classrooms.

Model Fidelity

In order to confirm model fidelity for using the MI and non-MI approaches, lesson plans from teachers were reviewed, curriculum guides for the classrooms were reviewed, and interviews were conducted with teachers and administrators.

Lesson Plans and Curriculum Guides

Lesson plans of the four teachers were reviewed to determine what types of activities were being implemented within the classrooms in order to measure the degree to which MI was implemented in both the MI and non-MI classrooms. Curriculum guides were also viewed to determine if these schools were implementing MI at the school and county level.

Interviews

Information obtained from the teachers' and administrators' interview forms (presented in Appendix A) was analyzed to determine if school matching variables were similar, if MI was implemented in instruction, and to determine how MI was incorporated in instruction. The teachers' interviews were analyzed in order to determine: (1) if the MI or non-MI approach to instruction was being implemented at the third and fourth grade levels; (2) if the teachers had been trained in MI and were utilizing MI or non-MI methods to instruction; and (3) to determine what types of activities, if any, were being utilized to promote the intelligences. The administrators' interviews were analyzed in order to determine: (1) if the MI or non-MI approach was being used as the primary method of instruction; (2) if the teachers had been trained in MI and were utilizing MI or non-MI methods; (3) how long MI had been implemented within the school; and (4) if the MI school and non-MI school were similar in total student enrollment, ethnicity, community environment or if the student population was stable or transient, and socio-economic status or the number of students receiving free or reduced lunch.

Null Hypotheses

The null hypotheses for the study were as follows:

1. There was no statistically significant difference in the mean reading achievement score as measured by the ITBS in Spring 2000, as compared to the Spring 1999 reading achievement score for two groups of third grade students when one group received the MI and one group received a non-MI approach to instruction.

2. There was no statistically significant difference in the mean mathematics achievement score as measured by the ITBS in Spring 2000, as compared to the Spring 1999 mathematics achievement score for two groups of third grade students when one group received the MI and one group received a non-MI or approach to instruction.

3. There was no statistically significant difference in the mean reading achievement score as measured by the ITBS in Spring 2000, as compared to the Spring 1999 reading achievement score for two groups of fourth grade students when one group received the MI and one group received a non-MI approach to instruction.

4. There was no statistically significant difference in the mean mathematics achievement score as measured by the ITBS in Spring 2000, as compared to the Spring 1999 mathematics achievement score, for two groups of fourth grade students when one group received the MI and one group received the non-MI approach to instruction.

Instrumentation

Instrumentation for the study included eight observation checklists and the Iowa Test of Basic Skills (ITBS). The eight observation checklists were first used in a pilot study to determine if the checklists captured an array of the eight

intelligences and could, therefore, be used in the research study to measure the extent that MI was incorporated into instructional activities. Information was also obtained from the ITBS to determine if a statistically significant difference existed in the mean total mathematics and reading scores for the students participating in the research study.

Observation Checklists

Attempts were made by the researcher to locate an observation checklist that could be used during classroom observations to detect if MI was being incorporated into the classroom instruction (see Appendix B). Correspondence from leading authors of MI from Project Zero (M. Kornhaber personal communication, July 10, 1998 & June 30, 1999), Lazear (D. Lazear, personal communication, July 16, 1999), and Armstrong (T. Armstrong, personal communication, June 30, 1999) did not supply information in locating an existing MI observation instrument. Furthermore, administrators of MI schools in Indiana and Missouri (M. Beckman, personal communication, May 6, 1998 & T. Hoerr, personal communication, June 16, 1999) did not have knowledge of any existing MI observation instruments. Therefore, after correspondence with leading authors of the MI approach, principals of MI schools, and from Project Zero at Harvard University proved to be unsuccessful in locating a checklist for classroom observations, the researcher developed checklists to detect if one or all of the eight intelligences were implemented in the classroom instruction (see Appendix C). Checklists were designed for each of the eight intelligences and incorporated the ideas of Fogarty (1997), Armstrong (1994), Lazear (1991), and the researcher. The checklists captured a wide array of activities

in order to be broad enough to accurately reflect activities associated with MI instruction. Each checklist was divided into five sections and labeled “Task Type,” “Tasks Observed,” “How Often Observed,” “Activity Type,” and “Time Modules” (see Appendix C).

Eight observation instruments were developed and reflected the types of instructional activities corresponding to the eight intelligences. The column labeled “Task Type” listed the classroom activities. During classroom observations, tasks were either observed or not observed and were coded as yes or no in the “Tasks Observed” column. Tasks that were coded as yes received tally marks in the column labeled “If observed, how often?” The tally marks recorded how often the task was observed during each of the five minute time modules. An explanation of the task observed was recorded in the column labeled “Activity Type.” The time that the tasks were observed were recorded in the “Time Modules” section.

Iowa Test of Basic Skills

Content validity and descriptions of the subtests for the ITBS were obtained from Validity Information for the Iowa Tests of Basic Skills (ITBS) and Iowa Tests of Educational Development (ITED). The ITBS was normed in 1995 and was designed to yield “up-to-date” normative interpretations of test performance that “closely reflect the performance that would be expected from participants in the national standardization in the years after the standardization took place” (Validity information, 1992, pg. 56). Reading total scores were derived from the vocabulary and comprehension subtest scores. The vocabulary assessment measured each student’s general vocabulary development. The reading

comprehension subtest measured the student's ability to construct meaning from reading passages, poetry, and other literary forms. Mathematics total scores were derived from the concepts, problem-solving, and computation subtest scores. The mathematics concepts and estimation test measured the fundamental concepts of primary-grade mathematics curriculum, measurement, number sentences, and estimation. The problem-solving and data interpretation test measured the quantitative thinking and mental arithmetic capabilities. The computation subtest required an emphasis on basic facts and computing of numbers according to specific processes.

Pilot Study

A pilot study was completed to investigate if the eight MI observation checklists (see Appendix C), developed for the study, could accurately detect the degree to which MI implementation took place in third grade and fourth grade classrooms by teachers who were utilizing the MI approach or the non-MI approach to instruction. The results of the pilot study were analyzed to determine if the checklists could be used to identify if MI teachers and non-MI teachers were implementing MI in instructional activities to a low, medium, or high degree. The results obtained from the observation checklists were further analyzed to determine if non-MI teachers were inadvertently utilizing the MI approach in their classroom instruction.

Teacher Selection

Six teachers were selected from one elementary school in Georgia to participate in the pilot study. All six teachers had been observed by the researcher over a period of five years. During this time period, the researcher had many opportunities to

interview the teachers and make classroom observations as a peer teacher. The researcher selected three third grade teachers and three fourth grade teachers to observe for the pilot study.

Of the six teachers observed, two had received MI staff development coursework. One third grade teacher and one fourth grade teacher used MI in their classroom instruction. The other four teachers, two third grade teachers and two fourth grade teachers, were non-MI in their approach to instruction.

Data Collection

The eight MI observation checklists were used by the researcher while observing the instruction in three third grade and three fourth grade classrooms in the pilot study school. Pilot study classroom observations took place in the Spring of 2000. Six classrooms, three third grades and three fourth grades, were observed for 20 minutes each during one class session. By using the eight MI observation checklists, the researcher was able to determine the extent that MI was incorporated into instructional activities. Each of the twenty minute sessions were divided into five minute time modules to assess if MI was or was not being incorporated in classroom instruction. The purpose of the five minute intervals was to ascertain what number of the intelligences were utilized by the teacher during five minute instructional modules. Every five minutes any MI instruction that was observed was recorded on each of the eight checklists. Therefore, during the twenty minutes of classroom observation, the researcher made four five-minute recordings on the eight checklists to record if multiple intelligences instruction was implemented.

The degree that MI was implemented into the instruction was determined by the number of intelligences incorporated into the classroom activities during the same five minute time modules. The degree that MI was implemented during multiple five segment modules was ranked as low, medium or high. Instructional activities that incorporated one to three of the eight intelligences during the same five minute time module was designated as implementing MI to a low degree. Instructional activities that incorporated four to five intelligences during a five minute time module was described as incorporating MI to a medium degree. Instructional activities implementing six to eight of the multiple intelligences during a five minute time module was described as having a high degree of MI implementation.

Results

The results of the pilot study are reported in Table 1. The instructional approaches for the six teachers were reported as either “Yes” or “No” for implementing MI through each of the eight intelligences. Of the three third grade teachers observed during mathematics instruction, teachers A and B were non-MI in approach to instruction and teacher C was MI. Both non-MI teachers A and B utilized two of the intelligences during their observations
which designated their instruction as low in MI implementation. Teacher C, the MI teacher, utilized six of the intelligences during the observation which ranked her instruction as high in MI implementation.

Of the three fourth grade teachers observed for the pilot study during language arts classes, teachers D and E were non-MI

Table 1

Pilot Study Data

Teacher	Approach	Grade	Intelligences Implemented*								MI Degree
			VL	LM	MU	BK	IE	IA	VS	NA	
A	Non-MI	3	yes	yes	no	no	no	no	no	no	low
B	Non-MI	3	yes	no	no	no	no	no	no	yes	low
C	MI	3	yes	yes	yes	yes	yes	no	yes	no	high
D	Non-MI	4	yes	no	no	no	no	no	yes	no	low
E	Non-MI	4	yes	no	no	no	no	no	no	no	low
F	MI	4	yes	no	yes	yes	yes	no	yes	no	medium

*Codes:

VL = Verbal-Linguistic
LM = Logical-Mathematical
MU = Musical
BK = Bodily-Kinesthetic
IE = Interpersonal
IA = Interpersonal
VS = Visual Spatial
NA = Naturalistic

in their approaches to instruction while teacher F utilized the MI approach to instruction. During the twenty minute observations, non-MI teacher D incorporated two of the intelligences, non-MI teacher E addressed one of the intelligences, and MI teacher F utilized five of the intelligences. Therefore, teachers D and E were designated as utilizing MI to a low extent and teacher F as having a medium amount of MI implementation.

All four non-MI teachers implemented MI to a low degree incorporating one or two of the intelligences in classroom instruction. The two MI teachers implemented MI to a medium and high degree incorporating five or six of the intelligences in classroom instruction.

Based upon these results, it was determined that the eight checklists were effective in determining to what extent teachers were using MI in their classrooms. Therefore, the checklists would be used as an integral part of establishing model fidelity in the study of third and fourth grade classrooms.

Data Collection

In order to collect data for the research study, a permission letter was sent home to parents for approval for their child to participate in the study (see Appendix D). The letter, requiring parent signature, informed parents of the purpose of the study and requested permission for the researcher to review students' permanent records and ITBS scores in order to identify students who met the selection criteria for the study. Students who participated in the study were those whose parents had given written permission to review student information; students who had been in the same school for at least three years; students

who were not in special education classes; and students who had taken the ITBS and had reading and mathematics scores for the Spring of 1999 and the Spring of 2000.

Observation Checklists

During the Spring of 2000, observations were made in one MI third grade classroom and one MI fourth grade classroom in Fayette County as well as in one non-MI third grade classroom and one non-MI fourth grade classroom in Clayton County. The four classrooms participating in the study were observed for 12 hours each.

Iowa Test of Basic Skills

Data were collected from students' ITBS test scores in mathematics and reading. Test scores reported from the Spring of 1999 served as the pretest and test scores reported from the Spring of 2000 served as the posttest. Pretest and posttest scores were then analyzed for the third grade students and fourth grade students attending MI or non-MI classrooms. For those third and fourth grade students who participated in the study and attended the non-MI Clayton County school, the researcher also analyzed the students' permanent records to determine if the students had previously attended MI schools. The non-MI students who participated in the study had not been enrolled in a Fayette County school and, therefore, did not attend any MI school in Georgia in previous years. Through teacher interviews the researcher determined that the non-MI teachers had not been trained in or taught in MI schools.

Data Analysis

Data analyses were conducted on the observation checklists and students' pretest and posttest data using a Repeated Measures

Analysis of Variance (Repeated Measures ANOVA). Interviews with teachers and administrators as well as teachers' lesson plans and county curriculum guides were also reviewed.

Observation Checklists

Data were tallied on the MI checklists in the columns titled "Tasks Observed" and "How Often" according to the number of times MI activities were observed being used in the classroom. The number of yes and no responses under "Tasks Observed" were tallied to analyze which of the eight intelligences were being implemented during the observation times. During the observations of the two MI and two non-MI classrooms, a tally mark was made every five minutes of the twelve hours of observations in the "How Often" category to record how many times a specific instructional activity occurred. The tallies were then compiled by dividing each of the twelve hours of observations into four, fifteen-minute time segments. The types of intelligences used in the four classrooms were recorded in 48 total time segments. Time segments in which one to three of the intelligences was implemented was recorded as having low MI implementation; implementation of four or five intelligences was recorded as medium MI; and implementation of six to eight intelligences was recorded as high MI based upon pilot study results.

Iowa Test of Basic Skills Data

Students' ITBS scores, totals in both reading and mathematics, from Spring of 2000 were then analyzed by the Repeated Measures ANOVA to determine if there were statistically significant differences in the mean reading and mean mathematics achievement of students in the third and fourth grades in the MI

and non-MI schools as compared to the students' reading and mathematics achievement scores in Spring of 1999.

Level of Significance

The level of significance was a predetermined level on which a null hypothesis could be rejected by the researcher. This level was based upon the probability of making an incorrect decision about a null hypothesis. The probability of making an error is denoted by the level of significance, or Alpha, and leads to the following rule: the researcher should "reject the null hypothesis if the probability of obtaining a sample mean at or beyond a certain value is less than or equal to .05 (or .01); otherwise, do not reject the null hypothesis" (Shavelson, 1996, p. 263).

A Type I error occurs when the researcher rejects a true null hypothesis. In this study, a Type I error would result if the researcher falsely found that there was a statistically significant difference between the type of approach, MI or non-MI, and ITBS scores for mathematics and reading achievement when the null was true.

A Type II error occurs when the researcher does not reject a false null hypothesis. In this study, a Type II error would result if it were falsely indicated that no statistical significant difference exists between the type of instructional approach, MI or non-MI, and ITBS scores for mathematics and reading achievement and the researcher did not reject the false null. For this study, the level of significance was set at the .05 level.

CHAPTER FOUR

FINDINGS OF THE STUDY

The purpose of the study was to determine if statistically significant differences existed in the mean mathematics and mean reading achievement of two groups of third and fourth grade students -– one group received the MI and one group received the non-MI approach to instruction. Data were analyzed from the classroom observations and from the ITBS test results from the students' reading and mathematics pretest and posttest scores.

Fidelity of Model

To determine whether or not MI teaching strategies were being incorporated into the elementary school classrooms, the researcher visited each of the selected classrooms. In order to determine if MI was or was not being implemented within the instruction, the fidelity model was assessed from five directions: examination of curriculum guides, teacher training, teacher lesson plans, administrator and teacher interviews, and classroom observations.

Curriculum Guides

The curriculum guides for Clayton County and Fayette County were analyzed to determine if MI implementation was endorsed at the county level. The third and fourth grade curriculum guides for the non-MI school in Clayton County made no reference to the MI approach to instruction. The guides were organized by academic subject and listed required competencies for students in each subject area. Fayette County curriculum guides for the MI school's third and fourth grades referenced to MI within the

instructional setting for all academic areas. The Fayette County guides gave explanations of MI and examples of how MI was implemented within each subject area. The curriculum guides for the MI school contained statements on MI implementation while the non-MI school's curriculum guides made no reference to MI.

Teacher Training

In order to implement MI in Fayette County, all MI teachers were required to attend MI training workshops held at the school site for a three year period. The MI teachers had also been required to read selected books on MI theory and practices. These teachers had folders of information obtained from workshops that were to be used along with the curriculum guides to ensure that MI methods were implemented. The two MI teachers who participated in the study had received the training, read the books by Gardner, attended numerous workshops, and kept documentation in their lesson plans to record that MI was implemented within their instruction.

Clayton County teachers had not received formal training in MI. The two non-MI teachers had not read any of Gardner's books on MI or attended any staff development courses on MI. While teachers in MI schools had received staff development in MI, the non-MI teachers had not.

Lesson Plans

Lesson plans were collected from each of the two third grade teachers and two fourth grade teachers. The one MI third grade teacher and one MI fourth grade teacher in the Fayette County school coded all lessons with one to eight of the intelligences being incorporated into the instruction. Each intelligence implemented in instruction was coded in the objectives and

classroom activities. For example, one activity in mathematics was coded as incorporating the intelligences of logical mathematical (LM), visual spatial (VS), interpersonal (IP), musical (MU), and bodily kinesthetic (BK). In an interview with the Assistant Principal of the MI school, she stated that all teachers were required to list in their lesson plans the intelligences being implemented for each instructional activity.

One third grade teacher and one fourth grade teacher of the non-MI school in Clayton County did not code lessons as incorporating MI into classroom instruction. However, the administration required teachers to post daily objectives in their classrooms. Objectives for each lesson were given and specific activities were listed for each objective in the teachers' lesson plans. Instructional activities were analyzed by the researcher in order to determine if MI was being implemented by the non-MI teachers without them being consciously aware that they were using MI in instruction. Although the lesson plans for the MI and non-MI teachers were similar in that both stated the objectives for each subject for the day, only MI teachers had coded one to eight of the intelligences for their instructional activities.

Administrator Interviews

Administrator interviews were conducted in order to record if MI was being implemented within the school and during classroom instruction. One administrator from Fayette County and one from Clayton County were interviewed. Interviews lasted approximately twenty to thirty minutes. Interview questions have been listed in Appendix A.

The Assistant Principal of the MI school in Fayette County reported that she had been as assistant for two years total, both years in this elementary school. The total enrollment for the school was 850 students and the SES for the school population was reported as 28% of the student population on free and reduced lunches. The school was in a suburban environment and the principal described the student population as having a small number of transients.

The Assistant Principal had heard of MI through workshops and the reading of Gardner's books and had adopted MI principles into the curriculum. The Assistant Principal explained that the Fayette elementary school was in its last year of a three year phase of MI implementation. In order to implement MI, the teachers were required to read Frames of Mind, attend presentations by guest speakers, and attend staff development workshops. The assistant stated that school wide projects such as the Mathematics and Science Olympiad were planned to encourage MI on a larger scale. Teachers were required to keep portfolios on each student and to document students by video utilizing the intelligences at least three times per school year. The assistant explained that MI differed from the non-MI approach in that MI utilizes multiple intelligence styles of learning. The researcher was told that MI is used through the arts, small and large group activities, and through teacher or student lead activities.

The assistant explained that since the school had adopted MI, teachers prevalently used informal assessments as well as "hands on" activities, and MI implementation was required to be coded in lesson plans. She commented that students appeared more

engaged than when the traditional approach to instruction had been utilized in the school and that parents were more involved in teacher led workshops and parent/student activities.

The principal of the traditional Clayton County school reported that she had been a principal for four years total, all four years in this elementary school. The total student enrollment for the MI school was 720 students. The SES for the school population was described as 15% of the students on free and reduced lunches. The MI school was in a suburban environment and the principal described the student population as primarily stable with a small number of transient students.

The principal reported that she had heard of MI but had not adopted the MI theory into the instruction at the school. The Clayton County elementary school had utilized an academic outcomes approach which was implemented county wide. Teachers had inservice in the academic outcomes approach to instruction but had not received any formal training in MI implementation. The principal stated that she considered her school to be traditional in its approach to instruction.

The principal stated that she would like for the researcher to notice the success of students directly related to teachers' expectations and the ability of teachers to instill high self-esteem in students. The principal also commented that she hoped the researcher would find a positive environment where students want to come to school to learn.

Teacher Interviews

Teachers were interviewed to provide information about their classroom instructional approaches. Brief personal profiles are presented to the researcher for the third grade MI teacher, third

grade traditional teacher, fourth grade MI teacher, and the fourth grade traditional teacher. Interviews lasted approximately thirty minutes. Interview questions are presented in Appendix A.

Third Grade Teachers.

The third grade teacher of the MI school in Fayette County had taught for sixteen years, eight of those years in this school, and had utilized the MI approach for four years. The teacher received MI training through Fayette County. The teacher's lesson plans were color-coded in correspondence with the intelligences being incorporated into the curriculum. The curriculum had been organized according to units of study and these units were incorporated into all of the academic subjects. In order to use a wide range of the intelligences, the teacher varied instruction from large group to small group focused with teacher directions given before each activity. The teacher directed the instruction utilizing an overhead projector and read books to the students reflecting the theme of the day. Posters with the eight intelligences were displayed. She commented that students presented with the non-MI approach to instruction are not given the chance to explore their levels of talent through the eight intelligences. The teacher asked that the researcher notice how students were engaged within the classroom activities. Students were required to keep notebooks for each subject and produce a final product for each unit of study presented over several weeks. Students kept a notebook for their journal entries. In addition, students were responsible for keeping a list of correctly spelled words written on three by five note cards and displayed on their desks. These cards list words that

the students had difficulty spelling and students use them as daily references when completing writing activities.

For assessment, the teacher stated that she used “student learning demonstrations” for the thematic units where the students had a choice in product selection. In the upcoming school year, students will have a video portfolio to accompany him or her onto the next grade level from year. Currently, each student had a portfolio of work products. This teacher stated that she often assesses her students by grouping the students according to their strengths. Although the academic focus was selected by the teacher, students had some choices for selection of the method of learning. The teacher stated that MI has affected the students and parents in that the students take pride in creating final products, which are displayed in the school, and parents give positive feedback to teachers saying the students are excited about school.

The MI third grade teacher explained that she believed the main difference between the non-MI and MI approach was that MI challenged the students to look at the big picture.

As with the MI third grade teacher, the non-MI third grade teacher from Clayton County was asked a series of interview questions. The non-MI teacher had taught for 28 years. She had taught third grade for 17 years at this school. The teacher taught third grade and had 24 students. Although she had briefly heard of the MI approach in one of her college course classes, she had not been trained in or implemented MI principles in her classroom. The teacher commented that she would like for the researcher to notice how the students interact and how they complete their worksheets to prepare for tests. She stated that

textbooks were used daily for all subjects and assignments were given from the texts. Although English was the primary language for the students, they would be asked to respond sometimes to numerical answers in Spanish. The teacher stated that the students were required to keep notes in notebooks. Instruction was whole group focused. Students were required to participate in center activities for one hour at the end of most days. During the center times, students worked in small groups on reading, mathematics, writing, and science skills. Students were assessed by tests created by the publishers of the textbooks.

Fourth Grade Teachers.

The fourth grade teacher of the MI school had taught for 20 years, the last 4 in this MI school, and had utilized the MI approach for 4 years. The teacher taught fourth grade to 24 students. She had adopted and utilized the MI approach at the college level where she had previously taught. She had received MI training and staff development through Fayette County. She stated she believed the best instructional methodologies included a hands-on approach where students could interact with the material presented during instruction.

The teacher explained that in order to ensure that MI was incorporated into the instruction, her lesson plans were coded to correspond to each of the eight intelligences. Lesson plans were very detailed and typed for the entire school year. Specific lessons and instructional activities were put into the teacher’s daily folders. Activities were developed to reflect as many of the eight intelligences as possible. The fourth grade teachers would meet regularly for planning and to develop literature circles which were designed to review literature for a particular

theme or unit of study. Curriculum was organized according to units of study. These units are incorporated into all of the academic subjects. The teacher explained that very little use was made from student texts. Instruction was in small groups with teacher directions being given before activities began. Students completed a self-report at the beginning of the year referring to their intelligence strengths. Students kept these folders to refer to and update during the year. The students were also required to keep notebooks for each subject and produce a final product for each unit of study presented over several weeks.

The teacher commented that the differences between MI and the traditional approach were that MI recognizes the strengths and individuality of all children. Students do not learn in the same way.

The teacher stated that the researcher would notice various activities during observations. The teacher said she encouraged the students to read about a topic, write about it, and create something with the information. Students would be taking notes while instruction was being presented utilizing an overhead projector. The teacher would draw pictures to correspond to the ideas being presented. She would also read books reflecting the theme of the day. The classroom displayed MI posters describing the eight intelligences and had separate mathematics and science work areas.

The teacher stated that MI had affected assessment and classroom activities that were different from a traditional approach to instruction. The teacher explained that she had to work harder to present state mandated curriculum utilizing the intelligences and that she was continuously aware of

incorporating the eight intelligences. Students have choices when creating final products for their units of study. Video-taping and power-point presentations were utilized for final products this year. Each student had a video portfolio that would accompany him or her onto the next grade level from year to year. The teacher noted that fourth grade students had portfolios of work products that also accompanied them the next school year. In addition, the fourth grade students will often participate in a whole-class culminating activity, such as a field trip, at the end of each unit.

The teacher stated that she has visibly seen the changes in her students in that they become “highly responsible” for and take an interest in their learning. She was especially pleased with the accomplishments of her students with learning disabilities. She explained that implementing MI gave these students opportunities to develop their strengths and experience academic success in a variety of ways. To involve parents, the teacher also holds student lead conferences in order to present MI concepts.

She stated that MI was prevalent in everything that happened within her classroom. The teacher had introduced MI concepts in all classroom instruction and activities. The students designed and organized several clubs. For example, in the Buddy Club, students develop interpersonal and intrapersonal skills by pairing with younger students to read to them or to help them with their work. The Ecology Club recycled the paper and cans at the school. The students were responsible for organizing pick-up times for collections. Poetry and music clubs were also available to students. The teacher stated that she believed that

it was essential that instruction stays focused upon the development of the whole person. She responded that a student's life's work may come from their MI strengths.

As with the fourth grade MI teacher, the fourth grade non-MI teacher from Clayton County was asked a series of interview questions. The teacher had taught for ten years and it was his third year at this school. He taught fourth grade and had 29 students.

The teacher responded that although he had heard the MI approach to instruction mentioned in college courses, he had not been trained or was incorporating MI principles in his teaching. The teacher stated that he believed he was not using MI in his approach to instruction.

The teacher stated that he wanted the researcher to notice how students were engaged through the various activities he presents in class. He believed strongly in presenting material to students related to everyday life experiences. He used textbooks daily for all subjects and assignments. The teacher explained that the students were required to have notebooks for their academic work to keep notes and assignments in. Agendas, containing homework assignments, were sent home daily for parent signature. Furthermore, the instruction was primarily whole group focused with time given for independent work completion.

Students were assessed by tests created by the publishers of the textbooks. When the teacher was asked if he wanted to share anything else about his teaching, he responded that it was important to develop a positive teacher/student relationship and to actively engage students in the learning process.

Analysis of the Data

Data for this study were collected and analyzed from the classroom observations and students' records containing ITBS scores.

Classroom Observations

Classroom observations were analyzed utilizing the eight MI observation checklists. The twelve hours of academic subjects observed for each of the four classrooms was displayed in Table 2 and Table 3. The twelve hours of classroom observations was divided into 48 fifteen minute time segments. Each of the 48 time modules were then designated as having low, medium or high MI implementation according to the degree that MI was observed during the modules.

The extent that MI was incorporated into the four classrooms was recorded as low, medium, or high MI implementation and was displayed according to the grade level and type of approach in Table 4. Implementation of one to three intelligences observed during a fifteen-minute time segment was designated as low, implementation of four to five intelligences was medium, and implementation of six to eight intelligences was high. Observation data in Table 4 revealed that MI teachers had most time segments recorded as high implementation of MI within the instruction. The third grade MI teacher had 38 out of the total 48 time segments in the medium and high ranges while the third grade non-MI teacher had four in the medium range and zero in the high range. The fourth grade MI teacher had 40 out of the 48 time segments designated as medium to high MI while the fourth grade non-MI teacher had only two segments in the medium range. Therefore, most instructional segments for the non-MI teachers

Table 2

Observation Data for the Third Grade MI and Non-MI Classrooms

Group	Day	Subject/Time Observed	Total Hours Observed
3rd MI	1	Mathematics/8:30-9:30 Reading/11:15-11:45	1.5
	2	Language Arts/11:15-12:15 Reading/1:00-2:00	2.0
	3	Music/8:30-8:45 Mathematics/8:45-9:45 Language Arts/9:45-11:30	3.0
	4	Language Arts/11:30-12:30 Social Studies 1:00-2:00 Independent Study/Rdg. 2:00-2:30	2.5
	5	Mathematics/8:30-9:30 Music/9:30-9:45 Language Arts/9:45-11:00 Social Studies/11:00-11:30	3.0
3rd Non-MI	1	Language Arts/9:30-11:30	2.0
	2	Reading/11:30-12:30 Mathematics/12:30-1:30 Centers/1:30-2:00 Reading books/2:00-2:30	3.0
	3	Mathematics/11:00-12:00, 12:30-1:00 Social Studies/1:00-2:00 Reading/2:00-2:30	3.0
	4	Reading/8:30-9:00 Mathematics/9:30-10:00 Language Arts/10:00-11:00 Mathematics/11:00-11:30	2.5
	5	Mathematics/12:30-1:00 Centers/1:00-2:00	1.5

Table 3

Observation Data for the Fourth Grade MI and Non-MI Classrooms

Group	Day	Subject/Time Observed	Total Hours Observed
4th MI	1	Social Studies/1:00-2:00 Science/2:00-3:00	2.0
	2	Reading/8:15-8:45 Mathematics/8:45-9:30 Spelling/9:30-9:45 Language Arts/9:45-11:00 Dramatization/11:00-11:15	3.0
	3	Reading/11:30-12:00 Science/12:45-1:45 Social Studies/1:45-2:15	2.0
	4	Reading/8:30-8:45 Mathematics Rotations/8:45-9:45 Music/9:45-10:00 Language Arts/10:00-11:00	2.5
	5	Reading Literature/12:00-12:30 Science/1:00-2:00 Social Studies/2:00-3:00	2.5
4th Non-MI	1	Mathematics/11:30-12:30 Reading/1:00-3:00	3.0
	2	Language Arts/8:30-9:30 Mathematics/10:30-11:30	2.0
	3	Language Arts/8:30-9:30 Mathematics/10:00-11:00	2.0
	4	Mathematics/11:30-12:30 Social Studies/1:00-2:00 Language Arts/2:00-2:30	2.5
	5	Reading/8:30-9:30 Language Arts/10:00-11:00 Mathematics/11:00-11:30	2.5

Table 4

Frequencies of Low, Medium, and High MI Implementations by Grade and Approach for the MI School and Non-MI School

Grade	Approach	Total Number of Time Segments	Number of Time Modules By Implementation Type		
			Low	Medium	High
3rd	MI	48	10	18	20
3rd	Non-MI	48	44	4	0
4th	MI	48	8	14	26
4th	Non-MI	48	46	2	0

were low in MI approach while the MI teachers had most segments within the medium and high ranges.

An analysis of the number of and types of intelligences utilized during the observations were also presented in Table 5. As shown in Table 5, the data revealed that the MI classes had a greater degree of the bodily, interpersonal, intrapersonal, and visual spatial intelligences when compared to the non-MI classes. While all four teachers dedicated high amounts of instruction to verbal-linguistic intelligence, all but the third non-MI class also had a high number of segments implementing logical/mathematical intelligence. Although both MI teachers utilized music and naturalistic intelligences during more time segments than the non-MI teachers, these two intelligences were used less often than the other six intelligences. Therefore, MI teachers incorporated a higher number of the intelligences during instructional segments than the non-MI teachers.

Iowa Test of Basic Skills Results

The ITBS was administered to the two third grades and two fourth grades during the Spring of 1999 and Spring of 2000 school years. Third and fourth grade students' pretest and posttest scores were then compared and analyzed. The ITBS test scores were used because this standardized test was the one primarily used in these school systems to record student achievement.

The statistical technique selected for the study was the Repeated Measures ANOVA. Scores collected from the ITBS subtests were titled reading total (total) and mathematics total (total). The ANOVA results are presented in Table 6, Table 7, Table 8, and Table 9 for third and fourth grades respectively.

Table 5

MI Observation Checklist Data by Grade Level and Approach for the MI and Non-MI Third and Fourth Grade Classroom

Intelligences	Number of Intelligences Observed During 48 (15 minute) Time Segments			
	3rd MI	3rd Non-MI	4th MI	4th Non-MI
Verbal/Linguistic	44	44	44	34
Logical/Mathematical	20	12	30	28
Musical/Rhythmic	12	3	12	2
Bodily/Kinesthetic	34	4	29	4
Interpersonal	48	12	42	4
Intrapersonal	24	4	36	0
Visual/Spatial	26	8	34	3
Naturalistic	6	4	14	0

Table 6

Repeated Measures ANOVA for Third Grade ITBS Reading Scores in 2000 According to Method as Compared to Reading Scores in 1999

Prestest vs. Posttest				
DF	SS	Mean Square	F Value	Pr>F
1	9.76	9.76	36.67	0.0001**
MI vs. Non-MI				
DF	SS	Mean Square	F Value	Pr>F
1	0.02	0.02	0.08	0.8042

$p \leq .01$ = **

$p \leq .05$ = *

Table 7

Repeated Measures ANOVA for Third Grade ITBS Mathematics Scores in 2000 According to Method as Compared to Reading Score in 1999

Pretest vs. Posttest				
DF	SS	Mean Square	F Value	Pr>F
1	17.71	17.71	85.71	0.0001**
MI vs. Non-MI				
DF	SS	Mean Square	F Value	Pr>F
1	3.85	3.85	18.63	0.0002**

$p \leq .01$ = **

$p \leq .05$ = *

Table 8

Repeated Measures ANOVA for Fourth Grade ITBS Reading Scores in 2000 According to Method as Compared to Reading Scores in 1999

Pretest vs. Posttest				
DF	SS	Mean Square	F Value	Pr>F
1	26.14	26.14	48.89	0.0001**
MI vs. Non-M				
DF	SS	Mean Square	F Value	Pr>F
1	0.22	0.22	0.40	0.5302

$p \leq .01$ = **

$p \leq .05$ = *

Table 9

Repeated Measures ANOVA for Fourth Grade ITBS Mathematics Scores in 2000 According to Method as Compared to Mathematics Scores in 1999

Pretest vs. Posttest				
DF	SS	Mean Square	F Value	Pr>F
1	54.15	54.15	45.86	0.0001**
MI vs. Non-MI				
DF	SS	Mean Square	F Value	Pr>F
1	2.09	2.09	1.77	0.1940

$p \leq .01$ = **

$p \leq .05$ = *

As reported in Table 6, the analysis of mean scores for ITBS reading total in 2000 as compared to reading total scores in 1999 for the third grade students did not reveal a statistically significant difference between the MI and non-MI groups in reading. In Table 7, the analysis of the mean scores for ITBS mathematics total in 2000 as compared to mathematics total scores in 1999 for the third grade students revealed a statistically significant difference at the .05 level between the MI and non-MI groups. As reported in Table 8, the analysis of mean scores for ITBS reading total as compared to reading total scores in 1999 for fourth grade students did not reveal a statistically significant difference between the MI and non-MI groups in reading. Table 9 results were reported and the analysis of the mean scores for the ITBS mathematics total as compared to mathematics total scores in 1999 for fourth grade students did not reveal a statistically significant difference between the MI and non-MI groups in mathematics.

As presented in Tables 6, 8, and 9, there were no statistically significant differences in the means of third grade reading, fourth grade reading, and fourth grade mathematics scores. The MI groups performed as well as the non-MI groups in reading. The MI fourth grade group also performed as well as the non-MI fourth grade group in mathematics. However, as noted in Table 7, there was a statistically significant difference at the .05 level of significance between the third grade non-MI and MI students in mathematics total scores. The non-MI third grade group scored higher in mathematics total scores than the MI group.

Descriptive statistics were reported in Table 10 in order to make comparisons of the test results for each grade level. The mean scores and standard deviations were given for the third and fourth grade test scores.

Table 10

Descriptives for Pretest and Posttest Scores by Grade, Test, and Approach

			Spring 1999		Spring 2000		Gain
Grade	ITBS Test	Approach	M	SD	M	SD	
3rd	Reading	MI	3.08	.81	3.92	1.04	.84
		Non-MI	3.76	1.33	4.53	1.21	.77
3rd	Mathematics	MI	3.34	.87	3.92	1.14	.58
		Non-MI	3.70	.82	5.29	1.41	1.59
4th	Reading	MI	4.25	1.49	5.45	1.88	1.2
		Non-MI	4.30	1.09	5.74	1.96	1.44
4th	Mathematics	MI	4.34	1.05	5.56	1.10	1.22
		Non-MI	4.78	1.36	6.00	1.59	.96

CHAPTER 5

SUMMARY, CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

Chapter five was divided into four parts: (a) Summary of the Findings, (b) Conclusions, (c) Implications and Discussion, and (d) Recommendations for Further Research.

Summary of Findings

Observation checklists were developed incorporating specific tasks of the eight intelligences from the work of Armstrong (1994), Fogarty (1997), Lazear (1991), and the researcher. These checklists were divided into sections labeled “Task Type,” “Tasks Observed,” “How Often Observed,” “Activity Type,” and “Time Modules” (see Appendix C). The eight observation checklists were designed based upon the literature and were broad enough to reflect all eight of the intelligences. The observation checklists captured the array of MI activities as defined by the literature and co-defined under the definitions of the eight intelligences. The MI checklists were first used in a pilot study of three third grade and three fourth grade classrooms to gather data on the extent that MI was implemented within the instruction.

Results of the pilot study found that the two non-MI third grade teachers and two non-MI fourth grade teachers utilized MI to a low degree and that the one MI third teacher and one MI fourth grade MI teacher used MI to a medium or high degree. Therefore, data collected from the non-MI teachers’ classrooms confirmed that little MI was implemented in instruction and the data from the MI teachers confirmed that MI was used to a medium

or high degree during instruction. Such results gave merit to the eight checklists when used as an instrument to detect if MI were implemented within instruction and therefore enhanced the research study.

Following the pilot study, a research study was conducted with 30 third grade students, 15 MI and 15 non-MI, and 30 fourth grade students, 15 MI and 15 non-MI. from MI and non-MI classrooms. Results from the observations of the four classrooms revealed that MI teachers implemented MI to a medium or high degree during most of the observed time modules. However, non-MI teachers implemented MI to a low degree during most of the observed time modules.

Test scores from the ITBS for Spring 1999 and Spring 2000 in reading and mathematics were collected and analyzed for the third grade and fourth grade students participating in the study. Results from the ANOVA statistical analysis of ITBS tests (Spring of 1999 and Spring of 2000 were the dependent variables) revealed that no statistically significant differences existed in the reading achievement scores of third and fourth grade students in MI or non-MI classrooms. Although a statistically significant difference did not exist in classroom instruction for fourth grade students in mathematics achievement, there was a statistically significant difference between non-MI and MI third grade students in mathematics total scores.

Conclusions

Two conclusions were drawn from this study and are as follows:

The first conclusion, drawn from the pilot study, was that the eight MI observation checklists could be used to measure the extent that MI was incorporated into third and fourth grade classrooms. The specific tasks observed in MI classrooms were supported in the literature by Lazear (1991), Armstrong (1994), and Fogarty (1997). During the pilot study, data was gathered from the checklists to record the extent or degree of MI (low, medium, or high) implementation within the instruction of third and fourth grade classrooms. Non-MI teachers in the pilot study utilized MI to a low extent and MI teachers used MI to a medium or high degree.

A second conclusion was that the implementation of MI was as equally effective as the non-MI approach to instruction at the third and fourth grade levels. This conclusion was reached after the data analysis was completed and a review of the gain scores from pretest and posttest results revealed that the third and fourth grade students had similar increases in mean scores for reading and mathematics.

Implications and Discussion

Implications from the study are as follows:

First, the results of the study may be beneficial to educators wanting to obtain information on the extent that MI is incorporated into instruction. According to the data retrieved from the MI observation checklists during the study, the degree that MI was incorporated into the classrooms was consistent with the teachers' and administrators' perceptions of the approach used in the instructional process. Data results from classroom observations reported the majority of the instruction received by students in the MI classrooms had a high extent of MI

implementation. In contrast, students in the non-MI classrooms received a majority of their instruction with a low extent of MI implementation.

Second, the findings of the research study may assist educators in making choices in instructional planning. Although the MI theory has been introduced and implemented in schools around the country, MI implementation is relatively new to Georgia. At the time of this study, no research had been done to determine if utilizing MI has a statistically significant affect on reading and mathematics achievement scores on the ITBS for students attending elementary schools in Georgia. In Georgia, the new A Plus Education Reform Act of 2000 puts a mandatory emphasis on the results of standardized tests for schools. Therefore, it is important for Georgia schools to incorporate methods that show progress in helping students achieve success in school.

The question arises as to what are the guidelines for helping students to becoming successful in school. Although Georgia legislatures primarily focus on the results of standardized tests as a basis for school success, teachers in Georgia may have different perceptions of the importance of standardized tests. Since standardized tests reflect verbal linguistic and logical mathematical intelligences, the results of the study may assist educators in drawing conclusions if standardized tests, such as the ITBS, adequately assess individual strengths in the eight intelligences. In this study, students may have had strengths in areas not measured on the ITBS.

Third, the results of the study may benefit educators in assessing if a significant difference exists between the MI and non-MI approach to instruction when MI is implemented into the instruction over several years. The data analyzed from the ANOVA did not reveal a statistically significant difference between the third grade reading, fourth grade reading and fourth grade mathematics. The MI third and fourth grade students participating in this study were among the first to receive MI instruction in Georgia. A study completed after the final phase of MI implementation or after MI had been implemented for more than three years may have rendered different results.

Implications derived from the results of the study should be guardedly considered. The results of this study should be considered preliminary research and further research should be conducted. The following section offers recommendations for further research.

Recommendations for Further Research

Recommendations for further study include:

A recommendation for further research is to complete a similar study after the schools in Fayette County have completed the last phase of MI implementation over a period of at least three years. By replicating the study three years from now, results would be more conclusive if the MI approach has any statistically significant effect on reading and mathematics achievement at the third and fourth grade levels. In three years, all of the teachers of the MI school would have fully integrated MI. Therefore, the students would have received MI instruction for several years by the time they reached the third and fourth grades. The school would have also had time to fully incorporate

all phases of the MI approach to assessment and integrate MI in a more consistent manner.

Another recommendation is to complete a comparison study of lower grades, elementary, and upper grades, middle school and high school, utilizing the MI approach in order to reveal if any statistically significant differences in achievement would be reported for students receiving MI over a period of several years. This study did not involve student participants at the middle school or high school levels. It would be beneficial for educators to be able to assess if utilizing MI over several years has any effect on student achievement.

A comparison study could be conducted on teacher attitudes using the MI or non-MI approach to instruction. The current study did not consider teacher attitudes toward the type of instructional method used in the classroom. However, the teacher interviews revealed some beliefs held by the MI teachers on MI implementation. The MI teachers in this study were both very accepting of incorporating the MI approach into their instruction. However, if teachers of the MI school were forced to implement MI into their instruction and they did not believe in the MI method, different results may have been revealed in the study.

A study of the relationship between teacher experience and the degree of MI implementation within instruction would be beneficial to educators. The number of years of experience held by the MI teachers was not a consideration for this study. However, if the instruction of MI teachers with little teaching experience is compared to the instruction of experienced MI teachers, results would reveal if experienced teachers

instinctively provide MI instruction to a higher degree than inexperienced teachers.

Another recommendation is to complete a comparison study of teachers with lengthy, formal staff development in MI theory to those teachers having only a brief introduction to MI. Such a study could be completed to compare the achievement scores of students to determine if students taught by teachers with extensive MI staff development had statistically significant gains in test scores when compared to students taught by teachers who knew very little about the MI approach to instruction.

It would be beneficial to educators to conduct a similar research study comparing the achievement scores of students with learning disabilities who were taught by MI teachers or non-MI teachers. This study did not include ITBS test scores of special education students. However, it would be beneficial for educators to be able to analyze the achievement data of students with learning disabilities when students had MI implemented into their instruction in order to determine if the MI approach could promote achievement for students with learning disabilities.

A final recommendation for further research that would also be beneficial to educators would be a longitudinal study following students who received MI in elementary school and comparing their future school success to students who did not receive MI instruction. The MI students could be compared to students receiving non-MI approaches to instruction on indicators such as dropout rate, those receiving a high school diploma, those attending college, and students completing a college degree. Such research could also follow the MI students through their professional lives to note if types of career choices could

be linked back to their intelligence strengths demonstrated in elementary school. However, the intensity in which future researchers study the effects of the MI approach upon student achievement will be dependent upon the interest of the individual in seeking the relevance of innovative instructional methods targeted to enhance the academic success of students.

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APPENDIX A

INTERVIEW GUIDES FOR

MULTIPLE INTELLIGENCES IN ELEMENTARY SCHOOL CLASSROOMS AND

STUDENT ACHIEVEMENT

Teacher Interview Form

I. Introduction:

- Thank you for allowing me to interview you today.
- I would like to tape this conversation. Anything you say will be kept confidential.
- My name is Pam Green and I am completing this interview as part of my doctoral study.
- The purpose of the study is to identify if/how multiple intelligences are being incorporated into the curriculum at the elementary school level and to study the affects that MI has on student achievement.
- Do you have any questions?
-

II. Background Information

1. How many years have you been a teacher?
2. How many years have you taught at this school?
3. What grade/subject matter do you teach?
4. How many students are in your class?

III. Adoption of MI

5. What types of curriculum approaches or methodologies do you utilize during your instruction?
6. Have you heard of the multiple intelligences approach to instruction?
7. If yes, how did you first hear of MI?
8. Have you adopted the principles of MI into instruction?
9. If yes, for how long?
10. What steps or activities do you undertake in order to implement the theory of MI?
11. What kinds of things do you do in order to use a range of the intelligences?
12. How do you believe the MI approach differs from the traditional approach?

IV. Utilization of MI/Traditional Approaches

13. What would you like me to notice during the observations?
14. What activities will I see in your classroom?

For MI Classrooms Only:

15. Has MI affected your instruction, the curriculum, and assessment? If so, how?
16. Are these activities different than before you began using MI? If so, how?
17. Have you noticed any changes in the students? If yes, what types of changes?
18. Has MI affected parental interactions? If so, how?

Concluding Comments:

19. Is there anything else you would like for me to know regarding your classroom and the utilization of the MI/traditional approach?

INTERVIEW GUIDES FOR

MULTIPLE INTELLIGENCES IN ELEMENTARY SCHOOL CLASSROOMS AND

STUDENT ACHIEVEMENT

Principal Interview Form

I. Introduction:

- Thank you for allowing me to interview you today.
- I would like to tape this conversation. Anything you say will be kept confidential.
- My name is Pam Green and I am completing this interview as part of my doctoral study.
- The purpose of the study is to identify if/how multiple intelligences are being incorporated into the curriculum at the elementary school level and to study the affects that MI has on student achievement.

II. Background Information

1. How long have you been a principal?
2. How long have you been an administrator at this school?
3. What grade levels are represented in your school?
4. What is the total student enrollment of your school?
5. Would you provide a brief profile of the student body?
6. Would you provide a brief profile of the surrounding community that you serve?

III. Adoption

7. What types of curriculum approaches or methodologies do your teachers utilize during the instructional process?
8. Have you heard of the multiple intelligences approach to instruction?
9. If yes, how did you first hear of MI?
10. Have you adopted the principles of MI into your school?
11. If yes, for how long has this been implemented?
12. If you have implemented MI, what steps or activities have you taken in your school in order to implement the theory of MI?
13. What kinds of things does your school do in order to utilize a range of the intelligences?
14. How do you believe the MI approach differs from the traditional approach?

IV. Utilization of MI/Traditional Approaches

15. What would you like me to notice during the observations?

16. What types of activities will I observe during instruction?

For MI Schools Only:

17. Have there been any changes in the instructional process, curriculum, or assessment since MI has been implemented within your school?
18. What do you believe I will see that will tell me that MI is being incorporated into the curriculum?
19. How are these activities different than before MI was implemented?
20. Has MI affected parental interactions? If so, how?

Concluding Comments:

21. Is there anything else you would like for me to know regarding your school and the utilization of the MI/traditional approach?

APPENDIX B

E-MAIL CORRESPONDENCE

Subj: Re: Ml **observation instrument**
Date: 6/16199 10:22:30 AM Eastern Daylight Time
From: tfioerr@newcityschool.org *(Thomas R.* Hoerr)
To: Teacher122@aol.com

Pam,

Unfortunately, I don't have an instrument that would help you! If, however, you don't have our faculty's two books, let me know and I can send you an order form. I am sure that there would be some ideas and/or forms that would be helpful.

In addition, my recommendation is that you might develop your own observational check-list, something that might be filled out by both teacher and students. Depending upon the nature of your research, too, it might be fun to look at what is on the walls in both classrooms and the hall, ie is a Valuing of all the intelligences reflected by what is displayed and esteemed? Finally, are there things like Honor Rolls, awards assemblies, and the like? If so, what intelligences are recognized?

Good luck!

Thomas R. Hoerr, Ph.D.
Director, New City School
trhoerr@newcityschool.org

Subj: Instrument
Date:6/30/99 12:14:39 AM Eastern Daylight Time
From:
komhaber@pz.havard.edu (Mindy Kornhaber)
To: Teacher122@aol.com

Dear Pam:

I don't know of an instrument or inventory that meets your needs. For my Dissertation, in which I attempted to understand in part whether an assessment that claimed to draw on MI really did draw on MI I used three criteria: the assessment had to be intelligence fair, domain based, and extend beyond the three traditionally-tested assessments. Don't know that this will help you. The inventories that exist are most geared toward the 'student' rather than classroom level.

Good luck!
Mindy

Subj: Re: MI observation instrument
Date: 7/16/99 6:44:18 PM Eastern Daylight Time
From: LaserBeem@worldnet.att.net (David G. Lazear)
To: Teacherl22@aol.com

Dear Pam,

I am not aware of an instrument that does what you are looking for, however, I would invite you to check out my book entitled Multiple Intelligence Approaches to Assessment: Solving the Assessment Conundrum. In this book I have suggested a variety of instruments teachers can use with their students to identify the various intelligences. Please check out my website for ordering information is you are interested: http://www.multi-intell.com.

Please do not hesitate to contact me if I can be of further service to you. Good luck on your project at University of Georgia.

Sincerely,

David Lazear

Subj: Re: MI observation instrument
Date: 6!30/99 3:01:41 PM Eastern Daylight Time
From: tothomas@sonic.net (Thomas Armstrong)
To: Teacher122@AOL.COM

Dear Pam,

I honestly would like to be more encouraging and supportive in your research, but I simply can't give permission far my checklists to be used in this way, precisely because they have not been designed for that purpose, nor has any reliability or validity research been done on them. Also, I would hesitate because 1 am wary of supervisors going into teachers classrooms "looking for MI". I'm afraid that's how Madeline Hunters marvelous model was ruined, and I'd hate to see it happen to MI. In my opinion, MI is an art rather than a science, and so achieving that kind of quantitative precision is antithetical to its spirit. I suggest that if you really feel passion around this, that you create your own observation instrument and establish its reliability and validity through inter-rater protocols. Good luck!

Sincerely, Thomas Armstrong, Ph.D.

Subj: Re: MI observation instrument
Date: 98-08-1915:57:07 EDT
From:info@pz.harvard.edu (info)
To: Teacher122@aol.com

Tests/evaluations for MI are not something that Project Zero has/is working on. There are a number of evaluation tools out there for MI but we do not keep track of them nor do we stand behind one or another. Best of luck!

Subj: Re: multiple intelligences/elementary level curriculum
Date: 98-05-06 09:32:35 EDT
From: MBECKMAN@edinboro.edu (mbeckman)

To: Teacher122@AOL.COM

Pam, I would be interested in your variables and how you are incorporating MI in the classroom. Will it be in just one class or in several? How will you maintain consistency in the offering of MI so that your results are generalizable? I am very interested because I have found that there is a great deal of interpretation of MI and how it is used in the classroom. I have done a great deal of assessment through observation. I used anecdotal records to verify, etc. Howard Gardner had always maintained that he would not be formulating assessments for each area of intelligence (formal ones), but I have been made aware of a program called MIDAS by a Brandon Sheerer. That may be of interest to you. I wish you the best of luck on your research. I can't think of a more exciting topic!
Sincerely, Marian S. Beckman
Director Miller Laboratory School
Edinboro University of PA

Subj: Re: Fwd: MI observation instrument
Date: 98-07-10 11:24:00 EDT
From: komhaber@pz.harvard.edu (Mindy Komhaber)
To: Teacher122@aol. com

To: Pam Green
Fm: Mindy Kornhaber

Your inquiry to Project Zero was sent to me. I head up the project on Schools Using MI Theory, and have looked at issues of school reform, MI, and intelligence, more generally over some 10 years at PZ.

I could be wrong, but I know of no observation instrument for ascertaining whether Ml is being implemented. What may be helpful to you is a study I did, which in part describes considerations for deciding whether MI was in place: It's called the Theory of Multiple Intelligences: Why and How Schools Use ft. Unfortunately, it's work I did as a student in 1994. I could send you a copy if you covered the costs ($15). Al-so, you should check out SUMIT's upcoming revised webpage, which lists 6 Compass Points (c 1997 Pres & Fellows of Harvard University) for using MI well. Most of these overlap with other sorts of successful reform ideas, but two I think are particularly useful: a prominent role for the arts and the use of the theory as a means rather than an end. The revised site will be up in c. 2 weeks: http://pzweb.harvard.edu/SUMIT

Hope this helps.

APPENDIX C

MULTIPLE INTELLIGENCES CHECKLISTS

Verbal-Linguistic

School Code_____
Class Code _____

Task Type	Tasks Observed (yes/no)	If observed, how often	Activity Type	Time Modules
Written: Stories				
Essays				
Poetry				
Journals				
Word Processing				
Publishing				
Listening Activities: Audio Tapes				
Class Presentation				
Verbal: Humor				
Speeches				

Storytelling				
Reading Aloud				
Debates				
Discussions				
Visual: Reading				
Word Puzzles				
Worksheets a.Teacher Created b. Student Created				
Researching				

Additional Comments:

Musical-Rhythmic

School Code_____
Class Code _____

Task Type	Tasks Observed (yes/no)	If observed, how often	Activity Type	Time Modules
Uses Songs: Jingles				
Choral Readings				
Singing				
Humming				
Whistling				
Rap				
Other				
Plays Music: Instruments				
Background Sounds				
As a group				
Listening Appreciation				
Performances				
Creates Music: Rhythmic Patterns				
Compositions				

Musical Concepts: Analyzes musical structures				
Illustrates With sound				
Utilizes Musical Software				

Additional Comments:

Logical-Mathematical

School Code_____
Class Code _____

Task Type	Tasks Observed (yes/no)	If observed, how often	Activity Type	Time Modules
Calculation Processes				
Logical Analysis				
Pattern games/codes				
Probabilities				
Scientific Demon-strations				
Classifying				
Categorizing				
Logical Problem Solving				
Higher-Order Reasoning				
Logic/ Rational Exercises				

Computer Programming				

Additional Comments:

Bodily-Kinesthetic

School Code_____
Class Code _____

Task Type	Tasks Observed (yes/no)	If observed, how often	Activity Type	Time Modules
Charades				
Pantomiming				
Dramatization				
Dance				
Physical Exercises/ Activities				
Skill Demonstra-tions				
Sports				
Games				
Field Trips				
Tactile Materials/ Experiences				
Activities with Body Language				
Classroom Theater				

Puppets				

Additional Comments:

Interpersonal

School Code_____
Class Code _____

Task Type	Tasks Observed (yes/no)	If observed, how often	Activity Type	Time Modules
Encourages group tasks				
Conversation allowed				
Debates				
Collages				
Murals				
Round Robin Activities				
Teaching Others Encouraged				
Interviewing				
Group Brainstorming				
Conflict Mediation				
Board Games				
Peer Sharing				

Giving/ Receiving Feedback				

Additional Comments:

Intrapersonal

School Code_____
Class Code _____

Task Type	Tasks Observed (yes/no)	If observed, how often	Activity Type	Time Modules
Independent Study				
Journal Writing				
Self-Assessments				
Personal Goal Emphasis				
Higher-Order Thinking Questions				
Personal Applications				
Individual Projects				
Reflections Periods				
Free Choice Time				

Additional Comments:

Visual-Spatial

School Code_____
Class Code _____

Task Type	Tasks Observed (yes/no)	If observed, how often	Activity Type	Time Modules
Graphic Representa-tions: Drawing				
Painting				
Sketching				
Illustrating				
Cartooning				
Models				
Posters				
Mapping				
Diagrams				
Optical Illusions				
Doodling				

Murals				
Other Representa-tions: Sculpting				
Puzzles				
Video Recording				
Photography				
Manipulative Demonstrations				
Visual Thinking Exercises				
Computer Software for Drawing/ Painting/Designs				

Additional Comments:

Naturalistic

School Code_____
Class Code _____

Task Type	Tasks Observed (yes/no)	If observed, how often	Activity Type	Time Modules
Discovering Patterns of nature				
Caring for plants/ Animals				
Conservation				
Exploring				
Labs				
Nature Encounters				
Nature Observations				
Nature simulations				
Species classification				
Sensory simulations				
Collecting				

Identifying plants/animals				

Additional Comments:

APPENDIX D

CONSENT FORMS

Parental Consent Form

I agree to allow my child _____ to take part in a study titled *Multiple Intelligences in Elementary Classrooms and Student Achievement*, which is being conducted by Pamela L. Green, (hp) 770-479-5514 or (wp) 770-479-3978, under the direction of Dr. David Weller, Department of Educational Leadership, University of Georgia, 706-542-3343. I do not have to allow my child to take part in this study. I and my child can stop taking part at any time without giving a reason, and without penalty. I can ask to have information related to my child returned to me, removed from the research records, or destroyed.

The reason for the research is to observe elementary school classrooms implementing the multiple intelligences (MI) approach to instruction and to compare them to classrooms that are traditional in their instructional approach. Students in third and fourth grades who attend classrooms where MI has been incorporated into the instruction will have their achievement test scores from the Iowa Test of Basic Skills (ITBS) compared to matched students in third and fourth grades whom have had a traditional approach to instruction. The researcher has already received permission from the school's principal and classroom teacher to observe my child's classroom for one week. Furthermore, the researcher is also asking for my consent to view my child's permanent record in order to detect where my child has attended school, in an MI or traditional school, and to obtain achievement test score data from the 1998-1999 and 1999-2000 ITBS. It is my understanding that all information relating to my child will be kept confidential.

Although I will not benefit directly from this research, allowing the researcher to view permanent file test score data may lead to information that

could indirectly benefit schools in choosing the most effective type of instructional approach to use in classrooms.

The procedures are as follows: (1) the researcher will be observing my child's classroom for one week. During this time, the researcher will sit quietly in the room and will not interact with the students and, (2) the researcher will view my student's permanent file information to detect where my child has attended school and to obtain achievement test score data from the 1998-1999 and 1999-2000 ITBS. No discomforts or stresses are expected. No risks are expected.

Any information that is obtained in connection with this study, and that can be identified as my child, will remain confidential and will be disclosed only with my permission or as required by law. If information about my child is published, it will be written in a way that my child cannot be recognized. In order to keep my child's information confidential, the identity of my child will be coded and all data will be kept in a secured, limited access location. The master list identifying my child with his/her code will only be seen by the researcher and will be kept in a safe.

The researcher will answer any further questions about the research, now or during the course of the project, and can be reached by telephone at (hp) 770-479-5514 or (wp) 770-479-3978. I understand the procedures described above. My questions have been answered to my satisfaction, and I agree to participate in this study. I have been given a copy of this form.

_____

Signature of Researcher Date

_____

Signature of Parent or Guardian Date

Please sign both copies of this form. Keep one and return the other to school for the investigator.

For questions or problems about your rights please call or write: Ms. Julia D. Alexander, Human Subjects Office, University of Georgia, 606A Boyd Graduate Studies Research Center, Athens, Georgia 30602-7411; Telephone (706) 542-6514; E-Mail Address IRB@uga.edu.

Teacher Consent Form

I agree to take part in a study titled *Multiple Intelligences in Elementary Classrooms and Student Achievement*, which is being conducted by Pamela L. Green, (hp) 770-479-5514 or (wp) 770-479-3978, under the direction of Dr. David Weller, Department of Educational Leadership, University of Georgia, 706-542-3343. I do not have to take part in this study. I can stop taking part at any time without giving a reason, and without penalty. I can ask to have information related to me returned to me, removed from the research records, or destroyed.

The reason for the research is to observe elementary school classrooms implementing the multiple intelligences (MI) approach to instruction and to compare them to classrooms that are traditional in their instructional approach. Students in third and fourth grades who attend classrooms where MI has been incorporated into the instruction will have their achievement test scores from the Iowa Test of Basic Skills (ITBS) compared to matched students in third and fourth grades whom have had a traditional approach to instruction.

I give consent for the researcher to observe my classroom for one week. It is my understanding that during these observations, the researcher will sit quietly in the room and will not interact with the students in my class.

I further understand that I will be interviewed by the researcher and will have to give my consent in order for my answers to be tape recorded. I understand that only the researcher will be using a cassette tape for purposes of her study and that the tape will be secured by her. It is my understanding that no one other than the researcher will listen to this taped interview and that the tape will be properly labeled, secured by her, and erased after three years.

Furthermore, I understand that the researcher may make copies of my lesson plans in order to analyze what types of activities I am using during

instruction. It is my understanding that no one other than the researcher will be viewing/copying my lesson plans and that these documents will be secured by her.

Although I will not benefit directly from this research, allowing the researcher to observe my classroom activities could indirectly benefit schools in choosing an effective type of instructional approach to use in classrooms. No discomforts or stresses are expected. No risks are expected.

Any information that is obtained in connection with this study, and that can be identified as me, will remain confidential and will be disclosed only with my permission or as required by law. If information about me is published, it will be written in a way that I cannot be recognized. In order to keep my information confidential, my identity will be coded and all data will be kept in a secured, limited access location. The master list identifying my name with a code will only be seen by the researcher and will be kept in a safe.

The researcher will answer any further questions about the research, now or during the course of the project, and can be reached by telephone at (hp) 770-479-5514 or
(wp) 770-479-3978.

I understand the procedures described above. My questions have been answered to my satisfaction, and I agree to participate in this study. I have been given a copy of this form.

_____
Signature of Researcher Date

_____
Signature of Teacher Date

Please sign both copies of this form. Keep one and return the other to school for the investigator.

For questions or problems about your rights please call or write:
Ms. Julia D. Alexander, Human Subjects Office, University of Georgia, 606A Boyd Graduate Studies Research Center, Athens, Georgia 30602-7411; Telephone (706) 542-6514; E-Mail Address IRB@uga.edu.

Administrator Consent Form

I agree to take part in a study titled *Multiple Intelligences in Elementary Classrooms and Student Achievement*, which is being conducted by Pamela L. Green, (hp) 770-479-5514 or (wp) 770-479-3978, under the direction of Dr. David Weller, Department of Educational Leadership, University of Georgia, 706-542-3343. I do not have to take part in this study. I can stop taking part at any time without giving a reason, and without penalty. I can ask to have information related to me returned to me, removed from the research records, or destroyed.

The reason for the research is to observe elementary school classrooms implementing the multiple intelligences (MI) approach to instruction and to compare them to classrooms that are traditional in their instructional approach. Students in third and fourth grades who attend classrooms where MI has been incorporated into the instruction will have their achievement test scores from the Iowa Test of Basic Skills (ITBS) compared to matched students in third and fourth grades whom have had a traditional approach to instruction.

I give consent for the researcher to observe specified classrooms for one week. It is my understanding that during these observations, the researcher will sit quietly in the room and will not interact with the students in these classes.

It is also my understanding that the researcher will view the permanent records of the selected third and fifth grade students. I understand that she must receive parental consent before being allowed to view these records. The only information that the researcher will be allowed to view is: (1) The number of years in attendance at the school, and (2) information from the Iowa Test of Basic Skills for the students in the observed classrooms for the years 1998-1999 and 1999-2000.

I further understand that I will be interviewed by the researcher and will have to give my consent in order for my answers to be tape recorded. I understand that only the researcher will be using a

cassette tape for purposes of her study and that the tape will be secured by her. It is my understanding that no one other than the researcher will listen to this taped interview and that the tape will be properly labeled, secured by her, and erased after three years.

Although I will not benefit directly from this research, allowing the researcher to observe classroom activities and view information from standardized tests, once parental consent has been obtained, could indirectly benefit schools in choosing an effective type of instructional approach to use in classrooms.

No discomforts or stresses are expected. No risks are expected. Any information that is obtained in connection with this study, and that can be identified as me, will remain confidential and will be disclosed only with my permission or as required by law. If information about me is published, it will be written in a way that I cannot be recognized. In order to keep my information confidential, my identity will be coded and all data will be kept in a secured, limited access location. The master list identifying my name with a code will only be seen by the researcher and will be kept in a safe.

The researcher will answer any further questions about the research, now or during the course of the project, and can be reached by telephone at (hp) 770-479-5514 or (wp) 770-479-3978. I understand the procedures described above. My questions have been answered to my satisfaction, and I agree to participate in this study. I have been given a copy of this form.

_____

Signature of Researcher Date

_____

Signature of Administrator Date

Please sign both copies of this form. Keep one and return the other to school for the investigator.

For questions or problems about your rights please call or write: Ms. Julia D. Alexander, Human Subjects Office, University of Georgia, 606A Boyd Graduate Studies Research Center, Athens, Georgia 30602-7411; Telephone (706) 542-6514; E-Mail Address IRB@uga.edu.