

**Differential Effects of a Multiple Intelligences Curriculum on Student
Performance**

by
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Differential Effects of a Multiple Intelligences Curriculum on Student Performance

Thanh T. Nguyen

A Dissertation

Presented to the Faculty

of the

Graduate School of Education of Harvard University

in Partial Fulfillment of the Requirements

for the Degree of Doctor of Education

2000

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For my parents, Vang T. Nguyen and Kim-Anh T. Le, who have
believed in the wealth of education and knowledge,
6 brothers, Cuong, Tan-Thanh, Phuoc, Loc, Tai, and Quoclong
& 5 sisters, Kim-My, Thuy, Xuan, Trang, and Kim-Ut

and

My husband, Long T. Nguyen, Ph.D.
& 3 daughters, Tina, Tiffany and Titania

and

All of my students from Vietnam to America.

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Abstract

The Fuller School is one of the six elementary schools in Gloucester, Massachusetts, a small urban community known for shipbuilding and fishing. Fuller students come from a wide range of socioeconomic backgrounds (from public housing facilities to affluent families) and a variety of ethnic groups (including Italian, Hispanic and Vietnamese). With its diverse population, the Fuller School represented an excellent environment to test the use of Multiple Intelligences (MI) as a foundation for its curriculum.

This study aimed to examine one of the ten objectives of the FIRST Schools and Teacher Program Grant: “To improve student achievement on standardized tests” by using “multiple intelligences instruction.” The results of the California Achievement Test/5 (CAT/5) given at grade 5 tended to show no differences between students in the MI and the traditional school program. Although no association between CAT/5 outcomes and the MI treatment were found, two report-card outcomes at the sixth grade-level--Math and Physical Education--and an interaction of Program-type with Home-language on Music were found to be significant. By and large, the magnitude of these differences was not large enough to conclude that the MI treatment was effective in producing larger standardized test scores than students in the non-MI program. Yet, considering that the MI program emphasizes different kinds of activities and more diverse ways of learning and provides an alternative to the traditional classroom, this result of no differences between programs can be thought of a success for the MI community. Participants in the MI program performed just as well as those who had been in the traditional program.

This case study is unusual because public schools rarely assigned their students randomly to experimental programs through a lottery process. Although students were randomly assigned to MI and traditional classrooms, accounting for several additional demographic variables in the students' personal and family background helped to characterize the differences in student performance in language, mathematics, social studies, science, arts, physical education, and music.

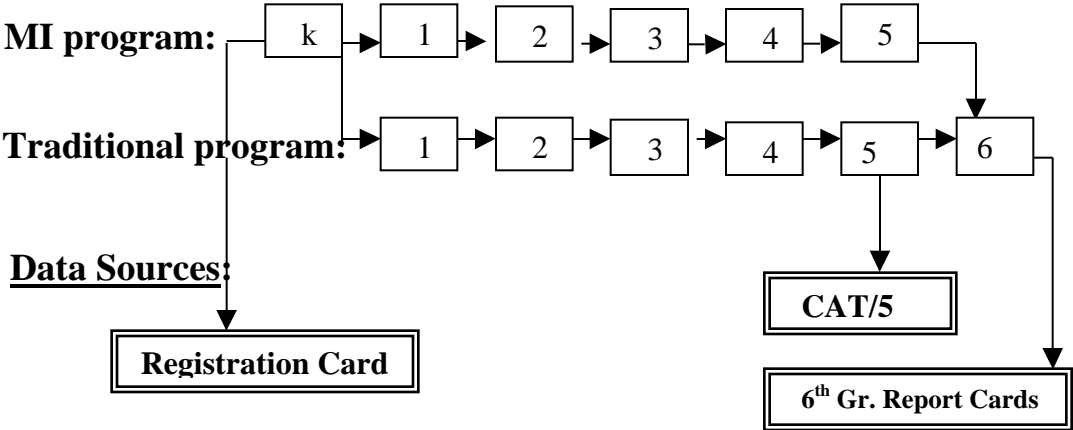
Educators should find the results encouraging, even with no differences in test scores and grades, because this indicates that MI approaches are competitive with traditional ones. These findings shed new light on the application of MI and, given the growth in its use, provides a much-needed comparison for those interested in implementing it as one component of educational reform.

Chapter I - Introduction

The Fuller School is one of the six elementary schools in Gloucester, Massachusetts, a small urban community known for shipbuilding and fishing. Fuller students come from a wide range of socioeconomic backgrounds (from public housing facilities to affluent families) and a variety of ethnic groups (including Italian, Hispanic and Vietnamese). With its diverse population, the Fuller School represented an excellent environment to examine the use of Multiple Intelligences (MI) as a foundation for its curriculum (Bates, 1996; Kornhaber, 1994; Kornhaber & Krechevsky, 1994).

In a pilot program begun in 1990, all Fuller kindergarten students were required to attend the MI program. After that year, students were randomly selected through a lottery process to be placed in either the MI program or the traditional classrooms. In the 1991-1992 academic year, first grade students were officially separated into two classroom settings, and continued to stay in the assigned program until fifth grade (see Figure 1).

Figure 1: Program at various grade levels and sources of data



In 1992, the Fuller School was awarded a grant from the FIRST Schools and Teacher Program of the U.S. Department of Education to support and develop further an elementary school program based on Howard Gardner's (1983) theory of multiple intelligences. One of the grant's ten objectives was "To improve student achievement on standardized tests" by using "multiple intelligences instruction."

By the end of the three-year grant (1992-1995), the program evaluator, Joan Bates (1996), reported that all the rudimentary goals of the MI program had been achieved, except for an evaluation based on the standardized tests as indicated in the eighth objective of the Project Summary . Not until the end of the 1995-1996 academic year did all fifth-grade students in Fuller take the required California Achievement Test/5 (CAT/5) before going to the middle school. Since this eighth objective was not evaluated (the grant ended a year before testing), the question of whether or not the MI curriculum's effect on achievement on the CAT/5 was an on-going issue for teachers, administrators and parents. It is, I believe, important to acknowledge that the MI program met nine significant objectives ranging from "mainstream special needs children" to "increase parental involvement."

I have now investigated the differential effects of MI instruction on student achievement as measured by the CAT/5 using multiple regression as the method of analysis (Anderson, Auquier, Hauck, Oakes, Vandaele, & Weisberg, 1980; Kleinbaum, Kupper, Muller, & Nizam, 1998). I evaluated the performance of the first group of students who were randomly assigned to both programs in the 1991-1992 academic year, and took the CAT/5 in April 1996. I also examined the subsequent effects of the MI program on student performance at the sixth-grade level (using report card grades) where

students from both programs worked together again for the first time after five years of separation. If the eighth objective of the FIRST grant was achieved, I would assume that the MI students would do as well as or better than the traditional students on both the CAT/5 and their report card grades, even as I acknowledge that “improvement” might suggest a comparison with earlier test scores. Since there were no earlier test scores as Gloucester eliminated all standardized testing during the first year of the grant, this is a preferred way to test this eighth objective.

If using “multiple intelligences instruction” does, in fact, “improve student achievement on standardized tests,” as the eighth objective of the FIRST grant expected, then MI students should perform as well or better than traditional students on the CAT/5.

To examine this claim, I addressed the following questions:

1. Is there any differential effect of the MI treatment on student achievement as compared to those in a traditional program using the subtest scores of CAT/5 and report-card grades?
2. Controlling for students’ personal and family background, how did the MI treatment affect student achievement compared to students in a traditional program using the subtest scores of CAT/5 and report-card grades?
3. Will the results appear to be consistent across different subgroups of children?

Chapter II: Review Of Literature

In this chapter, I review literature from the theory to the practice of multiple intelligences and describe the measures in the fifth edition of the California Achievement Tests (CAT/5). I begin by examining existing views of how the theory of multiple intelligences has been translated into educational practices by Gardner (1983) and other educators. I also examine the extent to which fundamental features and measurements of the CAT/5 can provide information on student achievement. I then compare the evaluation criteria of the CAT/5 and the report-card grades at the middle school. Finally, I review comparable studies that evaluated the differential effects of reading programs for children at-risk, inevitably efforts at school change. I do so as these studies are related to the work under examination at the Fuller School.

A. From the Theory of Multiple Intelligences to Practices

Existing views of the theory of multiple intelligences appear to fall into two groups: explanations from Howard Gardner and the translation of the theory from members of the educational community. The two have offered somewhat different pictures of the multiple intelligences theory. Gardner's position is that he defined each of the seven intelligences based on the results of his wide and massive survey of literature. On the other hand, the educational community has translated the multiple intelligences theory and found it significant in improving teaching and learning.

- Gardner's theory

Through his massive and ubiquitous survey based on a set of eight criteria that he used to measure and determine the validity of a specific intelligence, Gardner (1983) found evidences of at least seven intellectual strengths that are independently developed.

His eight criteria to measure and determine the validity of a specific intelligence are: 1) potential isolation by brain damage, 2) the existence of idiots savants, prodigies, and other exceptional individuals, 3) an identifiable core operation or a set of operations, 4) a distinctive developmental history, along with a definable set of expert “end state” performances, 5) an evolutionary history and evolutionary plausibility, 6) support from experimental psychological tasks, 7) support from psychometric findings, and 8) susceptibility in encoding in a symbol system (details on pp. 62-67).

The initial seven intelligences that he suggested are linguistic, musical, logical-mathematical, spatial, bodily-kinesthetic, interpersonal and intrapersonal. Linguistic intelligence is defined as the ability to use language to convey one’s thoughts to others, to help one remember and obtain information. Musical intelligence concerns abilities in working with tone, pitch, rhyme, and timbre. Logical-mathematical intelligence deals with making logical inferences, reasoning and working with numerical calculation. Spatial intelligence concerns abilities in perceiving the visual world accurately and then being able to transform and modify the form or the object based upon one’s initial perceptions. Bodily-kinesthetic intelligence addresses the abilities to master the motions of bodies and manipulate objects with finesse. Intrapersonal intelligence is the ability to access one’s inner feelings, whereas interpersonal intelligence associates with the abilities to understand others’ temperaments, motivations and intentions, thus allowing one to respond and lead others.

- Gardner’s educational suggestions

Gardner (1993) admitted that when he discussed the educational implications of the theory in his 1983 *Frames of mind*, his “eyes were not beamed toward the classroom” (p.

ix). However, since the book has greatly influenced the educational community, Gardner and his colleagues at Harvard Project Zero have put forth more efforts to bridge the theory to educational practices. I, therefore, will review his educational suggestions in two phases: early and later.

a. Gardner's early phase

In his 1983 edition, Gardner's primary hope was to examine "how various educational goals might be viewed and pursued" (p.373), and how educational progress should be ensured for everyone to fully reach his or her potential. Thus, he suggested that educators should recognize some important elements of the learning process such as: the kind of knowledge to be transmitted, the methods of transmission, the central points of learning, the people who transmit knowledge, and the general context of learning. Accordingly, Gardner (1983) proposed that an effective educational system should be able to balance various factors such as histories, traditions, cultures, and different combinations of intelligence. On that account, Gardner (1983) offered his views on how his theoretical framework might be applicable to such an effort.

First, any educational program must have explicit goals. Second, traditional methods of assessments such as "observation learning, informal interaction, apprenticeship systems, prevalent media, varieties of school, the curriculum (explicit or implicit) that currently exist" should be examined (p. 384). Third, more efforts should be made in investigating other possible learning styles that have been relatively prominent in diverse cultural communities. To that extent, he advised educators to think of ways to assess the intellectual profiles of individuals. Fourth, in assessing individual intellectual profiles, Gardner believed that the process should be started as early as in infancy

because early assessment would allow an individual to obtain and reinforce his or her intellectual credentials.

Ultimately, Gardner proposed to revise the educational planning system in order to meet the individual's intellectual profiles. After all, given a wide range of cultural settings, a variety of interest groups in the society, and even greater divergence of intellectual profiles, Gardner acknowledged that "The most I can do here is to sketch some expectations" (p. 390). He, therefore, hoped that educators would explore more biological and psychological tendencies, particularly in relation to the historical and cultural context of human beings.

b. Gardner's later phase

As Gardner's theory has revolved more profoundly into the educational community, Gardner experienced the need to provide some educational strategies from his point of view (Gardner, 1985, 1991, 1993).

As Gardner (1993) noted, when he discussed the educational implications of the theory in his 1983 *Frames of Mind*, his "eyes were not beamed toward the classroom" (p. ix). Since Gardner's theory has since been more profoundly integrated into the educational community, together with colleagues at Harvard Project Zero, Gardner has worked to bridge the theory to educational practices (Gardner, 1985, 1991, 1993). Two research projects, Arts PROPEL and Project Spectrum, were established to build research based on the educational implications of MI. Together with his colleagues at Project Zero, an educational research organization at the Harvard Graduate of Education, Gardner has put more effort into investigating the educational possibilities of MI. Two

research projects, Arts PROPEL and Project Spectrum, were established to build a research base on the educational implications of MI.

Together with David Feldman at Tufts University, Gardner founded Project Spectrum as a collaborative research project to look for alternative ways to assess preschoolers (Feldman, & Gardner, 1988). The goal was to look for all possible intellectual strengths in three- or four-year olds at the Eliot-Pearson Children's School in Medford, Massachusetts (see Hatch, & Gardner, 1986; Malkus, Feldman, & Gardner, 1988; Ramos-Ford, & Gardner, 1991; Wexler-Sherman, Feldman, & Gardner, 1988).

The Project Spectrum team learned that children at this age have more than just seven cognitive strengths and various working styles. Furthermore, these strengths can be powered up only with a teaching curriculum that allows these strengths to associate with a domain or symbol system (Gardner, 1997). For example, if we want to teach a child how to play chess, we could examine that child's spatial imagery or logical reasoning skills. Whether these measures might or might not be correlated with chess skills, Gardner and his colleagues recommended that teachers teach their students the rules of games and let them master the rules by introducing many activities whose intelligences are closely associated with chess. Once a student has been exposed to an ample set of experiences in the chess domain, he or she will exhibit his or her potential talents in that domain (see Chen, Isberg, & Krechevsky, 1995; Krechevsky, 1994 for domain-specific assessment instruments).

The significant contribution of Project Spectrum to the educational field is its list of recommendations for assessment activities and domain-specific assessment instruments that are compatible with school curricula (see Krechevsky, 1994). Accordingly,

Spectrum researchers also recommended that educators allow students to grow creatively and imaginatively based on each individual profile of strengths and weakness.

The second collaborative research project that Gardner and his colleagues organized, Arts PROPEL, worked jointly with the Educational Testing Service and the Pittsburgh Public School system. Its primary goal was to create and explore assessment techniques to detect potential intelligences in the domains of art (fundamentally in three areas: imaginative writing, music, and visual arts) at the middle and secondary levels (Gardner, 1989; Zessoules, Wolf & Gardner, 1988).

Two assessment techniques that the Arts PROPEL team proposed are portfolios and domain projects. A portfolio is a typical process-portfolio that contains initial plans, early sketches, self-evaluations, feedback from peers, teachers or experts, and plans for following projects. Simultaneously, the domain project is designed to present the central concepts, techniques, procedures and background knowledge for a specific domain in series. Thus, it would allow students to comprehend the full context of a work, and allow teachers to alter their teaching plans when needed, but still connect to standard curriculum. These are not included in the Fuller assessment.

B. MI Theory as seen by the Educational Community

While Gardner called his theory “multiple intelligences,” many educators interpreted it as “seven ways of knowing,” “seven kinds of learning styles,” or “multiple paths of learning.” In addition, MI advocates also translated his theory into many visual forms (charts, diagrams and drawings) and also used neurological references to connect these intelligences and capacities into curriculum and assessment (Armstrong, 1994; Bolanos, 1995; Lazear, 1990).

The most apparent translation of Gardner's theory into visual form is in David Lazear's diagram (1990). In this diagram, the sign "7 ways of knowing" in the center is symbolized as light. Surrounding the light symbol are numbers and shapes for the logical/mathematical intelligence, an eye symbol for visual/spatial intelligence, an arm for body/kinesthetic, the music symbol for musical/rhythmic intelligence, books and letters for verbal/linguistic intelligence, a head with light surrounding it for intrapersonal, and two hands together for interpersonal intelligence. Since his diagram could visually explain the basic principles of the seven intelligences, other authors have adapted his visual presentations as symbols in their books (see Campbell, Campbell, & Dickinson, 1996; O'Connor & Callahan-Young, 1994; Torff, 1997; Roth, 1998). Though later authors used different symbols for these seven intelligences (see Torff, 1997; Roth, 1998), more pictures have been used to explain these multiple intelligences.

The MI theory was also translated and connected with many capacities that involved each intelligence. For example, in his "Multiple Intelligences Summary Wheel," Lazear (1991) grouped these intelligences into three different types: "object-based," "objectless," and "personal." Likewise, Armstrong's (1994, pp. 7-8) "MI theory summary chart" shows how each intelligence is related to various systems, for instance "core components," "neurological systems," or "developmental factors."

C. The MI Theory in Practice

In this section, I review literature related to the MI curriculum and MI assessment methods.

The MI curriculum

In school-reform efforts across the nation, the MI theory has provided a “eureka” moment for many educators and teachers. Together with many other current ideas such as arts in education and gifted and talented education, the MI theory has stimulated efforts to build innovative curricula for diverse learners (Bates, 1996; Bolanos, 1995; O’Connor & Callahan-Young, 1994).

In 1987, the Key School in Indianapolis became the first MI school to officially apply the theory across all grade levels (see Bolanos, 1995; Fiske, 1988; Olson, 1988). With emphasis in physical education, art and music, students as young as 5 were required to play a musical instrument. Based on these diverse learning experiences, students were encouraged to draw on and explore their own intelligences through three major projects each year, such as focusing on the “connections” between people and their surroundings (Olson, 1988). They were also encouraged to learn through projects (or project-based learning) so that they could be creative, cooperative and personal in their own learning pace. In addition, they were videotaped at the beginning and the end of each year throughout their years at the Key School to create a profile (Olson, 1988).

The Fuller School MI curriculum was constructed with the Key School as a model. According to Bates (1996), the Fuller MI program was characterized by student-centered learning, authentic assessments, large-scale project learning, “less is more” in the acquisition of knowledge, and student-and-teacher learning partnerships. The difference

between the Key School and the Fuller School is the emphasis on “personal intelligences” in the Fuller School curriculum. According to O’Connor and Callahan-Young¹ (1994), the Fuller MI curriculum emphasized personal intelligences as early as possible because “many children have received little guidance in self-responsibility and are barely aware of their own motivation and actions and often do not understand consequences” (p. xiv). In *Seven Windows to a Child’s World: 100 ideas for the multiple intelligences classroom*, O’Connor and Callahan-Young (1994) suggested how the seven intelligences could be applied in their five example units. For instance, in the “Self” unit, one objective is to understand “why I am special and valued as an individual and a member of a group.” Based on this “Self” unit, the lesson plans would be divided into seven different intelligences. For example, in the logical-mathematical area, lesson plans were divided into “Graphing Eye Color,” “Exploration of Math Manipulatives,” and “People Patterns.” On the other hand, in interpersonal and intrapersonal intelligences, emphases were placed on “All by myself,” “Our Unique Faces,” and “I Was So Mad.” To assess these activities, the authors suggested teacher-made forms, checklists, narratives and portfolio formats such as collecting work samples, audio-tapes and/or videotapes to record student’s progress (O’Connor et al., 1994).

The MI assessment methods

Although many instruments have been suggested for assessing MI (Bellanca, Chapman, & Swartz, 1997; Gardner, 1993; Lazear, 1994; Torff (ed.), 1997), no particular assessment technique has been accepted as a standard tool for assessing MI student achievement. The reason, Gardner (1999, p. 80) argues is that, “intelligences must be

¹ Anna O’Connor and Sheila Callahan-Young are kindergarten teachers and founders of the Fuller MI program.

assessed in ways that are ‘intelligence fair’ – that is, in ways that examine the intelligences directly.” Relatedly, Project Spectrum provides a list of recommendations (not standardized assessment instruments) for teachers to observe domain-specific activities that will allow preschoolers to grow creatively and imaginatively based on each individual profile of strengths and weakness (see Chen et al., 1995; Krechevsky, 1994 for domain-specific assessment instruments). In conjunction, the Arts PROPEL team also proposed two assessment techniques, portfolios and domain-projects, for assessing the arts domain in series (Gardner, 1989; Zessoules et al., 1988).

Since most MI supporters advocate using individual-intellectual profiles, MI assessments, primarily teacher developed documentation, have been formulated for each of the seven intelligences. For instance, the Fuller School MI program has used the “Multiple Intelligences Program Interest Inventory” and “MI Assessment Form” to assess each intelligence, along with the “Goals/Assessment Report” for each subject matter. The main assessing categories for these tools are “less interested, interested, or strongly interested.”

Why should students be assessed by teachers in seven ways? Amstrong (1994) explained that when a school does not rely on a particular assessment instrument or a grading system, students have more opportunities to demonstrate their competence in a specific subject matter. Therefore, Amstrong recommended using his table of “49 MI Assessment Contexts,” in which students would have better chances to exhibit their proficiency in diverse ways for a specific subject-matter. Similarly, Lazear (1994) suggested a list of possible activities and tools that he called a “Multiple Intelligence Assessment Menu.” He suggested that these tools—videotapes, photography, student

journals, informal tests, student interviews, checklists, criterion-referenced assessments, classroom maps, and calendar records—can be used to create intellectual profiles.

While the concept of portfolios or process-folios may be sound, they were not maintained systematically at the Fuller School. A clearly related question, at a much later point, is how selective colleges would be able to read thousands of applicant folders made up of portfolios of student work. To solve this problem, Gardner (1997) suggested that students and counselors learn how to select the best materials for the admissions package, and colleges must find ways “to develop economical means for assessing such projects and process-folios” (p. 194). Up to now, unfortunately, standardized tests still stand as the most common requirement for college entrance that can be compared across schools. For that reason, the question of whether or not MI instruction would improve student performance on standardized tests is still of tremendous interest to educators and parents.

Even as I assume that conventional assessment techniques are not fully adequate to the task of measuring the seven intelligences, teachers, parents, and school administrators at Fuller are still interested in knowing how their children compare to the nation at large on standardized tests relating to basic skills. Educators would find the results encouraging, even if I found no difference in test scores and grades, because that would demonstrate that MI approaches are competitive with traditional ones. At this point, the benefits could be debated, although MI advocates claim that the benefits are larger and last much longer than the results of any standardized test.

D. The California Achievement Test, the Fifth edition (CAT/5)

As Armstrong (1994) reasoned, MI ways of teaching and learning should provide more opportunities for students to demonstrate their competence in a specific subject-matter. This view seemed compatible with the view of the founders of the Fuller MI program who suggested that this program would result in higher standardized test scores, at least in relevant domains. Here, I review the fundamental features and measurements of the CAT/5, the test actually used at the Fuller School, in assessing student achievement.

The fundamental features of the CAT/5

The California Achievement Tests were introduced in 1943, and have been continuously adjusted and updated in 1950, 1957, 1970 (Forms A and B), 1977 (Forms C and D), and 1985 (Forms E and F) to make them more suitable for use with current school curricula (Bunch, 1985). In 1992, in response to current interest in the integration of curriculum, the CAT/5 was redesigned from the 1985 CAT in an attempt to integrate content in a logical framework (Carney & Schattgen, 1994).

According to Carney & Schattgen (1994), the CAT/5 has been favorably received as a national standardized test series designed to measure student achievement in concepts and skills, from Grades K through 12, related to: Spelling, Reading, Language, Mathematics, Science, Study Skills, and Social Studies. Furthermore, the test series was designed to be administered by teachers in a regular classroom environment. Students are allowed some flexibility regarding the time for taking the test. For instance, they can work from 14 to 50 minutes on each subtest, and from a minimum of one and a half hours to a maximum of five and a quarter hours for the Complete Battery.