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ABSTRACT

Available scores from the Iowa Test of Basic Skills and Metropolitan Achievement Test-6 tests, administered between 1984 and 1988 to 88 students enrolled in a Montessori magnet program in the Houston Independent School District, were statistically analyzed. The t test for independent samples was computed to determine if minority students' scores differed significantly from test norms and district means. The study also computed analysis of variance in an effort to identify significant internal variance. Students in the subject population consisted of three cohorts: student were 31 percent Black, 26 percent Hispanic, and 39 percent White. Score analysis indicated that test performance of minority students in the Montessori magnet program was significantly higher than either the test norms or district means. The study concluded that Hispanic and Black students who have been enrolled in a Montessori magnet program for a year or more have impressive academic advantages. The students demonstrated mastery of subject material, measured by standardized tests, in all subtest areas. However, while the Montessori program has reduced deficiencies in minority achievement, it has not eliminated them. Even after several years in a Montessori program, race-related differences in student performance remain. Over 90 references are cited. (RH)

MINORITY STUDENT PERFORMANCE: IS THE MONTESSORI MAGNET SCHOOL EFFECTIVE?

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ABSTRACT

Available scores from the ITBS and MAT-6 tests,administered between 1984 and 1988,to 88 students enrolled in a montessori magnet program in the Houston Independent School District,were statistically analyzed . The t test for independent samples was computed to determine if minority student scores differed significantly from test norms and from HISD means. The F test was computed to indicate significant internal variance. The 88 students in the subject population consisted of three cohorts: 31% Black, 26% Hispanic and 39% White.

Score analysis indicates that minority student test performance is significantly higher at the $p<.05$ level in the montessori magnet program than either the test norms or HISD means.

MINORITY STUDENT PERFORMANCE: IS THE MONTESSORI MAGNET SCHOOL EFFECTIVE?

An analysis of standardized test scores indicates that the performance of minority students in a montessori magnet program is far superior to traditional instruction.

INTRODUCTION

Montessori classes are one of the programs available to inner city parents in the Houston Independent School District (HISD). These montessori magnet programs are not advertised as academically accelerated programs; they are part of district-wide magnet menus and are usually categorized as an alternative teaching method (Blank 1983; Bailey, 1987). The montessori magnet school provides individualized instruction in a three-year multi-age group setting; instruction begins with hands-on experiences by the child and slowly moves toward abstract conceptualization (Neubert, 1972; Montessori, 1965,1964). The instruction format appears to follow the theories of Albert Bandura, Jerome Bruner and R.M. Gange very closely (Bigge,1982). The scope and sequence of the curriculum, presented to each student individually, closely follows Bloom's theories for instructional presentation (Bigge,1982; Neubert,1972).

METHODOLOGY

The population selected for this study came from a montessori magnet school that had been in existence for twelve years. It was fully subscribed and had a long waiting list. There were 88 subjects, 31% Black, 26% Hispanic and 39% White or Asian. All students had been in the program from one to eight years. The classrooms were fully equipped with materials and the teacher/student ratios did not exceed 1:13. The staff were all certified montessori teachers; the teachers' aides in each of the classes also had montessori training. No staff member had been in the school for less than five years.

Individual test scores for 1984 through 1988 from the ITBS and the MAT-6 were analyzed statistically. The mean for each grade cohort was compared to national norms and school district means using the t test for independent samples. The scores were analyzed for internal variance using the F test.

Standardized test scores for the study population were collected for the year 1988, and for prior years as available. Because of a stable student population in the program, most students had at least three years of scores, while some students had scores back as far as 1984. When average scores for a grade are given below, those averages include all scores obtained by members of the test population when in that grade level, regardless of the calendar year.

RESULTS AND DISCUSSION

The mean grade equivalent of composite grade scores for the ethnic cohorts of the subject population was well above the grade

equivalent norm.

Table 1. Mean Grade Equivalent Scores of Ethnic Cohorts

Grade	1	2	3	4	5
Norm	1.7	2.7	3.7	4.7	5.7
Black Cohort					
N of scores	24	17	15	8	3
Mean	2.3	3.4	4.6	4.8	5.7
Hispanic Cohort					
N of scores	19	17	14	9	9
Mean	2.0	3.1	4.8	5.9	7.2

Black students performed one year above the grade norm in Grades 1 through 3, after which there appears to be a plateau at grade level. Hispanic students demonstrate a steady increase in above grade level performance beginning with just a few months above grade level in Grade 1, to one and one-half years above grade level in Grade 5.

The plateau within the Black cohort is partially explained by the fact that many academically able minority students left the montessori magnet program after Grade 3 to attend academic magnet programs.

There are at least four variables that could be contributing to the superior performance of the Black and Hispanic students studied:

1.) the mixed ethnicity of the montessori magnet population

2.) screening or selection by the school of more able and motivated students

3.) self (or parental) selection

4.) effectiveness of the instructional method used in the magnet school

The effects of ethnicity can be evaluated by comparing the magnet scores to scores from two conventional schools with the same percentages of ethnic representation as the magnet program. The magnet grade means were higher than the means of the two schools. When $p<.05$, t was significant in all cases except one (Table 2).

Table 2."t" Scores of Subject Population Compared to Two Schools With Matched Ethnicity, $p<.05$

Ethnic Percentages		B	H	W
Magnet		31%	26%	39%
School A		33%	23%	41%
School B		34%	31%	33%
Grade	**1**	**2**	**3**	**4**
School A	3.09*	2.24*	3.82*	.688
School B	3.98*	4.49*	4.09*	2.24*

The differences among the three schools having similar ethnic composition indicates that ethnicity is not the factor influencing the magnet achievement. If ethnicity were a factor, the t would have been non-significant.

Selection by the school is easily ruled out because this population was selected on the basis of date of application; student selection did not include testing nor were previous academic test scores considered in selection.

Self or parental selection cannot be ruled out, and, indeed

probably contributed to the high magnet school performance. However, it seems doubtful that this factor alone would account for performance averaging almost one year above grade level. The conclusion that can be drawn, therefore, is that when ethnically similar school environments are compared statistically, the montessori magnet program has significantly higher scores.

Comparing the performance of the ethnic cohorts of the subject population to single-race schools demonstrates that the montessori magnet scores are significantly higher for the Black and Hispanic cohorts. When $p < .05$, t is significant 70% of the time.

Table 3. "t" Scores of Subject Population Compared to Single Race Schools, $p<.05$

Grade	1	2	3	4	5
School A 100% Black	3.00*	2.54*	5.17*	.49	0.00
School B 99% Hispanic	1.53	2.89*	5.92*	4.74*	5.26*

The t values suggest that the montessori magnet program is particularly advantageous for Hispanic children. These scores demonstrate a fairly steady above grade level performance in all five grades.

Economically, the implication is significant to school districts. Language differences are one of the primary causes for lower Hispanic test scores. Language proficiency, however, is not

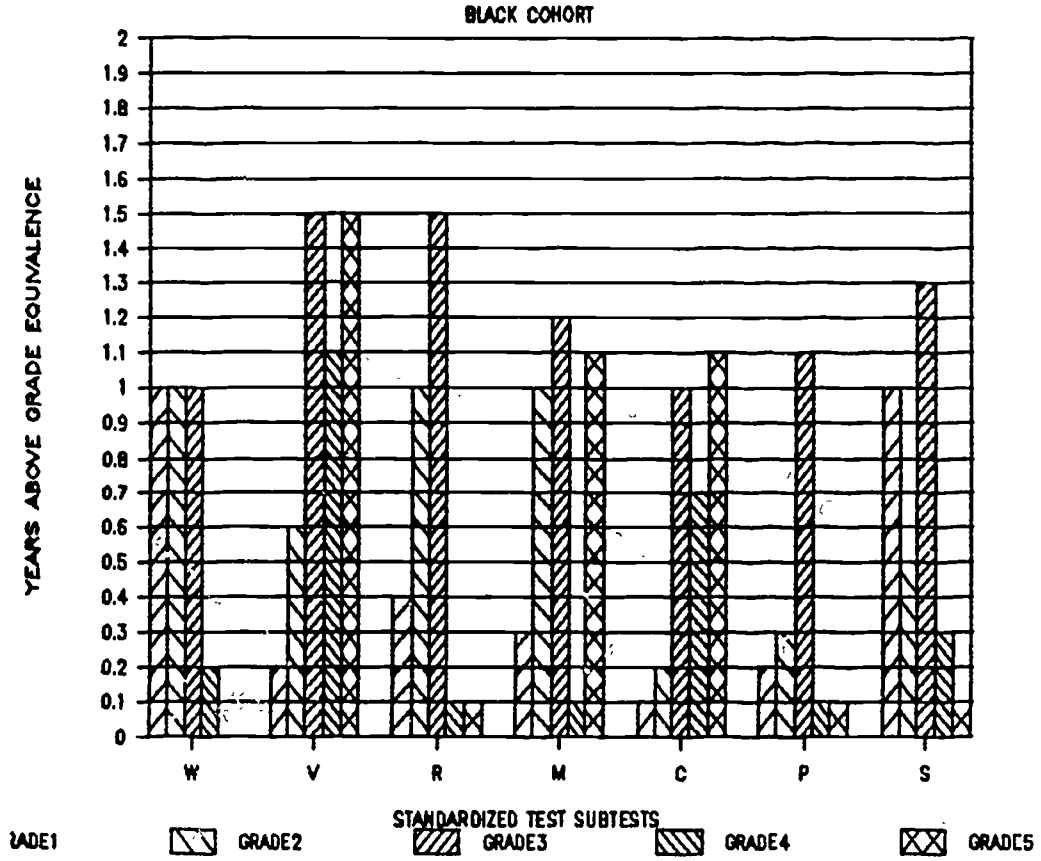
a selection criteria for admittance to the magnet program of this study. No student in this study had been placed in language remediation programs. Most of the Hispanic students had been enrolled in the magnet preschool program; by Grade 1, many had already attended the magnet school for three years. The scores indicate that above average performance can be expected from Hispanic students in the montessori magnet program without the cost of remedial language programs.

The Black cohort scores are inconclusive. The scores suggest that the magnet program is very effective through Grade 3. The scores for Grades 4 and 5 indicate that performance at that level is not any more advantageous to the Black student than traditional instruction. Within the subject population, the N for the Black cohort decreased 50% from Grade 3 to Grade 4. Skimming of the more academically able students has already been mentioned and has an adverse effect on cohort mean scores. However, the Hispanic N also decreased by a similar percentage and the scores maintained their above grade level curve. The parameters of this study do not give an explanation for the observed relative score decline within the Black cohort in Grades 4 and 5 within the montessori program or the district.

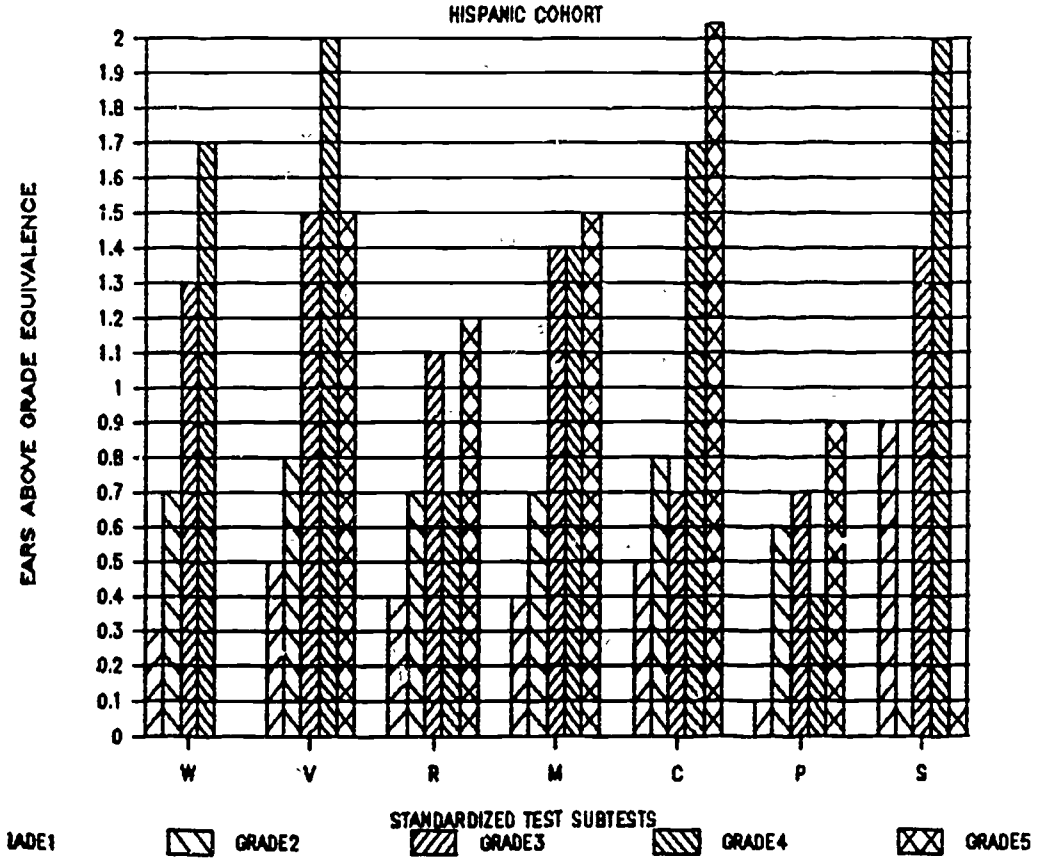
INTERNAL VARIANCE- Subtest Scores

The graphed subtest scores indicate that the curves for Grades 1, 2, and 3 are similar but the Grade 4 curve changes considerably and retains the new shape into Grade 5. Hispanics performance is lower than Black performance in Grades 1, 2, and 3. On average, Blacks and Hispanics show a dramatic score change in Grades 4 and 5: Black scores drop and Hispanic scores go up.

SUBTEST MEANS FOR RACE VARIABLE



SUBTEST MEANS FOR RACE VARIABLE



(GRAPH HERE)

Explanation:		
Standardized Test Subtests	w	word recognition
	v	vocabulary
	r	reading comprehension
	m	math computation
	c	math concepts
	p	math problem solving
	s	spelling

Race-sensitivity was most apparent in language related subtest scores.Vocabulary and spelling skills were consistently sensitive in Grade 1; reading comprehension,however, was not. All members of this research population, tested in Grade 1, had also attended the montessori preschool within the magnet program. It is not possible to determine from the available data, whether the subjects started pre-school with significant language differences, determined by race, or whether the montessori pre-school language program (when compared to the elementary language program) is not as effective or whether the racial cohorts represented in this study represent different rates of language development and language acquisition. Within the montessori program, the statistical differences, measured by the F test, disappeared after Grade 2.

The Black cohort demonstrates moderately higher language scores than math scores in Grades 1 and 2. Grade 3 shows a marked increase in the scores in all areas. This is followed by a performance drop in Grades 4 and 5.

The Hispanic cohort has relatively low language and math scores in Grades 1 and 2. Grade 3 shows some improvement in language, but not in math. Higher scores in language and math are

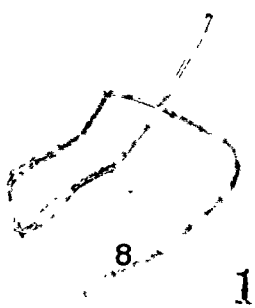
demonstrated in grades 4 and 5; however, reading comprehension remains relatively lower in all five grades.

Summarizing the score data, 47% of all Black cohort subtests and 41% of all Hispanic cohort subtest scores were one year or more above grade level.

CONCLUSION

Hispanic and Black minority students have impressive academic advantages after being enrolled in a montessori magnet program for one or more years. Mastery of subject material, measured by standardized tests, is demonstrated in all subtest areas.

The problems of unequal achievement go far beyond the montessori magnet program. While the program does not come to solving the problems, by raising the achievement of both races it is moving in the proper direction. Even after several years in a montessori program, there are differences in student performance based on race as measured on standardized tests. The montessori program has reduced the differences but it has not eliminated them.



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