MEMORANDUM February 14, 2013

TO: Daniel Gohl
Andrew Houlihan

FROM: Carla Stevens
Assistant Superintendent

SUBJECT: **COMPARATIVE MATH AND READING PERFORMANCE OF MONTESSORI PROGRAM AND NON-MONTESSORI COMPARISON STUDENTS, 2012–2013**

CONTACT: Carla Stevens, 713-556-6700

This study analyzed the math and reading performance of students enrolled in Montessori program schools compared to students enrolled in non-Montessori comparison schools. Specifically, the 2012 and 2013 STAAR math and reading scale scores of third and fourth grade students enrolled in Garden Oaks and Dodson elementary schools, and Wilson Montessori were compared with three non-Montessori schools: Durham, Kelso and Mitchell elementary schools. Schools were comparable on enrollment size and ethnic composition.

The study found that in 2013, third grade students enrolled in the Montessori program schools had a higher STAAR mean reading scale score compared to students enrolled in the non-Montessori comparison schools. In 2012 and 2013, third and fourth grade at-risk students enrolled in the non-Montessori comparison schools had higher STAAR mean math scale scores compared to their peers enrolled in the Montessori program schools.

The study also found that in 2012, G/T identification status was the strongest predictor of student performance on the STAAR math test of third and fourth grade students enrolled in the Montessori program and the non-Montessori comparison schools. It was also the strongest predictor on the 2013 reading performance for both third and fourth grade students enrolled in the Montessori program and non-Montessori comparison schools. Economic status and at-risk status were stronger predictors of the third and fourth grade STAAR math and reading performance in the Montessori program schools compared to the non-Montessori comparison schools.

Should you have any questions or require any further information, please contact Carla Stevens in the Department of Research and Accountability, at 713 556 6700.

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SS/CS:tds

cc: Sam Sarabia
Nancy Gregory
Alison Heath

RESEARCH

Educational Program Report

COMPARATIVE MATH AND READING PERFORMANCE OF MONTESSORI PROGRAM AND NON-MONTESSORI COMPARISON STUDENTS, 2012–2013

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Carla Stevens
ASSISTANT SUPERINTENDENT
DEPARTMENT OF RESEARCH AND ACCOUNTABILITY

Ted D. Serrant, Ph.D.
RESEARCH SPECIALIST

Venita Holmes, Dr.P.H.
RESEARCH MANAGER

Houston Independent School District
Hattie Mae White Educational Support Center
4400 West 18th Street
Houston, Texas 77092-8501

www.houstonisd.org

COMPARATIVE MATH AND READING PERFORMANCE OF MONTESSORI PROGRAM AND NON-MONTESSORI COMPARISON STUDENTS, 2012–2013

Executive Summary

Montessori program schools were established in the United States in 1960 (Edwards, 2002; Holfester, 2008). They are public and private institutions that cater to the education needs of inner city children, wealthy neighborhoods, rural and urban magnet programs, at-risk children, learning disabled populations, early childhood and child care centers (Lopata, Wallace and Finn, 2005).

Presently, three Montessori program schools operate in the Houston Independent School District (HISD) as magnet schools. These are Dodson and Garden Oaks elementary schools and Wilson Montessori, which enroll students in kindergarten to eighth grade. Systematically, the academic performance of students in these schools are reviewed and evaluated.

The purpose of this formative evaluation was to examine differences in the performances of students enrolled in Montessori schools in the 2011–2012 and 2012–2013 academic years compared to the performance of a sample of students in non-Montessori schools. The study analyzed the third and fourth grade academic performance of Garden Oaks and Dodson elementary schools, and Wilson Montessori relative to three non-Montessori schools with comparable enrollment size and student ethnic composition. The non-Montessori comparison schools were Durham, Kelso and Mitchell elementary schools.

The performance of students who attended the Montessori and non-Montessori schools relative to gifted/talented (G/T) status, at-risk status, economic status, and ethnicity were also analyzed. The evaluation was based on the following:

- Third and fourth grade State of Texas Assessments of Academic Readiness (STAAR) math and reading performance in 2102 and 2013.

Highlights

- In 2013, the mean STAAR reading scale scores for third and fourth grade students and math scale scores for third grade students enrolled in the Montessori program schools were statistically significantly higher compared to students enrolled in the non-Montessori comparison schools.

- In 2012 and 2013, non-at risk students enrolled in the Montessori program schools had higher mean math scores compared to the non-at-risk students enrolled in the non-Montessori, comparison schools. The results were statistically significant in 2012 for grades three and four, and in 2013 for grade three.

- In 2012 and 2013, at-risk third and fourth grade students enrolled in the non-Montessori comparison schools outperformed their at-risk peers in the Montessori program schools in math at statistically significant levels.

- On the 2013 STAAR math test, non-gifted/talented (G/T) Montessori students outperformed the non-Montessori comparison students in grade three. However, the G/T non-Montessori students outperformed their Montessori counterparts in grade four.

- The results relative to ethnicity appeared mixed. In 2013, African Americans and White students in Montessori program schools had higher mean reading scores compared to their African American and White peers enrolled in the non-Montessori comparison schools in both third and fourth grades. Sample sizes for White students in the non-Montessori comparison schools were too small to make meaningful conclusions. There was no significant difference for Hispanic students in either year or grade.

- G/T identification status was the strongest predictor of student performance in math in 2012 and in reading in 2013 for both third and fourth grade students in the Montessori program and non-Montessori comparison school.

- Economic status and at-risk status were stronger predictors of, but had negative effects on the math and reading performance of third and fourth grade students in the Montessori program compared to students in the non-Montessori comparison schools.

Recommendations

More research may need to be conducted on the Montessori program and its effects on student groups to make any meaningful conclusions beyond third and fourth grades. It should provide insights into the performance differences of at-risk students enrolled in the Montessori program and at-risk students enrolled in the non-Montessori comparison schools.

Introduction

Montessori program schools were established in the United States in 1960 (Edwards, 2002; Holfester, 2008). Today, there are more than 5,000 schools using some type of Montessori curriculum to teach students from kindergarten to eighth grade (Bowers, 2006). They are public and private institutions that cater to the education needs of inner city children, wealthy neighborhoods, rural and urban magnet programs, at-risk children, learning disabled populations, early childhood and child care centers (Lopata, Wallace and Finn, 2005). Presently, three Montessori program schools operate as magnet programs in the Houston Independent School District (HISD). These are Dodson and Garden Oaks elementary schools and Wilson Montessori which serve students in the kindergarten to eighth grade.

The Montessori Method is an innovative teaching technique that Italian educator and physician Maia Montessori developed. It is a "sensory-based pedagogy," premised on the belief that children learn at their own pace through object manipulation (Lopata, Wallace & Finn, 2005). It is also known as individual or progressive learning.

Montessori's teaching philosophy was originally devised in 1896 while Dr. Montessori worked with special needs children in the Psychiatric Department at the University of Rome. Although diagnosed as mentally deficient and unable to learn, within two years these students were able to successfully complete Italy's standardized public school exams (International Montessori School Index, 2006). As a result of her work, she observed that effective teaching styles required the establishment of a rich sensory environment that offered interactive yet independent learning opportunities. Children choose from a variety of development activities that promoted learning by doing in this 'educational playground." She believed it was necessary to train the senses before training the mind (Lapata, Wallace & Finn, 2005).

Through this self-directed individual learning, Montessori's educators were able to teach using crucial interaction in "prepared environment" containing connected tasks which gradually required higher levels of cognitive thought. This method created a task-oriented student, intrinsically motivated to master challenging tasks (Rathunde & Csikszentmilayah, 2005, p. 345).

This approach contrasted and challenged existing beliefs about whole class learning, the acquisition of knowledge and the development of early human cognition. Children, therefore, were not blank slates, and traditional methods such as recitation, memorization, and conditioning failed to develop necessary life skills and individual abilities (Holfester, 2008).

The academic performance of students attending Montessori schools has been compared to their non-Montessori peers to draw this contrast.

Literature Review

Since the introduction of Montessori program schools into HISD, it is believed that Montessori students outperform their non-Montessori peers on standardized tests. According to Friends of Montessori, "Montessori students at our partnering schools regularly outscore their peers on standardized test, and the program itself has proven to provide enhanced cultural diversity within the classroom, exceptional education for all students." It has been described as a "proven learning methodology and offers additional opportunities to disadvantaged children as well as families seeking a competitive alternative to private schools" (Friends of Montessori, 2012, p. 1).

In 2005, a study compared academic performance of 543 urban fourth and eighth graders in Montessori and traditional program schools. Results failed to support the hypothesis that enrollment in Montessori program schools was associated with higher academic achievement (Lapata, Wallace & Finn, 2005).

Peng (2009) conducted a comparative study on the achievement test performance of children who attended Montessori schools and non-Montessori schools in Taiwan. It involved 196 first, second and third grade students from a private Catholic elementary school who had or did not have Montessori early childhood education to determine who had higher scores in language arts, math and social studies. Students who had early childhood Montessori education had higher test scores in language arts. Partially, it supported the notion that Montessori education had long term impacts on student language Arts learning.

The Research and Accountability Department of the Houston Independent School District (HISD) evaluated the reading and math performance of its Montessori program students using the mean scores on the 2008–2009 Texas Assessment of Knowledge and Skills (TAKS), Stanford 10, and the Aprenda3 tests. All four Montessori schools in HISD were evaluated: Julian N. Dodson Elementary (Dodson); Whidby Elementary School (Whidby); Woodrow Wilson Montessori School (Wilson); and Garden Oaks Elementary (Garden Oaks).

The evaluation concluded that, when compared, non-Montessori program students had higher mean TAKS scores than their Montessori counterparts at the third grade level. All other grade levels at Wilson had higher mean TAKS scores than comparable grades in non-Montessori comparison schools. On the English TAKS, students attending Montessori schools had higher mean scores than the non-Montessori students in the third and fifth grades. They were outperformed, however, in the fourth grade. Montessori program schools also bettered their non-Montessori comparison counterpart's mean scores on Aprenda 3 reading and mathematics (HISD Research & Evaluation, 2009). There is, therefore, partial support in the literature for the belief that Montessori students outperform their non-Montessori peers on standardized tests.

Methods

Data Collection and Analysis

The study population consisted of students enrolled in the three HISD Montessori program schools (Dodson, Garden Oaks and Wilson). Three HISD non-Montessori comparison schools (Durham, Kelso and Mitchell) were selected as comparison schools based on ethnic composition and school size comparable to the Montessori schools. Non-Montessori schools with enrollments between 440 and 650 and about 60% Hispanic and 20% African American students were selected. The study sample included all students enrolled in third and fourth grades during the 2011–2012 and 2012–2013 academic years in all six schools. Students' gifted/talented (G/T) identification status; at-risk status, economic status, and ethnicity in sample schools were based on the third and fourth grade STAAR test database.

Student and teacher demographic/educational characteristics were also considered in the analysis; namely, ethnicity, economic status, gifted/talented identification and at-risk status of students, and experience and qualifications of teachers. STAAR math and reading scale scores for 2012 and 2013 measured students' academic performance at third and fourth grades. Third and fourth grades were selected because of their larger enrollment sizes. When data for other grades were disaggregated and analyzed, the Hessian Matrix did not return positive definite and valid results. As a result, they were excluded. The Hessian Matrix measures the normality of the distribution of the data.

IBM SPSS was utilized to analyze and compare the mean differences between the 2012 and 2013 math and reading STAAR scale scores for the Montessori program and the non-Montessori comparison third and fourth grade students. Math and reading were selected because most, if not all, students in all sample schools took both tests, and they were scaled vertically making them amenable to comparison across grades.

Independent sample t-tests were also conducted to compare the mean math and reading scores of third and fourth grade students enrolled in the Montessori program and the non-Montessori comparison

schools by G/T identification, at-risk status, and economic status and ethnicity. Linear regression analysis was conducted on the mean scale scores for the 2012 STAR math and 2013 STAAR reading tests to determine the impact of G/T identification, at-risk status, economic status and ethnicity on mean scale score differences for the Montessori program and the non-Montessori comparison students.

Where mean scale scores differences between the Montessori program and the non-Montessori compariosn students were statistically significant, details were provided in the text of this report. Otherwise reference is made to the Tables in Appendix A. Effect sizes were also provided as required by the Texas Education Agency (TEA) Best Practices Clearinghouse (TEA Best Practices Clearinghouse, 2011). Cohen (1988) described effect sizes as small (.20), moderate (.50) and larger (.80) however, the TEA Best Practices Clearinghouse uses an effect size of .25 as a threshold to meet the evidence type considered "Rigorous Scientific Evidence Practice". While considered conservative, it is also the threshold the US Department of Education's Institute of Education Sciences What Works Clearinghouse recommends.

Data Limitations

Students' academic performance was limited to the STAAR reading and math scores. Analysis of student performance by G/T identification and at-risk status was limited to the 2012 and the 2013 STAAR math tests for the Montessori students and the non-Montessori comparison students. Analysis of student performance by economic status and ethnicity was limited to the 2012 and 2013 STAAR reading tests. This approach was adopted to facilitate more in-depth analysis of the program effects, to determine the factors that were influencing performance, and to identify the student groups for which it was effective or not effective. Measures of program implementation fidelity were unavailable for this report.

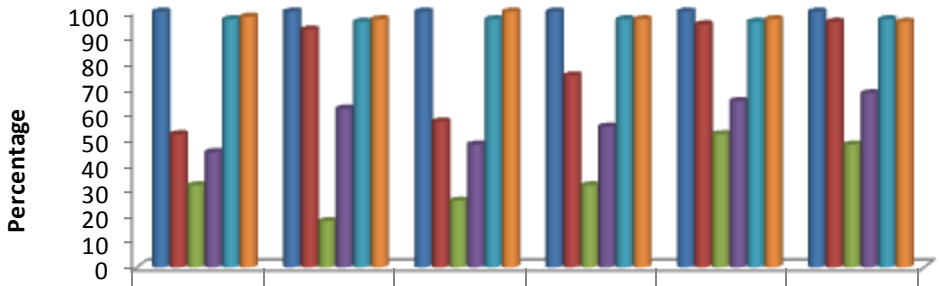
Only the independent t-tests were used for both years. Independent t-tests are best suited for large samples. All of the Montessori program students for whom math and reading scale scores were available were used, and only those who had scores for both years. Regression coefficient and beta weights were used to improve the inferential qualities of the independent t-test, aware that the coefficient and beta weight for the different predictors should not be compared. Where samples sizes were too small (below 30), effect sizes were not reported.

Results

How do the Montessori program schools compare to the non-Montessori comparison schools demographically?

- **Figure 1** displays selected student data for the Montessori program and the non-Montessori comparison schools.

Figure 1. Selected student data by Montessori program and non-Montessori comparison schools, 2012–2013



	Wilson	Dodson	Garden Oaks	Durham	Kelso	Mitchell
	Montessori Schools (%)			Non-Montessori Comparison Schools (%)		
Title 1	100	100	100	100	100	100
Econ. Disadvantaged	52	93	57	75	95	96
LEP	32	18	26	32	52	48
At-Risk	45	62	48	55	65	68
Attendance	97	96	97	97	96	97
Promotion	98	97	100	97	97	96

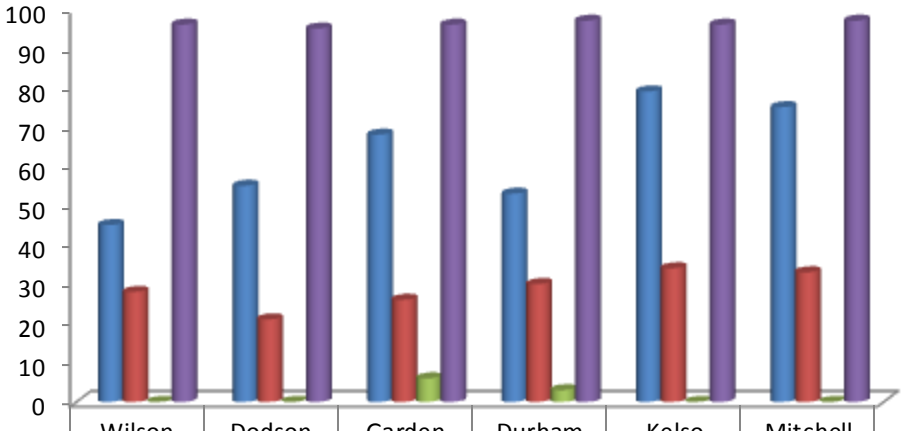
Source: HISD District and School profiles, 2012–2013

- School sizes ranged from 448 to 637 students. Garden Oaks elementary school had the largest and Kelso elementary had the smallest enrollments.
- With the exception of students at Wilson and Garden Oaks, at least 75% percent of the students in comparison schools were considered economically disadvantaged.
- Between 45% and 62% of the Montessori program students were at-risk for school dropout compared to 55% to 68% of the non-Montessori comparison school students.
- All the Montessori program and non-Montessori comparison schools were designated as Title 1.
- Overall, the non-Montessori comparison schools had higher percentages of Limited English Proficiency (LEP) students compared to the Montessori program schools.
- The attendance and promotion rates for the Montessori program and non-Montessori comparison schools were 96% or higher.

How do the Montessori program schools' teacher experience and qualification compare with the non-Montessori comparison schools?

- **Figure 2** displays teacher data for the Montessori program and non-Montessori comparison schools in this study. Additional data on number of teachers at each school, student-teacher ratios, and number of aides can be found in **Table 1** in **Appendix A** on page 20.

Figure 2. Selected teacher data by Montessori program and non-Montessori comparison schools, 2012–2013



	Wilson	Dodson	Garden Oaks	Durham	Kelso	Mitchell
	Montessori Schools (%)			Non-Montessori Comparison Schools (%)		
Experience (≥ 6 yrs.)	45	55	68	53	79	75
Masters	28	21	26	30	34	33
Doctoral	0	0	6	3	0	0
Teacher Attendance	96	95	96	97	96	97

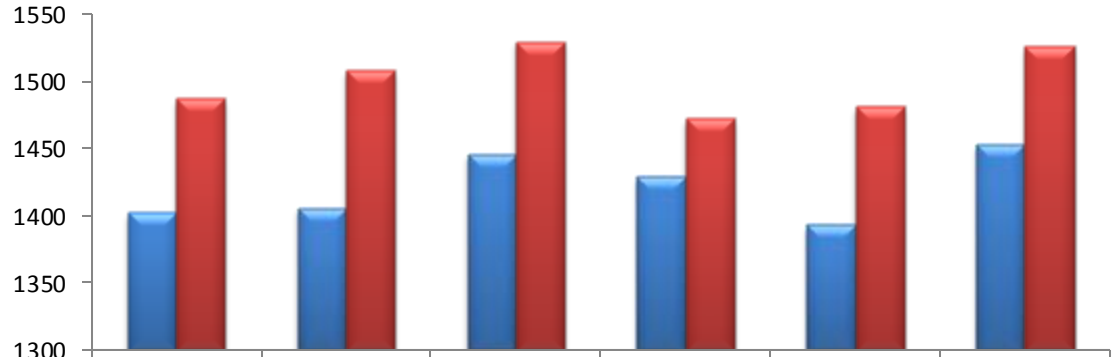
Source: HISD District and School Profiles, 2012–2013

- The number of teachers by the Montessori program and non-Montessori comparison schools ranged from 24 to 34.
- The student-teacher ratios were comparable and ranged from 15:1 to 20:1. (See Table 1 in Appendix A on page 21.)
- The majority of teachers, with the exception of those at Wilson, had six or more years of teaching experience. Wilson had only 45% of teachers with six or more years of teaching experience.
- A higher proportion of teachers in the non-Montessori comparison schools had Master's degrees. Six percent of teachers in Garden Oak elementary and 3% in Durham elementary had Doctoral degrees.
- Teacher attendance was at least of 95% for the Montessori program schools and at least 96% for the non-Montessori comparison schools.
- The number of educational aides in the Montessori program schools ranged from 10 to 14, while the number of educational aides in the non-Montessori comparison schools was either one or two. (See Table 1 in Appendix A on page 21 for details.)

How did the third and fourth grade Montessori students' performance compare to the performance of students at the non-Montessori comparison schools on the 2012 and 2013 STAAR math tests?

- Third and fourth grade students' STAAR mean math scale scores for the Montessori program and the non-Montessori comparison students are displayed in **Figure 3**. District means for third and fourth grades are given for comparison.

Figure 3. Comparative STAAR mean math scores for Montessori program and non-Montessori comparion schools, 2012 and 2013



	Montessori	Non-Montessori	District	Montessori	Non-Montessori	District
	2012			2013		
Grade 3	1402	1406	1446	1429*	1393	1453
Grade 4	1487	1508	1530	1472	1481	1526

**Statistically significant at p<.05 (in favor of Montessori program schools)*

District vs. Montessori and non-Montessori

- The District 2012 mean math scale score for the third grade (M = 1446) was higher compared to the mean math scale score for the Montessori program students (M = 1402) and the non-Montessori comparison students (M = 1406).
- In 2013, the District third grade mean math scale score (M = 1453) was also higher when compared to the Montessori program (M = 1429) and the non-Montessori comparison students (M = 1393).
- In 2012, the District fourth grade mean math scale score (M = 1530) was higher on the STAAR test compared to the mean math scale scores for the Montessori program students (M = 1487) and the non-Montessori comparison students (M = 1508).
- In 2013, the District fourth grade mean math scale score (M = 1526) was higher than the mean math scale scores of students enrolled in the Montessori program (M = 1472) and those enrolled in the non-Montessori comparison schools (M = 1481).

Third Grade Montessori vs. non-Montessori

- Third grade students in the non-Montessori comparison schools (M = 1406, SD = 136) had a slightly higher mean scale score on the 2012 STAAR math test compared to those in the Montessori program (M = 1402, SD = 127). There was no statistically significant difference in scores. (See **Table 2** in **Appendix A** on page 20 for details.)

- The Montessori program students (M = 1429, SD = 139), however, had a higher mean math scale score compared to their non-Montessori peers (M = 1393, SD = 131) on the 2013 STAAR math test. The mean difference was statistically significant, t(390) = 2.68; p = .004 (one-tailed), in favor of the Montessori program students. (See **Table 3** in **Appendix A** on page 20 for details.)

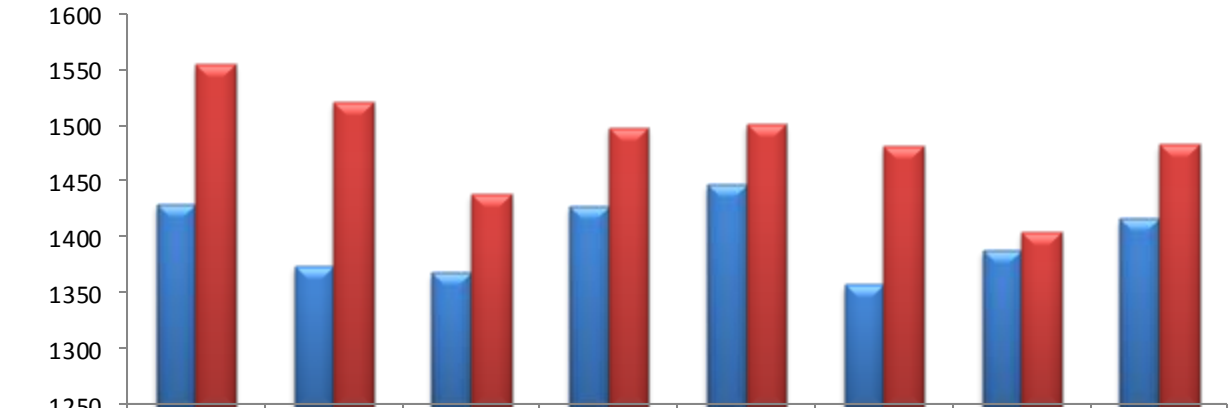
Fourth Grade Montessori vs. non-Montessori

- Fourth grade students in the non-Montessori comparison schools (M = 1508, MD = 120) had a higher mean scale score on the 2012 STAAR math test when compared to the Montessori program students (M = 1487, SD = 127). The mean scale score difference was not statistically significant. (See Table 2 in Appendix A on page 20 for details.)
- The 2013 fourth grade STAAR mean math scale score for the non-Montessori comparison students (M = 1481, SD = 133) was higher than the mean scale score for the Montessori program students (M = 1472, SD = 143). The mean scale score difference was not statistically significant. (See Table 3 in Appendix A on page 20 for details.)

How did the Montessori program and the non-Montessori comparison students' performance on the 2012 and 2013 STAAR math test compare relative to at-risk status and G/T identification status?

- The 2012 and 2013 STAAR mean math scale scores for third and fourth grades by student at-risk status in the Montessori program and the non-Montessori comparison schools were compared. The results are displayed in **Figure 4**. (Details are in **Table 4** and **Table 5** in **Appendix A** on page 21.)

Figure 4: Comparative third and fourth grade STAAR mean math scores by at-risk student groups in Montessori program and non-Montessori comparison schools, 2012 and 2013



	2012 Non-At-Risk Montessori	2012 Non-At-Risk Non-Montessori	2012 At-Risk Montessori	2012 At-Risk Non-Montessori	2013 Non-At-Risk Montessori	2013 Non-At-Risk Non-Montessori	2013 At-Risk Montessori	2013 At-Risk Non-Montessori
Grade 3	1430*	1375	1369	1429**	1448*	1358	1389	1417**
Grade 4	1555*	1522	1439	1499**	1502	1482	1405	1483**

**Statistically significant at p<.05 (one-tailed) (in favor of Montessori program students)*
***Statistically significant at p<.05 (one-tailed) (in favor of Non-Montessori comparison students)*

Third Grade Math: At-Risk Status

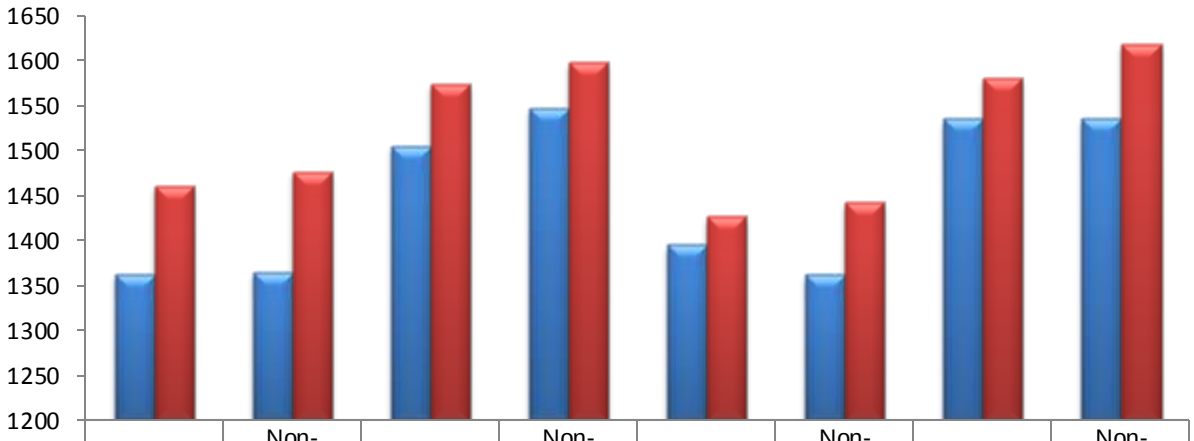
- The third grade, non-at-risk student group in the Montessori program (M = 1430, SD = 126) had a higher mean scale score on the 2012 STAAR math test compared to the non-at-risk non-Montessori comparison students (M = 1375, SD = 128). The difference in the mean scale scores was statistically significant; t(182) = 2.29, p = .000 (one-tailed), in favor of the non-at-risk students in the Montessori program. (See Table 4 in Appendix A on page 21 for details.)
- The third grade, at-risk non-Montessori comparison students (M = 1429, SD = 139) had a higher mean scale score on the 2012 STAAR math test compared to the at-risk Montessori program students (M = 1369, SD = 120). The mean score difference was statistically significant; t(195) = 3.19, p = .000, in favor of the at-risk non-Montessori comparison students. (See Table 4 in Appendix A on page 21 for details.)
- In 2013, the third grade, non-at-risk Montessori program students' mean math scale score (M = 1448, SD = 136) was higher compared to the mean scale score of the non-at-risk non-Montessori comparison students (M = 1358, SD = 112). The difference was statistically significant; t(208) = 5.11, p = .004, in favor of the non-at-risk Montessori program students. (See Table 5 in Appendix A on page 21 for details.)
- The 2013, the third grade, at-risk non-Montessori comparison students (M = 1417, SD = 138) had a higher mean math scale score compared to at-risk Montessori program students (M = 1389, SD = 138). The mean score difference was statistically significant; t(181) = 1.27, p = .000, in favor of the at-risk non-Montessori program students. (See Table 5 in Appendix A on page 21 for details.)

Fourth Grade Math: At-Risk Status

- In 2012, the fourth grade, non-at-risk Montessori program students (M = 1555, SD = 114) had a higher STAAR mean math scale score compared to the non-at-risk non-Montessori program students (M = 1522, SD = 130). The mean difference was statistically significant; t(136) = 1.57, p = .050, (one-tailed), in favor of the non-at-risk Montessori program students. (See Table 4 in Appendix A on page 21 for details.)
- On the other hand, the at-risk non-Montessori program students (M = 1499, SD = 112) had a higher mean scale score on the 2012 STAAR math test when compared to their Montessori at-risk peers (M = 1439, SD = 114). The mean difference was statistically significant; t(200) = 3.82, p = .000, in favor of the at-risk non-Montessori program students. (See Table 4 in Appendix A on page 21 for details.)
- The non-at-risk students in the Montessori program (M = 1502, SD = 147) had a higher mean scale score compared to the non-at-risk students in the non-Montessori comparison schools (M = 1482, SD = 146) on the 2013 STAAR math test. The mean scale score difference was not statistically significant. (See Table 5 in Appendix A on page 21 for details.)
- The mean scale score for the at-risk students in the non-Montessori comparison schools (M = 1483, SD = 116) was higher on the 2013 STAAR math test compared to the mean scale score of the at-risk Montessori program students (M = 1405, SD = 109). The difference between these mean math scales scores was statistically significant, t(134) = 3.83, p = .000, in favor of the at-risk students in the non-Montessori comparison schools. (See Table 5 in Appendix A on page 21 for details.)

- **Figure 5** displays STAAR mean math scale scores by G/T and non-G/T student identification in the Montessori program and the non-Montessori comparison schools. (See **Table 6** and **Table 7** in **Appendix A** on page 22 for details.)

Figure 5. Comparative STAAR mean math scale scores for G/Tidentification student groups by Montessori and non-Montessori comparison schools, 2012 and 2013



	2012				2013			
	Non-G/T		G/T		Non-G/T		G/T	
	Montessori	Non-Montessori	Montessori	Non-Montessori	Montessori	Non-Montessori	Montessori	Non-Montessori
Grade 3	1363	1365	1506	1548**	1395*	1362	1535	1535
Grade 4	1461	1477	1574	1598	1426	1442	1581	1618**

*****Statistically significant at p<.05 (one-tailed) (in favor of Montessori program students)*

******Statistically significant at p<.05 (one-tailed) (in favor of non-Montessori comparison students)*

Third Grade Math: G/T Identification Status

- The third grade non-G/T identification non-Montessori comparison student group (M = 1365, SD = 90) had a higher mean scale score than their Montessori program peers (M = 1363, SD = 116) on the 2012 STAAR math test. The mean scale score difference was not statistically significant. (See Table 6 in Appendix A on page 22 for details.)
- The third grade, G/T identification non-Montessori comparison students (M= 1548, SD = 133) had a higher mean scale score on the 2012 STAAR math test compared to the G/T, Montessori student group (M = 1506, SD = 107). The mean difference was statistically significant, t(93) = 1.79, p = .030, in favor of the G/T identification, non-Montessori comparison school students. (See Table 6 in Appendix A on page 22 for details.)
- In 2013, the third grade, non-G/T identification Montessori program students' mean scale score (M = 1395, SD = 121) was higher compared to the mean scale score for the non-G/T non-Montessori comparison school students (M = 1362, SD = 112) on the STAAR math test. The mean score difference was statistically significant, t(309) = 2.47, p = .000 (one-tailed). (See Table 7 in Appendix A on page 22 for details.)
- The third grade, G/T identification students in the Montessori program (M = 1535, SD = 139) and the G/T identification non-Montessori comparison students (M = 1535, SD = 125) had a similar mean math scale score on the 2013 STAAR test. (See Table 7 in Appendix A on page 22 for details.)

Fourth Grade Math: G/T Identification Status

- The fourth grade, non-G/T identification non-Montessori comparison students (M = 1477, SD = 145) had a higher mean scale score compared to their Montessori counterparts (M = 1461, SD =

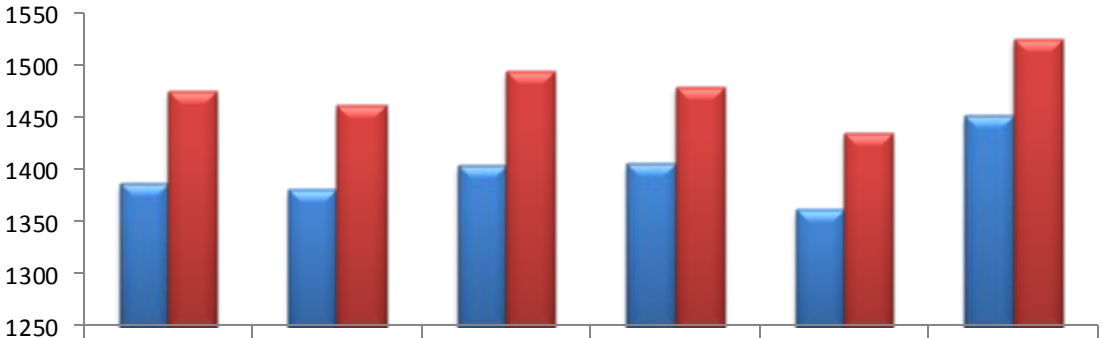
109) on the 2012 STAAR math test. The mean scale score difference was not statistically significant.

- The fourth grade G/T identification students enrolled in the non-Montessori comparison schools (M = 1598, SD = 106) had a higher mean scale score on the 2013 math test compared to the mean math scale score for the G/T identification students in the Montessori program (M = 1574, SD = 108). The mean scale score difference was not statistically significant. (See Table 6 in Appendix A on page 22 for details.)
- The 2013 fourth grade mean math scale score for the non-G/T identification non-Montessori comparison students (M = 1442, SD = 115) was higher when compared to the mean math scale score for the non-G/T identification Montessori program students (M = 1426, SD = 127) on the STAAR Test. The difference was not statistically significant. (See Table 7 in Appendix A on page 22 for details.)
- The 2013 fourth grade, G/T identification non-Montessori comparison students (M = 1618, SD = 88) had a higher mean math scale score compared to the G/T identification Montessori program students (M = 1581, SD = 119) on the STAAR test. The mean difference was statistically significant, t(90) = 1.65, p = .050 (one-tailed), in favor of the non-Montessori comparison students. (See Table 7 in Appendix A on page 22 for details.)

How did the Montessori program students compare with their non-Montessori peers on the 2012 and 2013 STAAR reading test?

- **Figure 6** displays the mean STAAR reading scale scores for Montessori and non-Montessori students. District means for third and fourth grade students are given for comparison.

Figure 6. Comparative mean STAAR reading scores for third and fourth grade students in Montessori and non-Montessori comparison schools, 2012 and 2013



	Montessori	Non-Montessori	District	Montessori	Non-Montessori	District
	2012			2013		
Grade 3	1388	1381	1405	1407*	1362	1453
Grade 4	1476	1462	1495	1480*	1436	1526

**Statistically significant at p<.05 (one-tailed) (in favor of Montessori program students)*

District Reading: Montessori and Non-Montessori

- HISD's third grade STAAR mean reading scale score (M = 1405) was higher compared to the mean reading scale score for both the Montessori program (M = 1388) and the non-Montessori comparison students (M = 1381) on the 2012 test.
- The District's third grade 2013 STAAR mean reading scales score (M = 1453) was higher compared to the mean reading scale scores for both the Montessori (M = 1407) and the non-Montessori comparison students (M = 1362).
- The District's fourth grade 2012 STAAR mean reading scale score (M = 1495) was higher compared to both the Montessori program (M = 1476) and the non-Montessori comparison student groups (M = 1462).
- The District's fourth grade 2013 STAAR mean reading scale score (M = 1526) was higher compared to both the Montessori program (M = 1480) and non-Montessori comparison students (M = 1436).

Third Grade Reading: Montessori and Non-Montessori

- In 2012, the third grade Montessori program students (M = 1388, SD = 127) had a higher mean scale score compared to non-Montessori comparison students (M = 1381, SD = 140) on the STAAR reading test. The mean difference was not statistically significant. (See **Table 8** in **Appendix A** on page 23 for details.)
- In 2013, the third grade Montessori program students (M = 1407, SD = 136) had a higher mean scale score compared to non-Montessori comparison students (M = 1362, SD = 150) on the STAAR reading test. The mean difference was statistically significant, t(390) = 3.06, p = .001, in favor of the Montessori program students. (See **Table 9** in **Appendix A** on page 23 for details.)

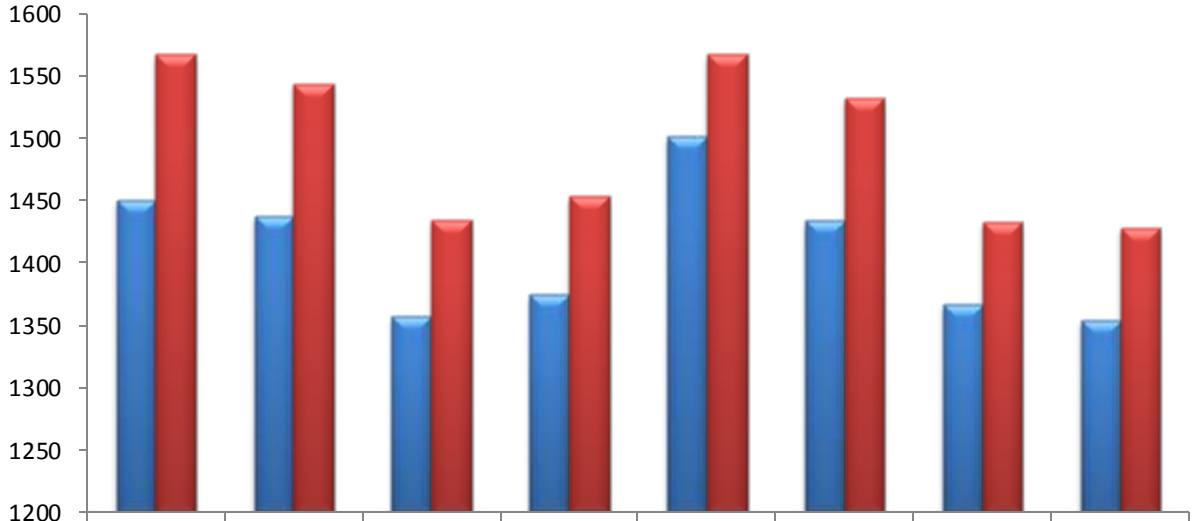
Fourth Grade Reading: Montessori and Non-Montessori

- In the fourth grade, the Montessori program students (M = 1476, SD = 144) had a higher mean scale score compared to the non-Montessori comparison students (M = 1462, SD = 104) on the 2012 STAAR reading test. The difference was not statistically significant. (Details are located in Table 8 in Appendix A on page 23.)
- The 2013, fourth grade students enrolled in the Montessori program (M = 1480, SD = 151) had a higher mean reading scale score compared to the non-Montessori comparison students (M = 1436, SD = 131). The mean difference was statistically significant, t(346) = 2.94, p = .001 (one-tailed), in favor of students enrolled in the Montessori program. (See Table 9 in Appendix A on page 23 for details.)

How did third and fourth grade Montessori program student performance by economic status and ethnicity compare to their non-Montessori peers on the 2012 and 2013 STAAR reading test?

- **Figure 7** displays the STAAR mean reading scale scores by economic status for the Montessori program and the non-Montessori comparison schools for 2012 and 2013. (See **Table 10** and **Table 11** in **Appendix A** on pages 23 and 24 for details.)

Figure 7. Comparative mean STAAR reading scores for third and fourth grade by economic status, 2012 and 2013



	2012				2013			
	Non-Econ Disadv.		Econ Disadv.		Non-Econ Disadv.		Econ Disadv.	
	Montessori	Non-Montessori	Montessori	Non-Montessori	Montessori	Non-Montessori	Montessori	Non-Montessori
Grade 3	1451	1438	1358	1375	1502*	1434	1367	1354
Grade 4	1567	1544	1435	1453	1567	1532	1433	1428

**Statistically significant at p<.05 (on-tailed) (in favor of Montessori program)*

Third Grade Reading: Economic Status

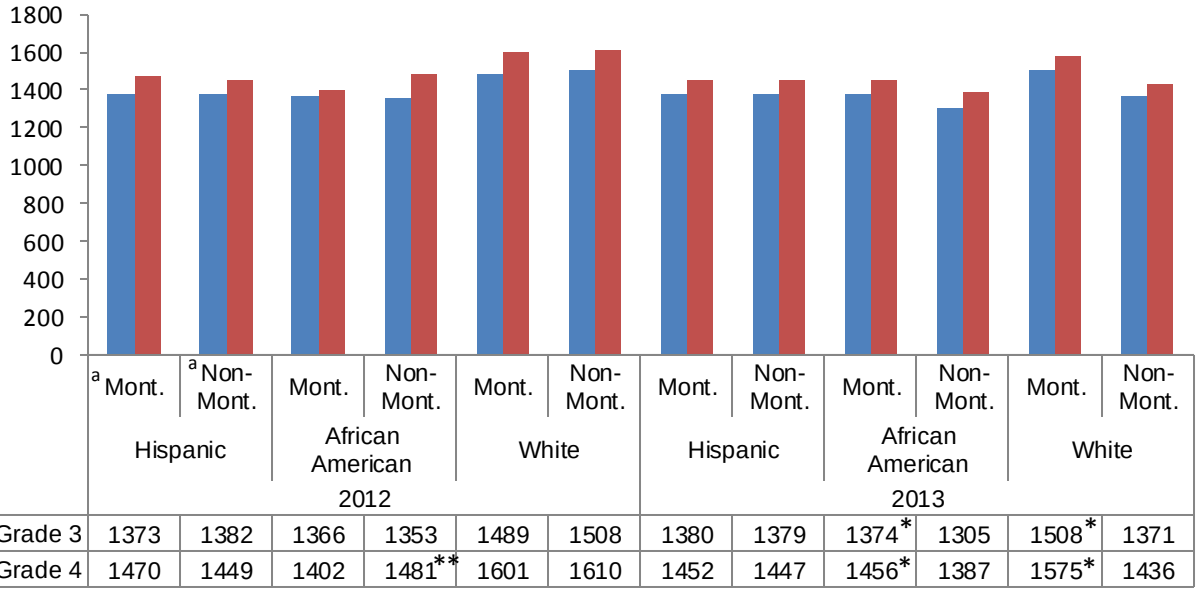
- In 2012, the non-economically-disadvantaged third grade students enrolled in the Montessori program (M = 1451, SD = 125) had a higher mean scale score compared to their non-Montessori counterparts (M = 1438, SD = 132) on the STAAR reading test. The mean difference was not statistically significant. (See Table 10 in Appendix A on page 23 for details.)
- The economically-disadvantaged third grade students who were enrolled in the non-Montessori comparison schools (M = 1375, SD = 140) had a higher mean scale score on the 2012 STAAR reading test compared to economically-disadvantaged students enrolled in the Montessori program (M = 1358, SD = 117). The difference was not statistically significant. (See Table 10 in Appendix A on page 23 for details.)
- In 2013, the non-economically-disadvantaged third grade students enrolled in the Montessori program (M = 1502, SD = 123) had a higher mean reading scale score than their non-Montessori counterparts (M = 1434, SD = 160) on the STAAR test. The mean difference was statistically significant, t(66) = 1.75, p = .042 (one-tailed). (See Table 11 in Appendix A on page 24 for details.)
- In 2013, the economically-disadvantaged third grade students who were enrolled in the Montessori program (M = 1367, SD = 122) had a higher mean reading scale score compared to the economically-disadvantaged students enrolled in the non-Montessori comparison schools (M = 1354, SD = 145) on the 2013 STAAR test. The difference was not statistically significant. (See Table 11 in Appendix A on page 24 for details.)

Fourth Grade: Economic Status

- In 2012, the non-economically-disadvantaged fourth grade students who were enrolled in the Montessori program (M = 1567, SD = 131) had a higher mean reading scale score compared to their non-Montessori counterparts (M = 1544, SD = 142) on the STAAR test. The mean difference was not statistically significant. (See Table 10 in Appendix A on page 23 for details.)
- The economically-disadvantaged fourth grade students who were enrolled in the non-Montessori comparison schools (M = 1453, SD = 96) had a higher mean reading scale score compared to economically-disadvantaged students enrolled in the Montessori programs (M = 1435, SD = 131) on the 2012 STAAR test. The difference was not statistically significant. (See Table 10 in Appendix A on page 23 for details.)
- In 2013, the non-economically-disadvantaged fourth grade students enrolled in the Montessori program (M = 1567, SD = 153) had a STAAR mean reading scale score that was higher than that of their non-Montessori counterparts (M = 1532, SD = 164). The mean difference was not statistically significant. (See Table 11 in Appendix A on page 24 for details.)
- The economically-disadvantaged fourth grade students who were enrolled in the Montessori program (M = 1433, SD = 128) had a higher mean reading scale score on the 2013 STAAR test compared to the economically-disadvantaged students enrolled in the non-Montessori comparison schools (M = 1428, SD = 126). The difference was not statistically significant. (See Table 11 in Appendix A on page 24 for details.)

Figure 8 shows STAAR mean reading scores for grades three and four by program type and ethnicity.

Figure 8. Comparative mean STAAR reading scores by ethnicity, 2012 and 2013



	2012						2013					
	Hispanic		African American		White		Hispanic		African American		White	
	[a] Mont.	[a] Non-Mont.	Mont.	Non-Mont.	Mont.	Non-Mont.	Mont.	Non-Mont.	Mont.	Non-Mont.	Mont.	Non-Mont.
Grade 3	1373	1382	1366	1353	1489	1508	1380	1379	1374*	1305	1508*	1371
Grade 4	1470	1449	1402	1481**	1601	1610	1452	1447	1456*	1387	1575*	1436

**Statistically significant at p<.05 (one-tailed) (In favor of Montessori program students)*

***Statistically significant at p<.05 (one-tailed) (In favor of non-Montessori comparison students)*

Note: [a]Mont. refers to Montessori Program students, and Non-Mont. refers to non-Montessori comparison students

Third Grade Reading: Ethnicity

Hispanic

- In 2012, third grade Hispanic students enrolled in the non-Montessori comparison schools (M = 1382, SD = 145) had a higher STAAR mean reading scale score compared to their peers in the Montessori program (M = 1373, SD = 118). The mean difference was not statistically significant. (See **Table 12** in **Appendix A** on page 24 for details.)
- In 2013, third grade Hispanic students enrolled in the Montessori program (M = 1380, SD = 124) had a higher STAAR mean reading scale score compared to their peers in the non-Montessori comparison schools (M = 1379, SD = 149). The mean difference was not statistically significant. (See **Table 13** in **Appendix A** on page 25 for details.)

African Americans

- In 2012, third grade African American students enrolled in the Montessori program (M = 1366, SD = 131) had a higher STAAR mean reading scale score compared to their peers in the non-Montessori comparison schools (M = 1353, SD = 115). The mean difference was not statistically significant. (See Table 12 in Appendix A on page 24 for details.)
- In 2013, third grade African American students enrolled in the Montessori program (M = 1374, SD = 122) had a higher STAAR mean reading scale score compared to their peers in the non-Montessori comparison schools (M = 1305, SD = 134). The mean difference was statistically significant. (See Table 13 in Appendix A on page 25 for details.)

White

- In 2012, third grade White students enrolled in the non-Montessori comparison schools (M = 1508, SD = 113) had a higher STAAR mean reading scale score compared to their peers in the Montessori program (M = 1489, SD = 118). The mean difference was not statistically significant. (See Table 12 in Appendix A on page 24 for details.)
- In 2013, third grade White students enrolled in the Montessori program (M = 1508, SD = 132) had a higher STAAR mean reading scale score compared to their peers in the non-Montessori comparison school (M = 1371, SD = 99). The mean difference was statistically significant, $t(40) = 2.75$, $p = .005$, (one-tailed). (See Table 13 in Appendix A on page 25 for details.) However, the sample size of the non-Montessori comparison students was too small to make any meaningful conclusions.

Fourth Grade Reading

Hispanic

- In 2012, fourth grade Hispanic students enrolled in the Montessori program (M = 1470, SD = 136) had a higher mean reading scale score compared to similar students enrolled in the non-Montessori comparison schools (M = 1449, SD = 99). The mean score difference was not statistically significant. (See Table 12 in Appendix A on page 24 for details.)
- In 2013, fourth grade Hispanic students enrolled in the Montessori program (M = 1452, SD = 142) had a higher mean reading scale score compared to similar students enrolled in the non-Montessori comparison schools (M = 1447, SD = 132). The mean score difference was not statistically significant. (See Table 13 in Appendix A on page 25 for details.)

African Americans

- In 2012, fourth grade African American students enrolled in the non-Montessori comparison schools (M = 1481, SD = 98) had a higher STAAR mean reading scale score compared to their peers in the Montessori program (M = 1402, SD = 137). The mean difference was statistically

significant, t(91) = -3.15, p = .001 (one-tailed). (See Table 12 in Appendix A on page 24 for details.)

- In 2013, fourth grade African American students enrolled in the Montessori program (M = 1456, SD = 141) had a higher STAAR mean reading scale score compared to their peers in the non-Montessori comparison schools (M = 1387, SD = 109). The mean difference was statistically significant, t(83) = 2.54, p = .007 (one-tailed). (See Table 13 in Appendix A on page 25 for details.)

White

- In 2012, fourth grade White students enrolled in the non-Montessori comparison schools (M = 1610, SD = 164) had a STAAR mean reading score that was higher when compared to their peers in the Montessori program (M = 1601, SD = 99). The mean difference was not statistically significant. (See Table 12 in Appendix A on page 24 for details.)
- In 2013, fourth grade White students enrolled in the Montessori program (M = 1575, SD = 148) had a higher STAAR mean reading score when compared to their peers in the non-Montessori comparison schools (M = 1436, SD = 162). The mean difference was statistically significant, t(39) = 2.72, p = .017, (one-tailed). (See details in Table 13 in Appendix A on page 25 for details.)

How much of the mean difference in math and reading scores is accounted for by student G/T identification, at-risk status, economic status, and ethnicity in the Montessori program and the non-Montessori comparison schools?

- **Table 14** and **Table 15** in **Appendix A** on pages 25 and 26 display the regression coefficients for selected predictor variables for student performance. These predictors were student G/T identification status, at-risk status, economic status, and ethnicity of the Montessori program and the non-Montessori comparison student groups.

Third Grade Math and Reading: Predictor Variables

- G/T identification status, at-risk status, economic status, and ethnicity combined accounted for 39% of the third grade math scale scores for students enrolled in Montessori programs in 2012 and 29% of the math scale scores of their peers enrolled in non-Montessori comparison in 2012.
- In 2012, G/T identification status and economic status each accounted for 20% of the math scale scores of students enrolled in Montessori programs compared to 14% and 2%, respectively, for their peers enrolled in non-Montessori comparison schools.
- In 2012, at-risk status accounted for 14% of the math scores of students enrolled in the Montessori program and only 1% of the mean scores of students enrolled in the non-Montessori comparison schools.
- In 2013, with respect to reading, the G/T identification status, at-risk status, economic status, and ethnicity accounted for 20% of the reading scale scores of the Montessori programs students and 32% of the scores of students enrolled in the non-Montessori comparison schools.
- In 2013, G/T alone accounted for 19% of the reading scale score for students enrolled in the Montessori program compared to 25% of the scale score of students enrolled in the non-Montessori comparison schools. (See Table 14 and Table 15 in Appendix A on pages 25 and 26 for details.)
- In 2012, based on the beta-coefficient (**β**), economic status and at-risk status had a larger negative effect on the math STAAR scale scores of third grade student enrolled in the Montessori program (-.45 and -.37 respectively) when compared to their non-Montessori peers (-.14 and -.07 respectively). (See Table 14 and Table 15 in Appendix A on Page 25 and 26 for details.)

- In 2013, based on the beta-coefficient (β), economic status had a larger negative effect on the reading STAAR scale scores of third grade student enrolled in the Montessori program (-.31) when compared to their non-Montessori peers (-.13). (See Table 14 and Table 15 in Appendix A on Page 25 and 26 for details.)
- In 2013, the at-risk status had a positive effect on the reading scale scores of students in non-Montessori (β = .22), and a negative effect on the Montessori program students scale scores (β = -.20).

Fourth Grade Math and Reading: Predictor variables

- G/T identification status, at-risk status, economic status, and ethnicity accounted for 50% of the math scale score of students enrolled in the Montessori program compared to 32% of the scores of students enrolled in non-Montessori comparison schools in 2012. (See Table 14 in Appendix A on page 25 for details.)
- In 2013, G/T identification status, at-risk status, economic status, and ethnicity together predicted 30% and 36%, respectively, of the reading scores for the Montessori program and the non-Montessori comparison schools. (See Table 15 in Appendix A on page 26 for details.)
- G/T identification status had the largest influence on the mean math scale scores for third and fourth grade Montessori program students (r^2 = .25*) and non-Montessori comparison students (r^2 = .21*) on the 2012 STAAR test. (See Table 14 in Appendix A on page 25 for details.)
- Similarly, G/T identification status accounted for the largest variation in the reading scale scores for fourth grade Montessori program students (r^2 = .25*) and the non-Montessori comparison students (r^2 = .32*) on the 2013 STAAR test. (See Table 15 in Appendix A on page 26 for details.)
- In 2012, using the beta-coefficient (β), economic status and at-risk status had larger negative effects on the scores of students enrolled in the Montessori program schools in fourth grade math (-.43 and -.35, respectively), and compared to students in the non-Montessori comparison schools (-.22 and -.08, respectively). (See Table 14 and Table 15 in Appendix A on Page 25 and 26.)
- In 2013, using the beta-coefficient (β), economic status and at-risk status had larger negative effects on the reading scores of fourth students enrolled in the Montessori program schools (-.26 and -.31, respectively) compared to students in the non-Montessori comparison schools (-.14 and -.01, respectively). (See Table 14 and Table 15 in Appendix A on page 25 and 26 for details.)

Discussion

The purpose of this evaluation was to compare the math and reading performance of the third and fourth grade Montessori program students to the performance of students enrolled in non-Montessori comparison schools using the 2012 and 2013 STAAR math and reading test results. The test results were also analyzed by student G/T identification status, at-risk status, economic status, and ethnicity.

Overall, in 2013, third grade Montessori program students had a higher mean math scale score compared to the students in the non-Montessori comparison schools. However, at-risk third and fourth grade students in the non-Montessori comparison schools outperformed their peers in the Montessori program schools in math. Students considered non-at-risk in the Montessori program schools outperformed their peers in the non-Montessori comparison schools.

In 2013, both third and fourth grade Montessori program students had higher mean reading scale scores than their peers enrolled in the non-Montessori comparison schools. The mean differences were statistically significant.

The results for ethnic groups appeared mixed. It appeared that third and fourth grade African American students in the Montessori program school outperformed their peers in the non-Montessori

comparison schools in 2013. Sample sizes for White students in non-Montessori comparison schools were too small to make any meaningful conclusions. There was no significant difference in either year or grade between Hispanic Montessori program students and non-Montessori comparison students.

In 2012, G/T identification status was the strongest predictor of student performance in math for both third and fourth grade Montessori program students and non-Montessori comparison students. It was also the strongest predictor of reading performance in 2013 for both third and fourth grade students enrolled in the Montessori program and non-Montessori comparison schools.

Students who were economically-disadvantaged did not perform better in Montessori program schools compared to non-Montessori comparison schools. Sample sizes for non-economically disadvantaged students in non-Montessori comparison schools were too small to make any meaningful conclusions.

Montessori program students appear to perform better in reading at the third and fourth grades compared to the non-Montessori comparison students in this study. The results were less conclusive for math. Continuing research and evaluation may be necessary to make more definite conclusions about performance differences between Montessori program students and non-Montessori students in HISD, particularly as students progress to higher grade levels.

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APPENDIX A:

Table 1: Teacher characteristics for Montessori and non-Montessori comparison schools, 2012-2013, HISD

	Wilson	Dodson	Garden Oaks	Durham	Kelso	Mitchell
Teachers	29	29	34	30	29	24
Student-teacher ratio	20	15	19	18	15	19
Experience (≥ 6 years (%)	45	55	68	53	79	75
Masters	28	21	26	30	34	33
Doctoral	0	0	6	3	0	0
Attendance	96	95	96	97	96	97
Aides	12	14	10	1	2	2

Source: HISD District and School Profiles, 2012–2013 (raw data only)

Table 2: Independent samples t-test, third and fourth grade math scale scores by program types, 2012

Math 2012		n	Mean	SD	F	t	MD	Sig (one-tailed)
Grade 3	Montessori	189	1402	127	.427	-.33	4	.370
	Non-Montessori	190	1406	136				
Grade 4	Montessori	172	1487	127	.053	-1.57	21	.057
	Non Montessori	178	1508	120				

*p<.05 (one-tailed)

Table 3. Independent samples t-test, third and fourth grade STAAR math scale scores by program type, 2013

Math 2013		n	Mean	SD	F	t	MD	Sig (one-tailed)	Effect Size (Cohen's d)
Grade 3	Montessori	172	1429	139	.192	2.68	37	.004*	.28
	Non-Montessori	218	1393	131					
Grade 4	Montessori	163	1472	143	.672	-.58	9	.280	
	Non Montessori	180	1481	133					

*p<.05 (one-tailed)

Table 4. Independent samples t-tests, third and fourth grade at-risk and non-at-risk STAAR math scale scores by program type, 2012

	Math 2012		n	Mean	SD	F	t	MD	Sig (one tailed)	Effect Size (Cohen's d)
Grade 3	Non-at-Risk	Montessori	101	1430	126	.00	2.29	55	.000**	.43
		Non-Montessori	81	1375	128					
	At Risk	Montessori	88	1369	120	2.46	3.19	60	.000**	
		Non-Montessori	107	1429	139					
Grade 4	Non-at-Risk	Montessori	70	1555	114	2.18	1.57	33	.050*	.27
		Non-Montessori	66	1522	130					
	At-Risk	Montessori	99	1439	114	.63	3.82	60	.000**	
		Non-Montessori	101	1499	112					

*****p<.05 (one-tailed)
**p<.01 (one-tailed)

Table 5. Independent samples t-tests, third and fourth grade at-risk ad non-at-risk STAAR math scale scores by program type, 2013

	Math, 2013		n	Mean	SD	F	t	MD	Sig (one tailed)	Effect Size (Cohen's d)
Grade 3	Non-at-Risk	Montessori	118	1448	136	2.31	5.11	90	.004*	.73
		Non-Montessori	90	1358	112					
	At-Risk	Montessori	54	1389	138	.34	1.27	28	.000**	
		Non-Montessori	127	1417	138					
Grade 4	Non-at-Risk	Montessori	115	1502	147	.13	.93	19	.170	
		Non-Montessori	93	1482	146					
	At-Risk	Montessori	48	1405	109	2.10	3.83	79	.000**	
		Non-Montessori	86	1483	116					

*p<.05 (one-tailed)
**p<.01 (one-tailed)

Table 6. Independent samples t-tests, gifted and non-gifted third and fourth grades STAAR math scale score by school type, 2012

Math 2012			n	Mean	SD	F	t	MD	Sig (one tailed)
Grade 3	Non-G/T	Montessori	138	1363	116	.18	.15	2	.440
		Non-Montessori	146	1365	90				
	G/T	Montessori	51	1506	107	4.83	1.79	42	.030*
		Non-Montessori	42	1548	133				
Grade 4	Non-G/T	Montessori	130	1461	109	.30	1.24	17	.108
		Non-Montessori	132	1477	145				
	G/T	Montessori	39	1574	108	2.84	.84	23	.200
		Non-Montessori	44	1598	106				

*p<.05 (one-tailed)

Table 7. Independent samples t-tests, third and fourth grades gifted and non-gifted student groups STAAR math scores by program type, 2013

Math 2013			n	Mean	SD	F	t	MD	Sig (one tailed)	Effect Size (Cohen's d)
Grade 3	Non-G/T	Montessori	130	1395	121	.33	2.47	33	.000**	.28
		Non-Montessori	179	1362	112					
	G/T	Montessori	42	1535	139	.18	.00	0	.480	
		Non-Montessori	37	1535	125					
Grade 4	Non-G/T	Montessori	114	1426	127	1.32	1.08	16	.140	
		Non-Montessori	138	1442	115					
	G/T	Montessori	49	1581	119	4.97	1.65	32	.050*	
		Non-Montessori	41	1618	88					

*p<.05 (one-tailed)

**p<.01 (one-tailed)

Table 8: Independent samples t-tests, third and fourth grade STAAR reading scale scores by program type, 2012

Reading 2012		n	Mean	SD	F	t	MD	Sig (one-tailed)
Grade 3	Montessori	191	1388	127	1.40	.60	8	.275
	Non-Montessori	190	1381	140				
Grade 4	Montessori	172	1476	144	18.02	1.09	14	.139
	Non Montessori	178	1462	104				

*p<.05 (one-tailed)

Table 9. Independent samples t-tests, third and fourth grade STAAR reading scales scores by program type, 2013

Reading 2013		n	Mean	SD	F	t	MD	Sig (one-tailed)	Effect Size (Cohen's d)
Grade 3	Montessori	173	1407	136	.97	3.06	45	.001*	.31
	Non-Montessori	217	1362	150					
Grade 4	Montessori	164	1480	151	3.53	2.94	44	.001*	.31
	Non Montessori	182	1436	131					

*p <.05 (one-tailed)

Table 10. Independent samples t-test for third and fourth grade STAAR reading scale scores by economic status, 2012

Reading 2012			n	Mean	SD	F	t	MD	Sig (one tailed)
Grade 3	Non-Econ Disadv.	Montessori	64	1451	125	.01	.34	13	.361
		Non-Montessori	16	1438	132				
	Econ Disadv.	Montessori	127	1358	117	5.74	1.19	17	.122
		Non-Montessori	174	1375	140				
Grade 4	Non-Econ Disadv.	Montessori	54	1567	131	.21	.60	23	.274
		Non-Montessori	17	1544	142				
	Econ Disadv.	Montessori.	118	1435	131	8.47	.13	18	.092
		Non-Montessori	161	1453	96				

*p<.05 (one-tailed)

Table 11. Independent samples t-test, third and fourth grade STAAR reading scale scores by economic status and program type, 2013

	Reading 2013		n	Mean	SD	F	t	MD	Sig (one tailed)
Grade 3	Non-Econ Disadv.	Montessori	51	1502	123	.59	1.75	68	.042*
		Non-Montessori	15	1434	160				
	Econ Disadv.	Montessori	122	1367	122	4.86	.80	13	.202
		Non-Montessori	201	1354	145				
Grade 4	Non-Econ Disadv.	Montessori	58	1567	153	.42	.75	34	.227
		Non-Montessori	14	1532	164				
	Econ Disadv.	Montessori	106	1433	128	.400	.35	5	.367
		Non-Montessori	167	1428	126				

*p<.05 (one-tailed)

Table 12. Independent samples t-tests, third and fourth grade STAAR reading scale scores by ethnicity and program type, 2012

	Reading, 2012		n	Mean	SD	F	t	MD	Sig (one tailed)
Grade 3	Hispanic	Montessori	104	1373	118	4.96	-.49	9	.304
		Non-Montessori	135	1382	145				
	African American	Montessori	54	1366	131	.30	.49	14	.312
		Non-Montessori	47	1353	115				
	White	Montessori	28	1489	118	.00	-.36	19	.352
		Non Montessori	6	1508	113				
Grade 4	Hispanic	Montessori	95	1470	136	5.14	1.31	21	.085
		Non-Montessori	126	1449	99				
	African American	Montessori	44	1402	137	1.43	-3.15	79	.001*
		Non-Montessori	47	1481	98				
	White	Montessori	31	1601	99	1.10	-.15	9	.427
		Non-Montessori	5	1610	164				

*p<.05 (one-tailed)

Table 13. Independent Samples t-tests, third and fourth grade STAAR reading scale scores by ethnicity and program type, 2013

	Reading, 2013		n	Mean	SD	F	t	MD	Sig (one tailed)
Grade 3	Hispanic	Montessori	93	1380	124	3.74	.03	1	.484
		Non-Montessori	156	1379	149				
	African American	Montessori	42	1374	122	.37	2.54	69	.006*
		Non-Montessori	49	1305	134				
	White	Montessori	32	1508	132	1.13	2.75	136	.005*
		Non Montessori	8	1371	99				
Grade 4	Hispanic	Montessori	85	1452	142	1.05	.02	6	.385
		Non-Montessori	129	1447	132				
	African American	Montessori	41	1456	141	1.63	2.54	69	.007*
		Non-Montessori	42	1387	109				
	White	Montessori	32	1575	148	.19	2.72	139	.017*
		Non-Montessori	7	1436	162				

*p<.05 (one-tailed)

Table 14. Regression coefficients and beta scores for predictor variables of student performance on STAAR math test 2012

Predictor	STAAR Math Test							
	Grade 3				Grade 4			
	Montessori		Non-Montessori		Montessori		Non-Montessori	
	R^2	β	R^2	β	R^2	β	R^2	β
G/t identification	.20*	.45	.14*	.37	.25*	.50	.21*	.46
Economic status	.20*	-.45	.02*	-.14	.18*	-.43	.05*	-.22
At-risk status	.14*	-.37	.01	-07	.12*	-.35	.03*	-.08
Ethnicity	.10	.31	.03	.16	.08	.28	.02*	.15
Total (R^2)	.39[a]		.29[a]		.50[a]		.32[a]	
n	172		163		215		180	

[a] Predictors (constant) g/t identification, economic status, at-risk status, ethnicity

*p<.05 (0ne-tailed)

Table 15. Regression coefficient and beta scores for predictor variable of student performance on STAAR reading test, 2013

Predictor	STAAR Reading Test							
	Grade 3				Grade 4			
	Montessori		Non-Montessori		Montessori		Non-Montessori	
	R^2	β	R^2	β	R^2	β	R^2	β
G/T identification	.19*	.45	.25*	.50	.25*	.50	.32*	.56
Economic status	.09*	-.31	.02*	-.13	.07*	-.26	.02*	-.14
At-risk status	.04*	-.20	.05	.22	.09*	-.31	.00*	-.01
Ethnicity	.02	.15	.07	-.28	.02*	.16	.05	-.24
Total (R^2)	.20[a]		.32[a]		.30[a]		.36[a]	
n	165		156		212		175	

[a]Predictors (constant) g/t identification, economic status, at-risk status, ethnicity

*p<.05 (one-tailed)