



Prince William County
PUBLIC SCHOOLS
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**Year Two Interim Report on Evaluation of Elementary
Mathematics Implementation of
“Investigations in Number, Data, and Space”**

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Prince William County Public Schools
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PRINCE WILLIAM COUNTY PUBLIC SCHOOLS

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**EVALUATION OF PWCS ELEMENTARY MATHEMATICS IMPLEMENTATION OF
“INVESTIGATIONS IN NUMBER, DATA, AND SPACE”
YEAR TWO REPORT: 2007-08**

EXECUTIVE SUMMARY

The purpose of this report is to provide the School Board with important preliminary findings after the second year (2007-08) of the evaluation of the Mathematics “Investigations” program. Following is a summary of those findings, in the areas of program impact, professional development, and program implementation, as well as recommendations based on the findings.

Summary of Preliminary Findings: Year Two

Student Achievement Outcomes

In the area of student achievement, overall student performance in the second year of Math “Investigations” was positive with improvements in proficiency in Stanford Diagnostic Mathematics Test (SDMT) skills, mean scaled scores, grade equivalents, and national percentile rankings. Grade 3 Standards of Learning (SOL) math test performance also remains strong. Specific findings are as follows:

Proficiency on SDMT Subtests

The proficiency of first graders improved from 70% or more in 9 of 10 skills in 2007 to 74% or more in all 10 skills assessed via ten subtests on the SDMT. Second graders demonstrated 80% proficiency or more in all 10 skills for 2007 and 2008.

2007 and 2008 Comparisons of SDMT Total Mean Scaled Scores and Grade Equivalents

For grades 1 and 2, in all student categories, total scaled scores in 2008 were statistically significantly higher ($p < .05$) than those in 2007. Across grade levels and all student categories, students in 2008 attained grade equivalents between one- to three-tenths of a school year (1 to 3 months) higher than students did in 2007.

Grade 2 Growth on the SDMT Mean Scaled Scores and Grade Equivalents

The growth of grade 2 students who took the SDMT in both grades 1 (spring 2007) and 2 (spring 2008) was examined. For all grade 2 student categories, the SDMT mean total scaled scores in 2008 were statistically significantly higher ($p < .05$) than they achieved in 2007 as first graders by 50 points or more. All second graders, White students, and “Other” students exceeded the grade equivalent expectation in 2008 by five-tenths to one full point (one-half to one whole school year). All groups of students achieved at least one school year of expected growth from first to second grade.

National Percentile Rankings

Percentile rankings improved in all SDMT categories by 6 to 10 points for first graders and 2 to 8 points for second graders from 2007 to 2008. Overall performance was “average” when compared nationally.

Third Grade Students’ Performance on the Standards of Learning (SOL) Tests

Performance on the grade 3 SOL tests remains quite high. There was no statistically significant difference between the pass rates of third graders in 2007 (88.60%) and 2008 (88.41%), the first year “Investigations” students took SOL tests. For those third graders who were second graders under “Investigations”, the pass rate was 89.22%, which is slightly, but not statistically significantly higher than the 2007 pass rate. With respect to students in the “advanced” group, there were statistically significant drops in pass rates from 2005 (59.63%) to 2006 (54.42%) and from 2006 (54.42%) to 2007 (48.06%). The “advanced” pass rate in 2008 was 47.95%, which was statistically the same as the rate in 2007.

Professional Development

Nine hundred sixty nine (96%) teachers attended at least one of the seven professional development opportunities provided in 2007-08. At the end of the school year, only a few teachers (6%) of the total surveyed indicated the need for more training in the area of general pedagogy (assessment, differentiation, managing time, and content area skills).

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Stakeholder Perceptions Related to Implementation

Key stakeholders (principals, teachers, and parents) were surveyed about the implementation of Math "Investigations". Stakeholder perceptions are summarized as follows:

Student Impact

Most of the principals (95%), teachers (85%), and parents (78%) reported that students enjoyed mathematics. About three-fourths (74%) of principals and just over half of the teachers (54%) and parents (53%) agreed or strongly agreed that Math "Investigations" was meeting the mathematics needs of students. In contrast, two-fifths (40%) of the teachers and about one-fourth (24%) of parents disagreed or strongly disagreed that Math "Investigations" met the needs of children. Teacher reporting varied by grade level with grade 3 teachers responding with the lowest level of agreement (32%) compared to kindergarten (68%), grade 1 (61%), and grade 2 (56%) teachers. Parent level of agreement was relatively consistent across grades levels with grade 3 parents slightly lower (48%) than kindergarten (52%), first grade (56%), and second grade (54%) parents. Most principals (93%) and teachers (93%) and just under half (45%) of parents agreed or strongly agreed that conventional algorithms are accepted from students. About 12% of the parents disagreed or strongly disagreed and about two-fifths (38%) of parents responded "don't know." Results suggest that teachers and parents are divided to some extent on the merits of "Investigations" meeting the mathematics needs of students and parents are split on the use of algorithms.

Support to Parents

The majority of principals (91%), teachers (89%), and parents (65%) reported that teachers work to enhance parents' understanding on how to support their children with mathematics. Only a few principals and teachers and just over one-fourth (26%) of parents disagreed. Most principals (86%), and roughly half of the teachers (53%) and parents (45%) reported that parents had the Student Math Handbook to use as a reference at home. Roughly three-fourths of the principals (79%) and teachers (74%), and over half (53%) of the parents said that K-3 teachers send parents family letters related to Math "Investigations" units. The implication is that while there are many efforts in place to communicate with parents, even more communication would be helpful.

Overall Perception of Math "Investigations"

Almost all principals (91%) are satisfied with the program, along with over half of teachers (55%) and parents (55%). Teacher perception varied by grade level, with grade 3 teachers expressing lower satisfaction (33%) than teachers in other grades. Kindergarten and grade 1 teachers had the highest satisfaction (67-68%), followed by grade 2 teachers (51%). Parent perceptions were relatively consistent across grade levels, but grade 3 parents did report lower satisfaction (48%) than kindergarten (54%), first grade (59%), and second grade (54%) parents.

Recommendations

Based on findings from Year Two of the evaluation, key issues have been identified in the areas of communication, training, and instruction. The following recommendations are offered for consideration.

Communication

1. Using various media, schools and teachers should increase communication with parents on general information for Math "Investigations" including access to the Student Math Handbook, and family letters.
2. Schools and teachers should continue to provide assistance to parents to help them better understand how best to support their children with mathematics assignments.

Training

3. The Mathematics Office should continue to provide general training on Math "Investigations" and specific training to teachers in pedagogical areas such as assessment, differentiation, managing time, and content.

Instruction

4. The Mathematics Office should continue to assist teachers, administrators, and parents in understanding that "Investigations" includes a balanced approach to mathematics by emphasizing conceptual understanding as well as mastery of facts and use of multiple strategies including traditional ones.

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5. Elementary Level Associates and administrators should investigate how much time is being devoted to math instruction and ensure all classrooms are devoting the amount of time as required by Regulation 602-1, and why this time might not be sufficient.

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INTRODUCTION

In January 2006, the Prince William County School Board approved the divisionwide implementation of the elementary mathematics program, “*Investigations in Number, Data, and Space*”, beginning with grades K-2 for the 2006-07 school year. At the same time, they requested that the program be evaluated. As a result, the Office of Program Evaluation (OPE) in the Office of Accountability was asked by the Associate Superintendent for Student Learning and Accountability to conduct a three-year, comprehensive evaluation of the initiative at all elementary schools and two traditional schools. The purpose of the evaluation is to inform decision-making and program improvement. OPE worked with an evaluation advisory team, composed of school-based and central office representatives, to develop evaluation questions and an evaluation design.

The “Investigations” program started with implementation in grades K-2 in 2006-07 and grade 3 in 2007-08. Grade 4 will begin implementation in 2008-09, followed by grade 5 in 2009-10. Results from the first year of the evaluation were presented to the School Board in December 2007.

The purpose of this report is to provide the School Board with important preliminary findings after the second year of the evaluation of the Mathematics “Investigations” program. Following is a summary of those findings, in the areas of program impact, professional development, and program implementation. The report also includes next steps for the evaluation as well as recommendations based on the findings thus far.

RESULTS

Student Achievement Outcomes

Assessment Instruments Used

To measure student achievement outcomes, the Standards of Learning (SOL) mathematics test for grade 3 and the Stanford Diagnostic Mathematics Test (SDMT) for grades 1 and 2 were used to assess computation skills and problem-solving strategies. The SDMT is a standardized, norm-referenced assessment published by Harcourt Assessment. It measures competence in basic concepts and skills, while emphasizing problem-solving and problem-solving strategies. Scores from the tests are on a developmental scaled, which allows growth to be examined for students tested in successive years (e.g., grade 1 in 2007 and grade 2 in 2008). The SDMT was chosen because there is currently no local or state mathematics assessment given in grades K-2 that could be used to evaluate the effectiveness of “Investigations” at the Division level.

In spring 2007, all PWCS students in grades 1 and 2 were tested. The student groups tested in 2007-08 are comprised of a random sample of one-half of the population of first- and second-grade classrooms across the Division. All schools were included (half of the grade 1 and 2 classrooms at each school). The demographics of the samples are representative of the overall first- and second-grade student populations in the Division as shown in Table 1 below.

Table 1: Student Demographics

Grade	Black		Hispanic		White		Other		Total	
	Population	Sample	Population	Sample	Population	Sample	Population	Sample	Population	Sample
First	1148 (20%)	545 (19%)	1629 (28%)	745 (27%)	2159 (38%)	1079 (39%)	816 (14%)	435 (15%)	5752 (100%)	2804 (100%)
Second	1229 (21%)	598 (21%)	1589 (28%)	754 (27%)	2216 (38%)	1055 (37%)	749 (13%)	417 (15%)	5783 (100%)	2824 (100%)

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The SDMT is comprised of a total of 52 assessment items. On the SDMT, student performance is interpreted in two different ways. First, scores are considered in terms of progress toward skill mastery. Second, scores are considered in comparison to the performance of a national sample. Appendix A contains a glossary of terms that will help explain the various scores. Appendices B and C contain charts with SDMT results and Appendix D shows trends in grade 3 Standards of Learning (SOL) mathematics test results.

In this report, performance on the SDMT is examined in four ways: 1) skill mastery, 2) average performance of the cohorts (spring 2007 and spring 2008), 3) growth from grade 1 to grade 2, and 4) comparative performance to national sample. Performance is considered for the entire group of students tested, as well as specifically for economically disadvantaged students.

Skill Mastery

A student’s proficiency or grade-level performance was defined by a raw score determined by a required number of items correct out of the total number of items in each of the following ten skill areas:

Concepts/Applications (total items: 32)

- Number systems and numeration
- Patterns and functions
- Problem solving
- Graphs and tables
- Measurement
- Geometry

Computation (total items: 20)

- Addition facts
- Addition operations
- Subtraction facts
- Subtraction operations

Percent of Students Proficient on SDMT Subtests in 2007 and 2008

Prince William County Schools students’ proficiency on the SDMT for grades 1 and 2 is described below.

- **Grade 1 Students Proficient on SDMT Subtests (See Figure B-1, Appendix B)**
 - 2007 – 70% or more proficient in 9 of 10 skill areas.
 - 2008 – 74% or more proficient in all 10 skill areas.
 - In 2008, increases were attained in all 10 skill areas (largest in addition facts and subtraction facts; smallest in measurement and geometry).
- **Grade 1 Disadvantaged Students Proficient on SDMT Subtests (See Figure B-2, Appendix B)**
 - 2007 – 70% or more proficient in 3 of 10 skill areas.
 - 2008 – 72% or more proficient in 5 of 10 skill areas.
 - In 2008, increases were attained in all 10 skill areas (largest in addition and subtraction facts; smallest in patterns and functions, and geometry).
- **Grade 2 Students Proficient on SDMT Subtests (See Figure B-3, Appendix B)**
 - 2007 and 2008 – over 80% proficient in all 10 skill areas.
 - In 2008, increases were attained in 8 of 10 skill areas (largest in graphs; smallest in subtraction facts).
- **Grade 2 Disadvantaged Students Proficient on SDMT Subtests (See Figure B-4, Appendix B)**
 - 2007 – 75% or more proficient in all 10 skill areas.
 - 2008 – 73% or more proficient in all 10 skill areas.
 - In 2008, increases were attained in 7 of 10 skill areas (largest in graphs; smallest in problem solving and subtraction facts).

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Students in grade 1 improved from 70% being proficient in 9 of 10 skill areas to almost three-fourths (74%) proficient in all 10 skill areas. Grade 1 disadvantaged students improved from 70% proficient in 3 of 10 skill areas to 72% proficient in 5 of 10 skill areas. Students in grade 2 performed similarly in 2007 and 2008 with over 80% being proficient in all 10 skill areas. Grade 2 disadvantaged students experienced a small decrease from 75% to 73% proficient in all 10 skill areas. In 2007 and 2008, both grades performed slightly better on the ‘Concepts and Applications’ subtest than on the ‘Computation’ subtest. However, increases were attained in the areas of addition and subtraction for all first graders and disadvantaged first graders.

Average Performance: Students’ Mean SDMT Scaled Scores and Grade Equivalents for 2007 and 2008 (See Figures C-1 and C-2, Appendix C)

Prince William County Schools’ performance on the SDMT for grades 1 and 2 are shown in Table 2. Comparisons are made between 2007 first graders and 2008 first graders and similarly for 2007 second graders and 2008 second graders. Both mean scaled scores and grade equivalent scores are included. Scaled score and grade equivalent are defined in the glossary. Students in grades 1 and 2 took different levels of the test, but both levels generate scores on the same developmental scale. The maximum attainable total scaled score for grade 1 was 676 and for grade 2, 692. For grades 1 and 2, in all student categories, total scaled scores in 2008 were statistically significantly higher ($p < .05$) than those in 2007 by 6 to 11 points. The gaps between disadvantaged students and all students’ mean total scaled scores were 13 and 14 points for first graders in 2007 and 2008 respectively; and 16 and 19 points for second graders in 2007 and 2008 respectively.

In 2007 and 2008, for first and second graders, all students, White students, and “Other” students met or exceeded the grade equivalent expectations of 1.8 and 2.8 for first and second grade respectively. Although Black, Hispanic, and disadvantaged students missed meeting the grade equivalent expectations by one- to four-tenths of a point, the average grade equivalents for these groups improved from 2007 to 2008. Also, across grade levels and all student categories, students in 2008 attained grade equivalents between one- to three-tenths of a school year (1 to 3 school months) higher than students in 2007. Across grade levels, the gaps between disadvantaged students and all students’ grade equivalents were between 0.3 and 0.7 (3 to 7 school months).

Table 2: Comparison of 2007 Students and 2008 Students on SDMT Mean Total Scaled Scores and Grade Equivalents

Students	2007			2008			Mean Total Scaled Score Difference	Grade Equivalent Difference
	N	Mean Total Scaled Score	Grade Equivalent	N	Mean Total Scaled Score	Grade Equivalent		
First Grade			(Expected = 1.8)			(Expected=1.8)		
All	5624	546	1.8	2758	555	2.0	9*	0.2
Black	1144	535	1.5	530	543	1.7	8*	0.2
Hispanic	1641	534	1.5	735	543	1.7	9*	0.2
White	2142	559	2.1	1068	568	2.2	9*	0.1
Other	697	553	1.9	425	561	2.1	8*	0.2
Disadvantaged	2055	532	1.5	915	542	1.7	10*	0.2
Second Grade			(Expected=2.8)			(Expected=2.8)		
All	5397	595	3.0	2779	604	3.3	9*	0.3
Black	1137	581	2.5	585	589	2.7	8*	0.2
Hispanic	1416	578	2.4	745	588	2.7	10*	0.3
White	2175	612	3.6	1042	618	3.8	6*	0.2
Other	669	603	3.3	407	614	3.6	11*	0.3
Disadvantaged	1964	579	2.5	889	585	2.6	6*	0.1

Note: The expected grade equivalent for grade 1 students would be 1.8, which corresponds to the 8th month of first grade. Likewise, the expected grade equivalent for grade 2 students would be 2.8, which corresponds to the 8th month of second grade.

**Mean total scaled score difference values are statistically significant ($p < .05$).*

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Growth: Grade 2 Students’ Growth from 2007 to 2008 (See Figure C-3, Appendix C)

Another way to look at student performance is to examine the growth of a particular group of students from one year to the next. In 2007-08, second graders were the first students for whom growth could be measured from grade 1 to grade 2 using the SDMT. Because a random sample of one-half of the second grade student population was tested in the spring of 2008, a total of 2,296 students were determined to have a previous first grade test score in 2007 and were analyzed accordingly. Student growth from 2007 to 2008 is depicted in Table 3. In sum, for all student categories, the SDMT mean total scaled scores in 2008 were statistically significantly ($p < .05$) higher than those in 2007 by 50 points or more.

Table 3: Growth on SDMT Mean Total Scaled Scores from First Grade (2007) to Second Grade (2008)

Second Grade Students	N	2007 as First Graders		2008 as Second Graders		Mean Total Scaled Score Growth	Grade Equivalent Growth
		Mean Total Scaled Score	Grade Equivalent	Mean Total Scaled Score	Grade Equivalent		
All	2296	549	1.8	604	3.3	55*	1.5
Black	454	537	1.6	589	2.7	52*	1.1
Hispanic	614	537	1.6	589	2.7	52*	1.1
White	907	560	2.1	619	3.8	59*	1.7
Other	321	557	2.0	615	3.7	58*	1.7
Disadvantaged	756	536	1.6	586	2.6	50*	1.0

Note: The expected grade equivalent for grade 1 students would be 1.8, which corresponds to the 8th month of first grade. Likewise, the expected grade equivalent for grade 2 students would be 2.8, which corresponds to the 8th month of second grade.
*Mean total scaled score growth values are statistically significant ($p < .05$).

Growth in terms of grade equivalents was represented by gains of one or more grade equivalent points (1.0 = one year of growth) from 2007 to 2008. In 2007, all first graders, along with White and “Other” students met or exceeded the expected grade equivalent of 1.8. When these same students took the SDMT in spring 2008 as second graders, the expected grade equivalent was 2.8 or 1.0 additional school year of growth. Results showed that all second graders, White students, and “Other” students exceeded the grade equivalent expectation in 2008 by five-tenths to one whole point (one-half to one whole school year). While Black, Hispanic, and disadvantaged students did achieve at least one school year of expected growth as second graders, they slightly missed meeting the grade equivalent expectations as both first and second graders.

Comparative Performance

The performance of PWCS students was also compared to the performance of a national sample, using percentile ranks and stanines. Definitions of the scores used are included in the glossary in Appendix A. It is important to remember that percentile ranks place a student’s (or a division’s) performance in the context of the performance of a larger group. For percentile ranks, 50 represents average performance (half the sample scored above that level and half scored below).

Division National Percentile Ranks

PWCS had the following ranks (Table 4) on the SDMT for grades 1 and 2 in 2007 and 2008. The percentile rankings achieved in 2008 were slightly higher than in 2007. These percentile ranks and stanines indicate the Division performed at the “average” level in both years.

Table 4: National Rankings

Skill Category	Students Tested				Percentile Ranking				Stanine Ranking			
	Grade 1		Grade 2		Grade 1		Grade 2		Grade 1		Grade 2	
	'07	'08	'07	'08	'07	'08	'07	'08	'07	'08	'07	'08
Concepts and Applications	5661	2782	5433	2794	49	55	54	62	5	5	5	6
Computation	5664	2764	5413	2792	44	54	45	47	5	5	5	5
Total	5625	2758	5396	2779	45	53	50	56	5	5	5	5

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Third Grade Students’ Performance on the Standards of Learning Tests (See Figure D-1, Appendix D)

Based on comparisons of grade 3 mathematics SOL test results in 2007 and 2008, 88.60% of third graders in 2007 and 88.41% of third graders in 2008 (the first “Investigations” group to take SOL tests) passed. As a result of z-test analysis conducted to determine statistical significance between proportions or percents, there was no statistically significant difference between the pass rates in 2007 and 2008. The “Investigations” and non-“Investigations” third graders performed at the same level. With respect to students in the “advanced” group, there were statistically significant drops in pass rates from 2005 (59.63%) to 2006 (54.42%) and from 2006 (54.42%) to 2007 (48.06%). The “advanced” pass rate in 2008 was 47.95%, which was statistically the same as the rate in 2007.

Professional Development

An important key to the success of the “Investigations” program is quality training and professional development that is tailored to the needs of teachers and administrators. Following is a list of various training sessions completed in 2007-08.

- Summer “Investigations” Workshops
- Introduction to the Second Edition of “Investigations”
- Math Solutions: *Building a Foundation for Algebra*
- Week-long TERC Teachers Institute
- Exxon Mobil Mickelson Math and Science Academy
- Developing Mathematical Ideas (DMI) Institutes at Mt. Holyoke College
- Inquiry-Based Mathematics Instruction
- Making Meaning for Operations
- Fourth Grade Spring Orientation: *Investigations in Number, Data, and Space*
- Community Engagement Sessions

Nine hundred sixty nine (96%) teachers attended at least one of the seven professional development opportunities provided in 2007-08. At the end of the school year, only a few teachers (6%) of the total surveyed indicated the need for more training in various areas of general pedagogy.

- Assessment
- Differentiation
- Managing time
- Content area skills

Stakeholder Perceptions of Areas Related to Implementation

Stakeholders’ perceptions are highly regarded in evaluations and may often be related to the level of successful implementation a program attains. Surveys were conducted in May and June of 2008 to determine the opinions of principals, teachers, and parents regarding the “Investigations” program. The response rates were as follows:

- Of 55 principals surveyed, 43 responded for a return rate of 78%.
- Of 1012 teachers surveyed, 745 responded for a return rate of 74%.
- Of the total population of over 19,000 K-3 parents, a random sample of 10% (1901) parents, all schools, were mailed surveys; 512 parents (representing all schools) responded for a return rate of 27%¹.

¹ The sample size of the parents actually responding to the survey was 512. That sample size does allow us to generalize to the larger population. For example, if the entire population of over 19,000 parents were asked the same survey questions posed to the sample, there is a 95% chance that the responses from the total population would be within plus or minus 4.275 percentage points of the response percent of the 512 parents in the sample.

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Student Impact

- The “Investigations” program is meeting the mathematics needs of students.
 - Seventy-four percent (74%) of principals, 54% of teachers and 53% of parents agreed or strongly agreed that the “Investigations” program is meeting the mathematics needs of students. In contrast, 14% of principals, 40% of teachers and 24% of parents disagreed or strongly disagreed with this perception.
 - Teacher reporting varied by grade level with grade 3 teachers responding with the lowest level of agreement (32%) compared to kindergarten (68%), grade 1 (61%), and grade 2 (56%) teachers. Parent level of agreement was relatively consistent across grades levels with grade 3 parents slightly lower (48%) than kindergarten (52%), first grade (56%), and second grade (54%) parents.
- Students enjoyed math during school year 2007-08.
 - Ninety-five percent (95%) of principals, 85% of teachers and 78% of parents agreed or strongly agreed that students enjoyed math during school year 2007-08.
- Conventional algorithms are accepted from students.
 - Ninety-three percent (93%) of principals, 93% of teachers and 45% of parents agreed or strongly agreed. In contrast, 2% of principals, 3% of teachers and 12% of parents disagreed or strongly disagreed with this perception. In addition, 38% of the parents did not know and 5% did not respond to the survey item.

In sum, almost three-fourths of the principals indicated that Math “Investigations” was meeting the mathematics needs of the students. In contrast, just over one-half of the teachers and parents shared this perception. Few principals, two-fifths of the teachers, and almost one-fourth of the parents disagreed or strongly disagreed with this perception. Almost all principals and the teachers, and more than three-fourths of the parents indicated that students enjoyed mathematics during school year 2007-08. With respect to teachers accepting conventional algorithms from students, most principals and teachers and almost one-half of the parents agreed or strongly agreed algorithms were accepted. Although few principals, teachers, and parents disagreed with this perception, about two-fifths of the parents did not know or did not respond to the survey item. Results suggest that teachers and parents are divided to some extent on the merits of “Investigations” meeting the mathematics needs of students and parents are split on the use of algorithms.

Support to Parents

- Teachers work with parents to enhance their understanding on how to support their children with mathematics at home.
 - Ninety-one percent (91%) of principals, 89% of teachers and 65% of parents agreed or strongly agreed, but, few principals (2%) and teachers (8%) and 26% of parents disagreed or strongly disagreed with this perception.
- K-3 parents have the Student Math Handbook to use as a reference at home.
 - Eighty-six percent (86%) of principals, 53% of teachers and 45% of parents agreed or strongly agreed. Only a few principals (7%), 34% of teachers, and 34% of parents disagreed or strongly disagreed; 13% of teachers and 21% of parents did not know or did not respond to the survey item.
- K-3 teachers send parents all of the family letters included with “Investigations” units.
 - Seventy-nine percent (79%) of principals, 74% of teachers and 53% of parents agreed or strongly agreed. Only a few principals (5%), 25% of teachers, and 31% of parents disagreed or strongly disagreed with this perception.

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To summarize, almost all principals and teachers, and almost two-thirds of the parents responded that teachers work with parents to enhance their understanding on how to support their children with mathematics at home. Only a few principals and teachers and more than one-fourth of the parents disagreed or strongly disagreed with this perception. On the subject of K-3 parents having the Student Math Handbook to use as a reference at home, most of the principals, over on-half of the teachers, and almost one-half of the parents agreed or strongly agreed. Only a few of the principals and over one-third of the teachers and parents disagreed with this perception. K-3 teachers are tasked with sending parents all of the family letters included with “Investigations” units. More than three-fourths of the principals, almost three-fourths of the teachers and just over one-half of the parents agreed or strongly agreed that letters were forwarded. Only a few of the principals, one-fourth of the teachers, and almost one-third of the parents disagreed or strongly disagreed. The implication of these stakeholders’ perceptions is that more communication between the schools/teachers and parents is warranted.

Overall Perception of Math “Investigations”

- I am Satisfied with Math “Investigations”.
 - Ninety-one percent (91%) of principals, 55% of teachers and 55% of parents agreed or strongly agreed. Only a few principals (7%), 38% of teachers, and 27% of parents disagreed or strongly disagreed; 18% of parents did not know or did not respond to the survey item.
 - Teacher responses varied by grade level, with grade 3 teachers reporting the lowest satisfaction (33%). Kindergarten and grade 1 teachers had the highest satisfaction (67-68%), followed by grade 2 teachers (51%). This means that 67% of the dissatisfied teachers were from grades 2 and 3.
 - Parent perceptions were relatively consistent across grade levels, but grade 3 parents did report slightly lower satisfaction (48%) than kindergarten (54%), first grade (59%), and second grade (54%) parents.

With respect to overall feelings about Math “Investigations”, almost all (91%) of the principals, over one-half of teachers and parents agreed or strongly agreed they were satisfied with Math “Investigations”. Very few (7%) principals, almost two-fifths (38%) of the teachers, and more than one-fourth (27%) of the parents disagreed or strongly disagreed they were satisfied with Math “Investigations”. Almost all principals are satisfied with the program, but satisfaction is not nearly as prevalent among teachers and parents.

Stakeholders’ Comments on Open-Ended Survey Items

Following is a summary of comments from principals, teachers, and parents on various aspects of Math “Investigations”. In many cases the frequency of responses was much less than 10% of the respondents. In such cases, some of the more frequent responses are provided.

Satisfaction with the Program.

Principals indicated the program’s support for students’ learning, conceptual thinking and understanding, and the use of multiple strategies were the bases of their satisfaction (40%). Teachers’ satisfaction was based on the program’s support of student learning and students succeeding (6%). Parents cited support for student learning, understanding, and succeeding (15%) as the basis of their satisfaction.

Dissatisfaction with the Program.

Principals indicated the need for more direct and indirect support for teachers, non-alignment with the SOL, and the difficulty experienced by second language learners were the bases for their dissatisfaction with “Investigations” (33%). Teachers cited the bases of their dissatisfaction as program shortcomings in meeting students’ learning needs (8%) and non-alignment with the SOL (4%). Parents cited general shortcomings in meeting students learning needs (12%), non-use of traditional or basic strategies (13%), and the need for more communication with parents (7%) as reasons for their dissatisfaction with the program.

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Program Strengths.

Principals indicated conceptual thinking and understanding (53%), multiple ways to solve problems (14%), and hands-on approach (16%) were the key strengths of Investigations. Teachers cited strengths as hands-on activities (8%), multiple strategies (3%), and students’ thinking, understanding, and solving math problems (3%). Parents indicated strengths were hands-on activities (8%), multiple ways of learning (9%), and the general category of students thinking, understanding, and performing mathematics (6%). In addition, parents attributed various forms of communication (newsletters, emails, teacher letters, teacher discussions, etc.) as being most helpful in their understanding various strategies used for their children’s math instruction (20%).

Areas of Program Improvement.

Principals indicated a need for more instructional time devoted to math (23%); more time for preparation and improvement in unit pacing (40%); and improvement in alignment with the SOL (26%). Teachers indicated the need to support better learning through less repetition, more traditional math, better differentiation, and support for assessments (5%); better time management (5%); and alignment between “Investigations” and the Standards of Learning (5%). Parents responded that the program could be improved with a balance of “Investigations” and traditional math or traditional math in lieu of “Investigations” (13%); and more communication with parents on “Investigations” (11%).

Next Steps

With respect to next steps in the evaluation process, the Office of Program Evaluation (OPE) will continue to monitor the impact of “Investigations” on student achievement during the 2008-09 school year. In October 2008, OPE will provide a formative report to the Mathematics Office, which will include connections between program implementation and program impact. In addition, recommendations will be provided for program improvement.

Recommendations

Based on findings from Year Two of the evaluation, key issues have been identified in the areas of communication, training, and instruction. The following recommendations are offered for consideration.

Communication

1. Using various media, schools and teachers should increase communication with parents on general information for Math “Investigations” including access to the Student Math Handbook, and family letters.
2. Schools and teachers should continue to provide assistance to parents to help them better understand how best to support their children with mathematics assignments.

Training

3. The Mathematics Office should continue to provide general training on Math “Investigations” and specific training to teachers in pedagogical areas such as assessment, differentiation, managing time, and content.

Instruction

4. The Mathematics Office should continue to assist teachers, administrators, and parents in understanding that “Investigations” includes a balanced approach to mathematics by emphasizing conceptual understanding as well as mastery of facts and use of multiple strategies including traditional ones.
5. Elementary Level Associates and administrators should investigate how much time is being devoted to math instruction and ensure all classrooms are devoting the amount of time as required by Regulation 602-1, and why this time might not be sufficient.

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Appendix A

Glossary of Terms

(Based on definitions by Harcourt Assessment, Incorporated)

Developmental Performance

Developmental performance is reported using scaled scores and grade equivalents.

Scaled Score

- Scaled scores are converted from raw scores. Scaled scores represent approximately equal units. A difference between two scaled scores at one part of the scale represents the same difference in performance as that represented by the same scaled score difference at another part of the scale. The continuous nature of the scale and its equal-interval property make scaled scores particularly suitable for studying change over an instructional period, regardless of the form or level of SDMT 4 taken before or after instruction.

Grade Equivalents

- Grade Equivalents relate students' scores to the typical performance of students in specified grades tested in a given month of the school year. The SDMT 4 grade equivalents range from 1.0 to 12.9, with grade equivalents lower than 1.0 designated as “K” (Kindergarten) and those higher than 12.9 designated as “PH” (post high school). The numeral to the left of the decimal point indicates the school grade; the numeral to the right of the decimal point indicates one-tenth of the school year, or one school month. Grade equivalents of 1.8 and 2.8 represent the typical performance of the national sample of first-grade students and second-grade students taking the SDMT 4 between April 16 and May 15 of the school year.
- Grade equivalent scores for SDMT 4 are comparable across levels and forms of the same subtest. Grade equivalents can be used for measuring student growth. However, it is important to use caution because although normal growth over a year's time is usually defined as one year (1.0) in grade equivalent units, one year of growth is typical only for students who earned average scores and were tested in the spring of the school year. Above-average students ordinarily show a difference greater than 1.0 over a year's time; below-average students show a difference of somewhat less than 1.0.
- Grade equivalents often have been misused because their meaning is not clearly understood. For example, if a sixth grader earns a grade equivalent of 8.5 on the Brown Level of SDMT 4, it means that the student's score was about the same as what the typical score of eighth graders would have been if they had been tested with the Brown Level in late January or early February (.5). A grade equivalent of 8.5 does not imply that the student has the mathematical skills ordinarily acquired by the middle of eighth grade, as is often erroneously assumed. While this student's performance may be far superior to that of most sixth graders, the level of achievement is not necessarily typical of that of an eighth grader.

Comparative Performance

Comparative scores on the SDMT are reported in a variety of ways for each child and are expressed as national percentile ranks (PR), stanines (S), and raw scores defined as follows:

Percentile Ranks

- Show a child's performance relative to other students of the same grade level who were administered the test nationally at the same point in the school year. Percentile ranks can range from 1 to 99, with 50 representing the midpoint or median performance for the grade level. A percentile rank of 45 would mean that the student performed as well or better than 45 percent of the students in the national sample. It **does not mean** that the student answered 45 percent of the questions correctly. Percentile ranks do not equate to percent correct. National percentile ranks from 23 to 76 are considered average. Ranks below 23 are below average and ranks above 76 are above average.

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Stanines

- Compare a student's performance with that of the national sample. Stanines range from 1 to 9, with a 5 designating the midpoint or average performance. For an individual child, stanines of 4, 5, and 6 represent average performance, with stanines of 7, 8, and 9 representing above-average performance, and stanines of 1, 2, and 3 representing below-average performance.

Skill Mastery

A student’s proficiency or grade-level performance is defined by a raw score determined by a required number items correct out of the total number of items in each skill area.

Raw Scores

- Represent the number of items a child got correct for each subtest and the total. This is in comparison to the number of items (shown as “No. of Items” on the report).

Concepts/Applications (total items: 32)

- Subtests and required number of items correct for proficiency

	<u>1st grade:</u>	<u>2nd grade:</u>
○ Number systems and numeration	9/12	8/12
○ Patterns and functions	2/3	2/3
○ Problem solving	5/6	4/6
○ Graphs and tables	2/3	1/3
○ Measurement	3/5	3/5
○ Geometry	2/3	1/3

Computation (total items: 20)

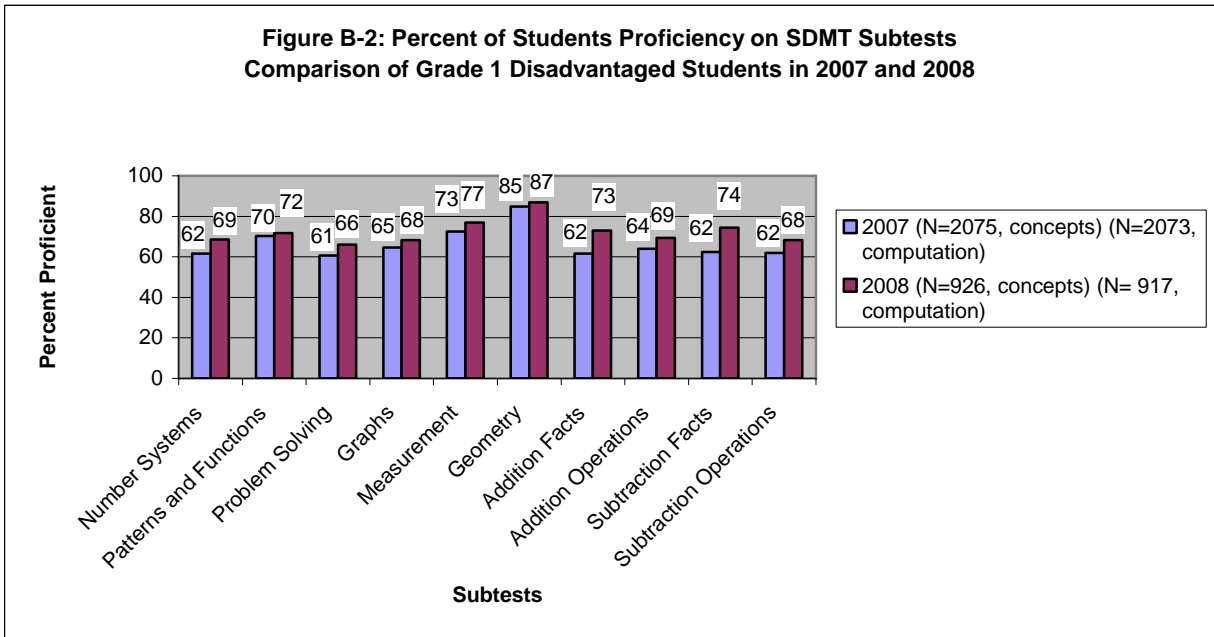
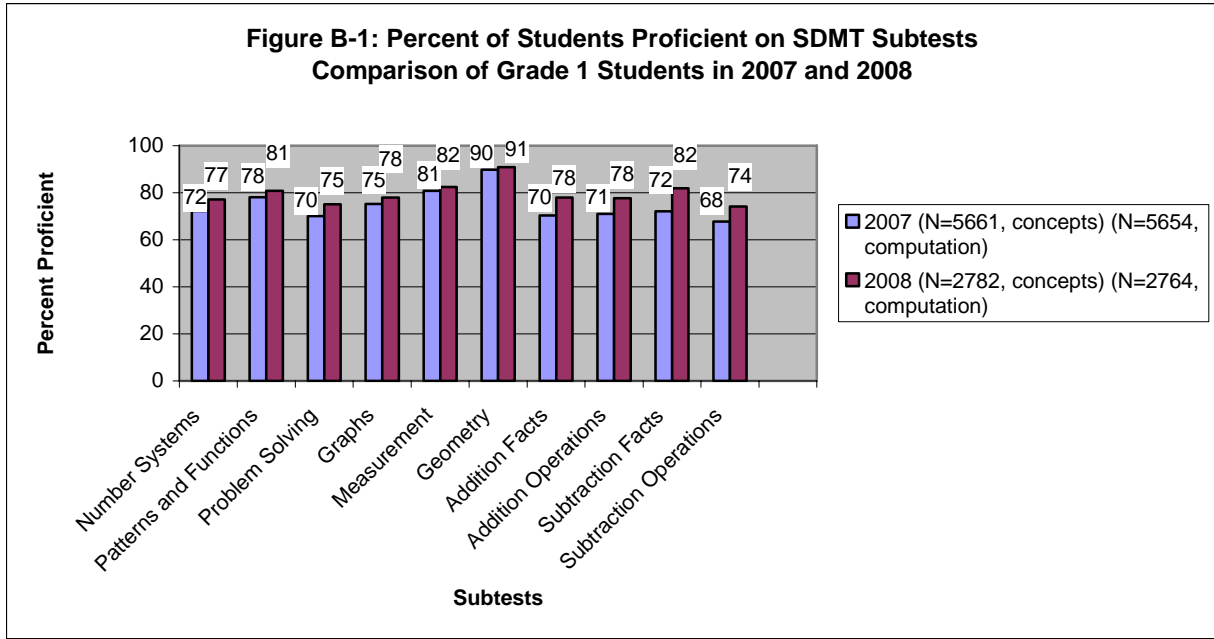
- Subtests and required number of items correct for proficiency

	<u>1st grade:</u>	<u>2nd grade:</u>
○ Addition facts	5/6	4/5
○ Addition operations	3/6	3/4
○ Subtraction facts	3/5	3/5
○ Subtraction operations	1/3	3/6

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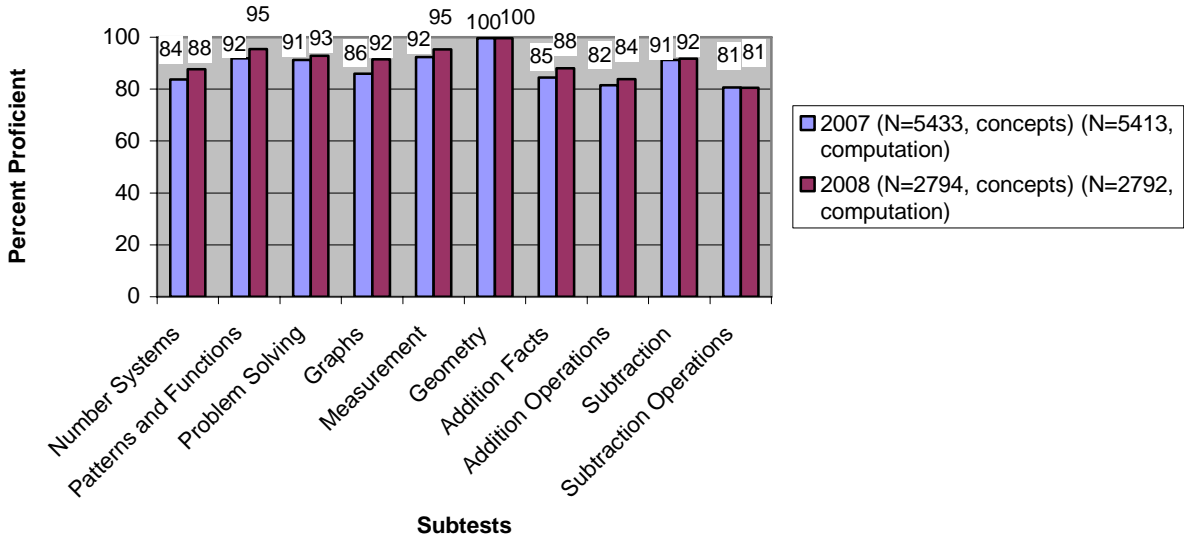
Appendix B

Proficiency on the Stanford Diagnostic Mathematics Test (SDMT)

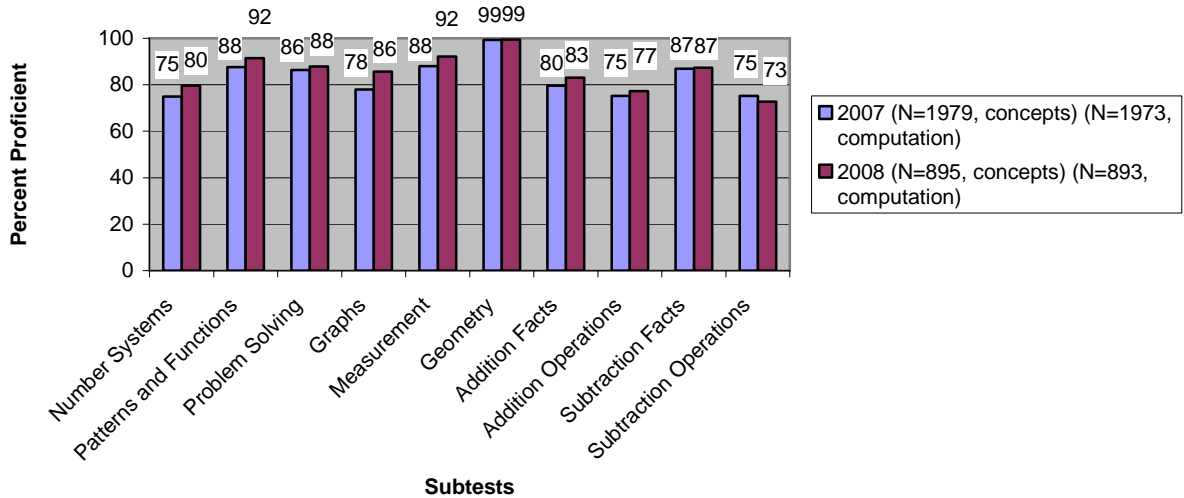


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**Figure B-3: Percent of Students Proficient on SDMT Subtests
 Comparison Between Grade 2 Students in 2007 and 2008**



**Figure B-4: Percent of Students Proficient on SDMT Subtests
 Comparison of Grade 2 Disadvantaged Students in 2007 and 2008**

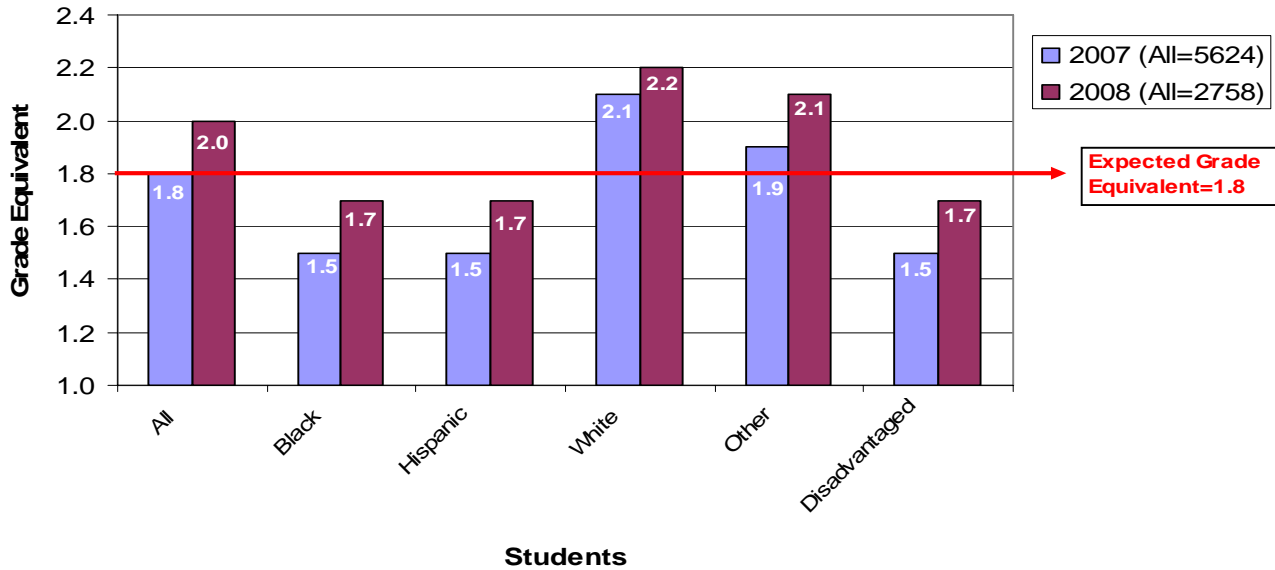


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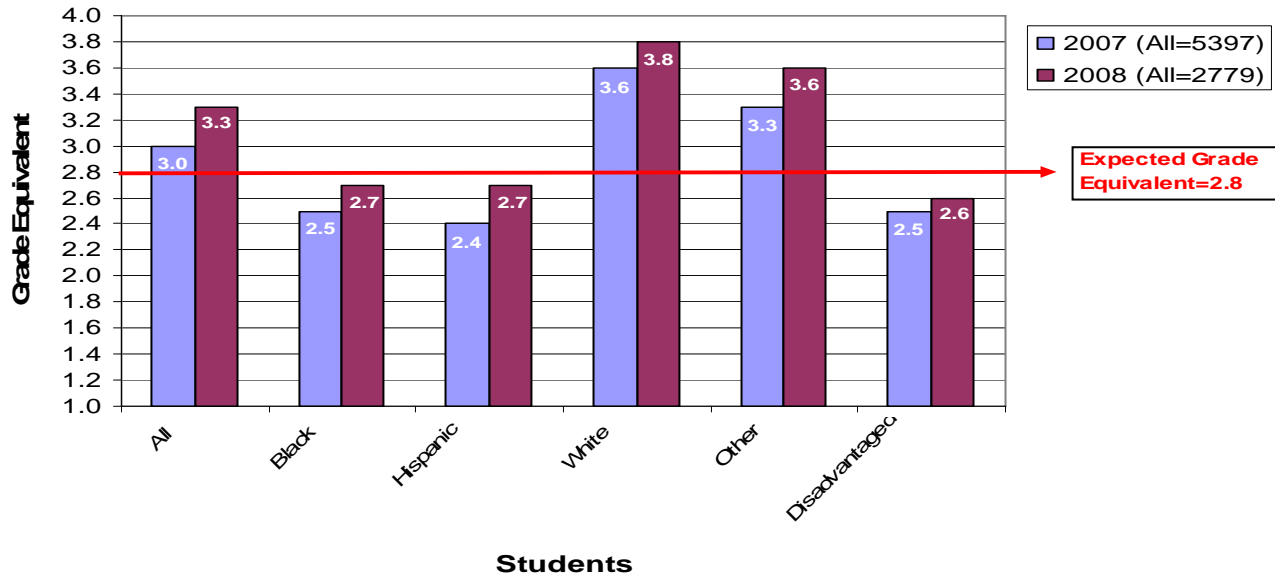
Appendix C

Stanford Diagnostic Mathematics Test (SDMT) Grade Equivalents

**Figure C-1: Comparison of First Graders' Grade Equivalents
 in 2007 and 2008**

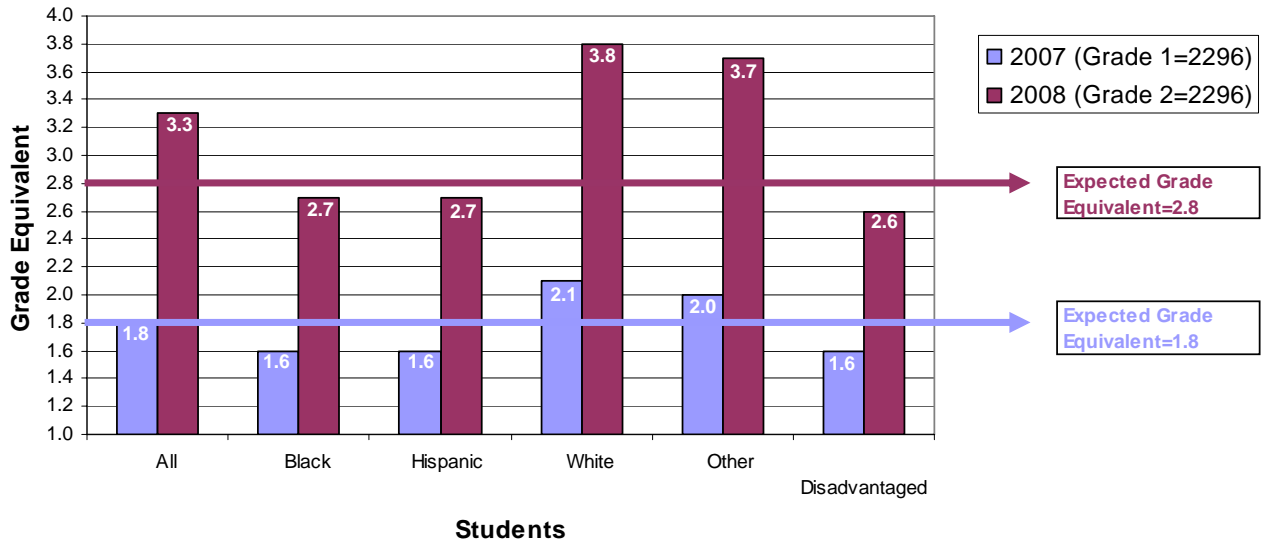


**Figure C-2: Comparison of Second Graders' Grade Equivalents in
 2007 and 2008**



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**Figure C-3: SDMT Grade-Equivalent Growth of Second Graders in 2008 Who
 Were First Graders in 2007**



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Appendix D

Trends in Grade 3 Pass Rates on the Standards of Learning (SOL) Mathematics Test

**Figure D-1: Standards of Learning (SOL)
 Trends in Grade 3 Math**

