RACE to the TOP
A Five-Year View of Math Sprint Competition
at
Camelot Elementary School
2005-2010

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Abstract— **Given Virginia's Standards of Learning (SOL) (1995) mandates, Virginia's elementary teachers and school leaders utilized research for teaching methods that encouraged gains on the end of course mathematics tests. The relationship between teacher motivation methods and student achievement on Virginia's End of Course SOL Test for elementary deserves investigation. Camelot Elementary School is a Title I school housing high concentrations of minority students who normally achieve lower test score gains than students in other district and state schools. Camelot has a student population receiving at least seventy percent free and reduced lunch nested in a low middle class neighborhood in Chesapeake, Virginia.**

This research was based on school effectiveness by a continued replication of specific relationships between student competition and statewide testing results in elementary mathematics for grades three, four, and five at Camelot Elementary School. A previous study was done developing and testing hypotheses about the student competition and statewide testing results in elementary mathematics for grades three and five at the same school. That study compiled data from the "Math Sprint Competition", a series of student group related reviews of state released test items in a math test relay format. Research focused on methods for motivating an experimental group of students motivated by the use of a math sprint competition from 2005 to 2007 versus a control group of elementary students in mathematics for grades three and five from 2002 to 2004.

This current study shows similar data from the third, fourth, and fifth grade "Math Sprint Competitions." Research focused on methods for motivating a group of students by the use of a math sprint competition from 2005 to 2010to shows achievement growth during the same time period. Students must maintain an annual pass rate in mathematics to meet Annual Yearly Progress (AYP) as recommended by the national "No Child Left Behind Act" of 2001. Student learning activities were compared from teaching methods that included: direct instruction, problem-based learning, technology aided instruction, cooperative learning, manipulative, models, and multiple representations, communication, and study skills.

A cohort of twelve mathematics teachers from Camelot Elementary School participated in this research to ascertain how frequently they used research-based teaching methods to determine the influence of teaching methods on their students' achievement. A simple analysis of the annual mean scores was used to determine if gains were made on the end of the year SOL mathematics test. The addition of fourth grade testing which began in the 2005-2006 school years was included in the five-year assessment as well.

Key Words: AYP, SOL, Math Sprint

I. INTRODUCTION

The research considered the SOL math scores of fourth grade at Camelot during the 2005-2010 school years were consistent with scores in third and fifth grade during the same testing years. The relationship between teacher motivation methods and student achievement on Virginia's End of Course SOL Test for elementary students deserved investigation. Virginia's elementary students in grades three, four, and five must maintain an annual pass rate to meet Annual Yearly Progress (AYP) as recommended by the national "No Child Left Behind Act" of 2001. Camelot Elementary School is a Title I school housing high concentrations of minority students who normally achieve lower test score gains than students in other schools. Camelot has a student population receiving at least seventy percent free and reduced lunch nested in a neighborhood of Chesapeake, Virginia. The school administration of Camelot continued using the math sprint exercises because they were strongly convinced that were raised the SOL scores. Since the 2008 research findings indicated that the math sprint test results showed a significant increase in SOL scores, the fourth grade test should indicate similar results.

The **ECSU Math Sprint Competition** fosters to enhance the skills and talents of public school students in the area of mathematics and science.

The **ECSU Math Sprint Competition** serves as a motivator to encourage students to strive toward success on the state's end of year test in the discipline.

The **ECSU Math Sprint Competition** insures that students will learn how to function in cooperative learning groups and acquire teambuilding skills.

The **ECSU Math Sprint Competition** functions as a catalyst for future careers in the field of mathematics and science.

Content knowledge that teachers provide in mathematics education strongly emphasizes "mathematical knowledge." This includes an understanding of the ways learners think, knowledge of didactic representations, the ability to make pedagogical judgments about students' questions and solutions to mathematical problems, and the ability to make judgments about the mathematical quality of instructional materials for the core content of the K-5 curriculum.

In **Grade 3**, instructional time should focus on four critical areas: (1) developing understanding of multiplication and division and strategies for multiplication and division within 100; (2) developing understanding of fractions, especially unit fractions (fractions with numerator 1); (3) developing understanding of the structure of rectangular arrays and of area; and (4) describing and analyzing two-dimensional shapes.

In **Grade 4**, instructional time should focus on three critical areas: (1) developing understanding and fluency with multi-digit multiplication, and developing understanding of dividing to find quotients involving multi-digit dividends; (2) developing an understanding of fraction equivalence, addition and subtraction of fractions with like denominators, and multiplication of fractions by whole numbers; (3) understanding that geometric figures can be analyzed and classified based on their properties, such as having parallel sides, perpendicular sides, particular angle measures, and symmetry.

In **Grade 5**, instructional time should focus on three critical areas: (1) developing fluency with addition and subtraction of fractions, and developing understanding of the multiplication of fractions and of division of fractions in limited

cases (unit fractions divided by whole numbers and whole numbers divided by unit fractions); (2) extending division to 2-digit divisors, integrating decimal fractions into the place value system and developing understanding of operations with decimals to hundredths, and developing fluency with whole number and decimal operations; and (3) developing understanding of volume.

Competition among young children has been known to force them to pick up on new material quickly and retain the old material in order to out-do the others. The research of how competition helps raise math scores was conducted and experimented on groups of children in third grade, fourth grade, and fifth grade. The competition came from the many math sprints in which students participated. Questions missed collectively were reviewed in various ways and made sure that the students were comfortable with the concepts. In addition, questions answered correctly were reviewed to refresh the students' memory. With the scores from the math sprints, benchmark tests, and SOL tests, a determination was made as to whether the math sprints indeed improved the SOL math scores of the participating students.

This research was based on the relationship between student competition and state wide testing results in elementary mathematics for grades three, four, and five at Camelot Elementary School in Chesapeake, Virginia. The study compiled data from the "Math Sprint Competition", a series of student group related reviews of state released test items in a math test relay format. Research focused on comparing test scores from 2005-2010 for grades three, four, and five.

ECSU students visit 4th and 5th grade classes during math sprints.

ECSU Math Team students with Camelot Principal, Dr. Stephanie Johnson

Test Level - 5th Grade - 2008-2009				
P/F	**Scored Band**	**# of Tests**	**% of Tests**	**Avg. Scaled Scores**
Passed	500 to 600	45	46.4%	564.7
	425 to 499	30	30.9%	464.1
	400 to 424	9	9.3%	408.2
Failed	350 to 399	6	6.2%	388.7
	0 to 349	7	7.2%	320.7
Total		97	100.0%	490.6

II. DATA COLLECTION

For the purpose of this analysis, the SOL math test scores of Camelot Elementary School 3rd, 4th and 5th grade students were used. The cohorts were students tested in the third grade for the 2002-2007 and fifth grade for the 2002-2007 end of the year SOL mathematics tests for the fall of 2001 school year through the spring of 2007 school year (six years). These students included in the analysis also attended Camelot Elementary School for three consecutive years in grades three, four, and five. The raw data for these students were found in the table below of students in each sample was as follows:

Camelot Elementary School
SOL Scores 2005-2010

Test Level - 5th Grade - 2005-2006				
P/F	**Scored Band**	**# of Tests**	**% of Tests**	**Avg. Scaled Scores**
Passed	500 to 600	44	45.4%	574.4
	425 to 499	34	35.1%	469.1
	400 to 424	11	11.3%	410.5
Failed	350 to 399	7	7.2%	383.3
	0 to 349	1	1.0%	296.0
Total		97	100.0%	502.2

Test Level - 5th Grade - 2006-2007				
P/F	**Scored Band**	**# of Tests**	**% of Tests**	**Avg. Scaled Scores**
Passed	500 to 600	52	52.0%	558.6
	425 to 499	33	33.0%	464.0
	400 to 424	9	9.0%	405.6
Failed	350 to 399	4	4.0%	367.3
	0 to 349	2	2.0%	292.5
Total		100	100.0%	500.9

Test Level - 5th Grade - 2007-2008				
P/F	**Scored Band**	**# of Tests**	**% of Tests**	**Avg. Scaled Scores**
Passed	500 to 600	41	54.7%	547.0
	425 to 499	28	37.3%	464.6
	400 to 424	1	1.3%	402.0
Failed	350 to 399	4	5.3%	388.8
	0 to 349	1	1.3%	372.0
Total		75	100.0%	503.5

Test Level - 5th Grade - 2009-2010				
P/F	**Scored Band**	**# of Tests**	**% of Tests**	**Avg. Scaled Scores**
Passed	500 to 600	32	37.6%	570.4
	425 to 499	42	49.4%	467.0
	400 to 424	5	5.9%	409.0
Failed	350 to 399	5	5.9%	390.0
	0 to 349	1	1.2%	326.0
Total		85	100.0%	496.4

Test Level - 4th Grade - 2005-2006				
P/F	**Scored Band**	**# of Tests**	**% of Tests**	**Avg. Scaled Scores**
Passed	500 to 600	39	39.8%	547.1
	425 to 499	37	37.8%	471.3
	400 to 424	9	9.2%	414.4
Failed	350 to 399	12	12.3%	376.5
	0 to 349	1	1.0%	320.0
Total		98	100.0%	482.6

Test Level - 4th Grade - 2006-2007				
P/F	**Scored Band**	**# of Tests**	**% of Tests**	**Avg. Scaled Scores**
Passed	500 to 600	17	22.1%	531.3
	425 to 499	38	49.4%	460.5
	400 to 424	14	18.2%	414.0
Failed	350 to 399	5	6.5%	394.8
	0 to 349	3	3.9%	327.0
Total		77	100.0%	458.2

Test Level - 4th Grade - 2007-2008				
P/F	**Scored Band**	**# of Tests**	**% of Tests**	**Avg. Scaled Scores**
Passed	500 to 600	30	36.1%	540.1
	425 to 499	39	47.0%	460.7
	400 to 424	5	6.0%	411.6
Failed	350 to 399	6	7.2%	388.5
	0 to 349	3	3.6%	352.8
Total		83	100.0%	477.0

Test Level - 4th Grade - 2008-2009				
P/F	**Scored Band**	**# of Tests**	**% of Tests**	**Avg. Scaled Scores**
Passed	500 to 600	36	40.9%	533.5
	425 to 499	38	43.2%	466.1
	400 to 424	9	10.2%	413.7
Failed	350 to 399	2	4.6%	392.0
	0 to 349	3	1.1%	342.3
Total		88	100.0%	482.7

Test Level - 3rd Grade - 2005-2006				
P/F	**Scored Band**	**# of Tests**	**% of Tests**	**Avg. Scaled Scores**
Passed	500 to 600	47	62.7%	550.1
	425 to 499	24	32.0%	464.2
	400 to 424	4	5.3%	423.0
Total		75	100.0%	515.9

Test Level -3rd Grade - 2006-2007				
P/F	**Scored Band**	**# of Tests**	**% of Tests**	**Avg. Scaled Scores**
Passed	500 to 600	49	56.3%	555.4
	425 to 499	30	34.5%	453.7
	400 to 424	4	4.6%	418.5
Failed	350 to 399	3	3.4%	391.3
	0 to 349	1	1.1%	338.0
Total		87	100.0%	505.9

Test Level - 3rd Grade - 2007-2008				
P/F	**Scored Band**	**# of Tests**	**% of Tests**	**Avg. Scaled Scores**
Passed	500 to 600	41	50.0%	558.7
	425 to 499	38	46.3%	470.7
	400 to 424	3	3.7%	417.0
Total		82	100.0%	512.7

Test Level - 3rd Grade - 2008-2009				
P/F	**Scored Band**	**# of Tests**	**% of Tests**	**Avg. Scaled Scores**
Passed	500 to 600	30	30.3%	550.9
	425 to 499	48	48.5%	465.4
	400 to 424	12	12.1%	410.2
Failed	350 to 399	6	6.1%	390.5
	0 to 349	3	3.0%	340.0
Total		99	100.0%	476.3

Test Level - 3rd Grade - 2009-2010				
P/F	**Scored Band**	**# of Tests**	**% of Tests**	**Avg. Scaled Scores**
Passed	500 to 600	42	56.8%	536.4
	425 to 499	24	32.4%	457.5
	400 to 424	3	4.1%	410.0
Failed	350 to 399	3	4.1%	383.3
	0 to 349	2	2.7%	337.0
Total		74	100.0%	494.1

Test Level - 4th Grade - 2009-2010				
P/F	**Scored Band**	**# of Tests**	**% of Tests**	**Avg. Scaled Scores**
Passed	500 to 600	44	44.0%	557.8
	425 to 499	43	43.0%	467.8
	400 to 424	6	6.0%	412.0
Failed	350 to 399	5	5.0%	378.7
	0 to 349	2	2.0%	310.5
Total		100	100.0%	496.5

Camelot Elementary School
3rd – 5th Grade Flow
3rd Grade Flow Charts 2005 – 2008

Test Level - 3rd Grade - 2005-2006				
P/F	**Scored Band**	**# of Tests**	**% of Tests**	**Avg. Scaled Scores**
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	400 to 424	14	18.2%	414.0
Failed	350 to 399	5	6.5%	394.8
	0 to 349	3	3.9%	327.0
Total		77	100.0%	458.2

Test Level - 5th Grade - 2007-2008				
P/F	**Scored Band**	**# of Tests**	**% of Tests**	**Avg. Scaled Scores**
Passed	500 to 600	41	54.7%	547.0
	425 to 499	28	37.3%	464.6
	400 to 424	1	1.3%	402.0
Failed	350 to 399	4	5.3%	388.8
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Total		75	100.0%	503.5

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P/F	**Scored Band**	**# of Tests**	**% of Tests**	**Avg. Scaled Scores**
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	425 to 499	39	47.0%	460.7
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3rd Grade Flow Charts 2007 - 2010

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P/F	**Scored Band**	**# of Tests**	**% of Tests**	**Avg. Scaled Scores**
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	425 to 499	38	46.3%	470.7
	400 to 424	3	3.7%	417.0
Total		82	100.0%	512.7

Test Level - 4th Grade - 2008-2009				
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3rd Grade Flow Charts 2008 - 2010

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P/F	**Scored Band**	**# of Tests**	**% of Tests**	**Avg. Scaled Scores**
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Test Level - 4th Grade - 2009-2010				
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	0 to 349	3	3.0%	340.0
Total		99	100.0%	476.3

3rd Grade Flow Chart 2010

Test Level - 3rd Grade - 2009-2010				
P/F	**Scored Band**	**# of Tests**	**% of Tests**	**Avg. Scaled Scores**
Passed	500 to 600	42	56.8%	536.4
	425 to 499	24	32.4%	457.5
	400 to 424	3	4.1%	410.0
Failed	350 to 399	3	4.1%	383.3
	0 to 349	2	2.7%	337.0
Total		74	100.0%	494.1

III. METHODOLOGY

A group of twelve elementary teachers from Camelot Elementary School participated in this research to ascertain how frequently they used math sprint competitions to determine positive gains in students' achievement. A multiple regression analysis, Pearson Product Moment Correlations, and tests of hypotheses made about two population means were conducted from a 40-item statewide test for third and fifth grade level to determine which variables possess strong and statistically significant relationships in a 2008 study. Many real and practical situations in the educational setting used such tests successfully. These analyses determined that gains in the benchmark scores resulted from the series of math sprint competitions used as motivators before benchmark assessments and SOL testing. Now the fourth grade scores have been added without any previous SOL testing. All three grades level SOL

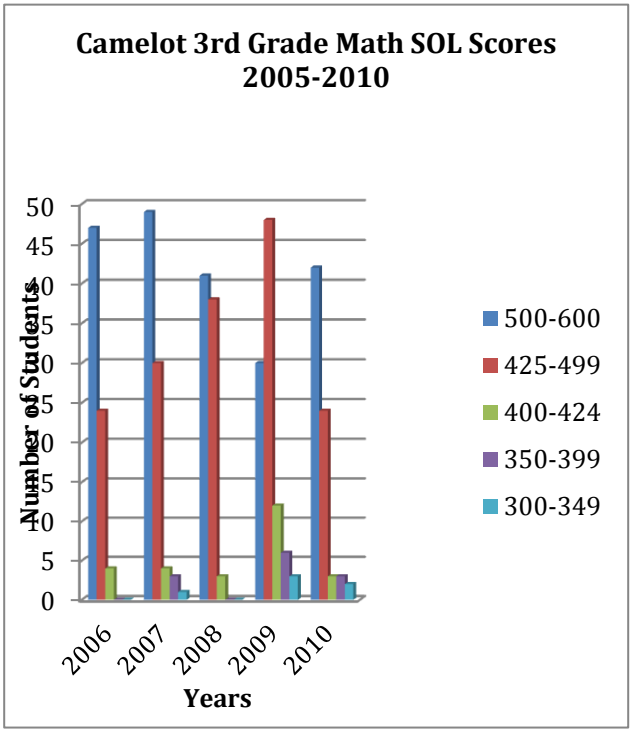
scores are compared for 2005-2010 years showing consistently high results.

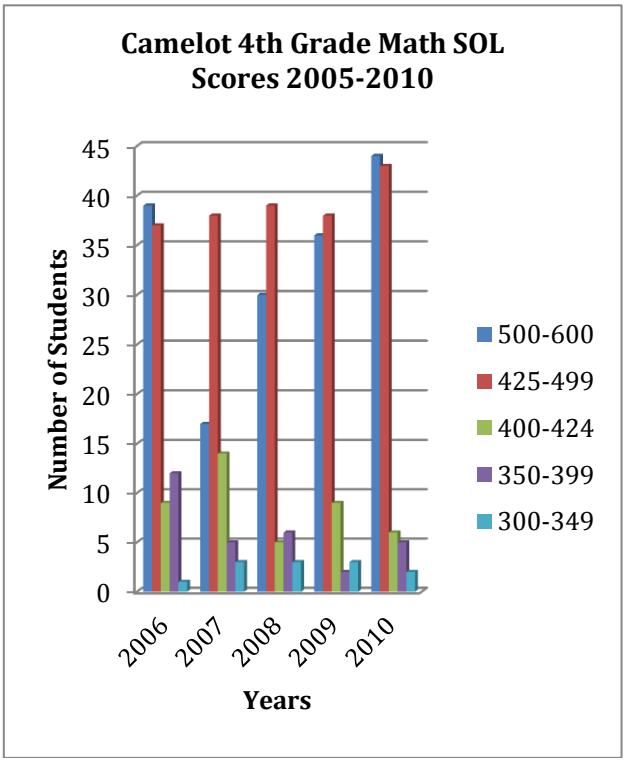
SOL score ranges are as follows:

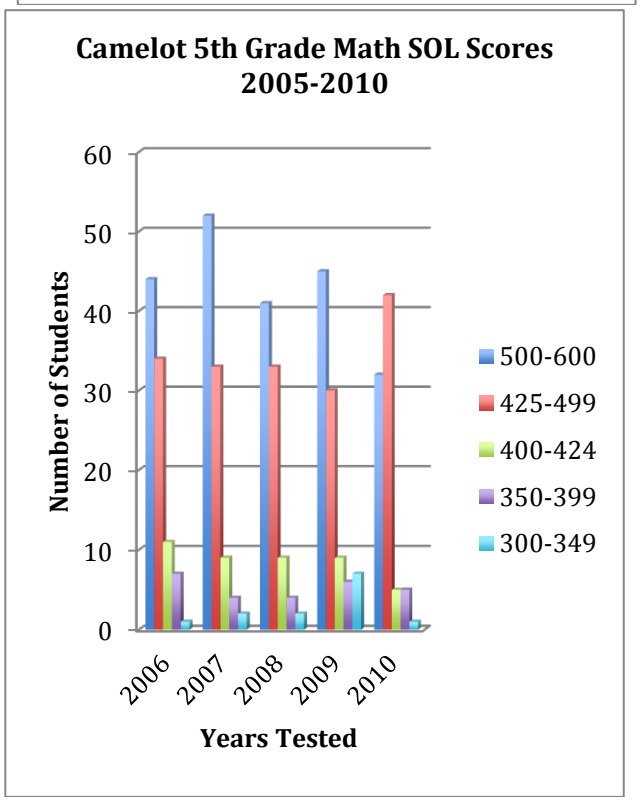
Perfect Score	**600**
Pass Advance	**500-599**
Pass	**400-499**
Fail	**Below 400**

IV. RESULTS

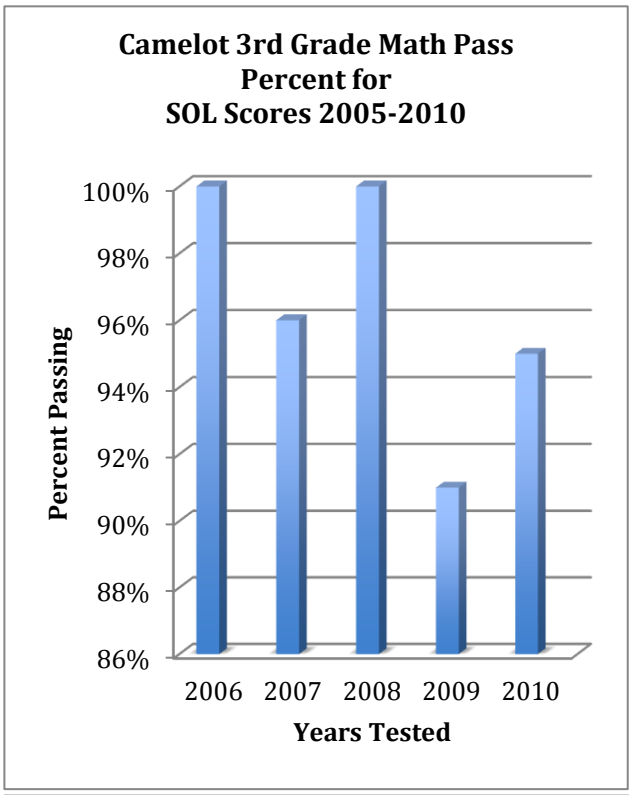
Graphs below represent 2005-2010 math SOL **pass/fail scores** for grades 3, 4, & 5.

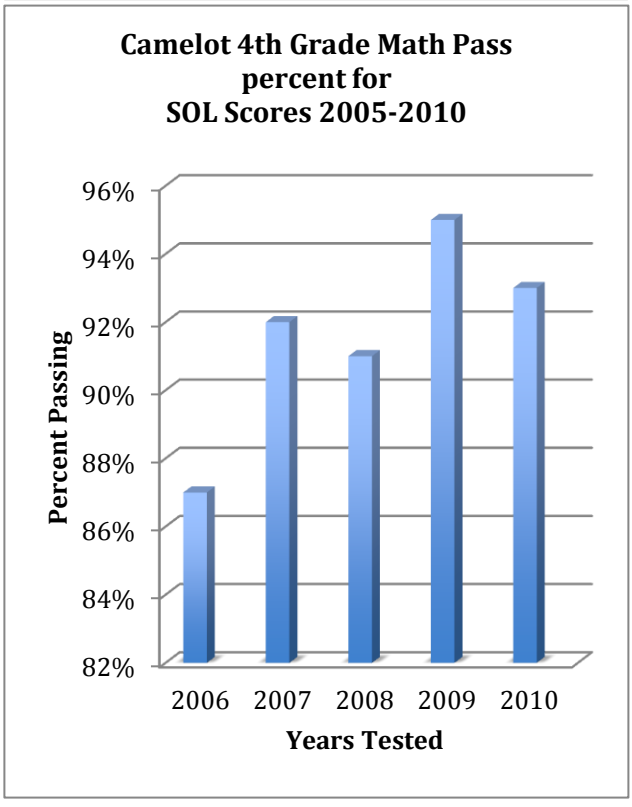


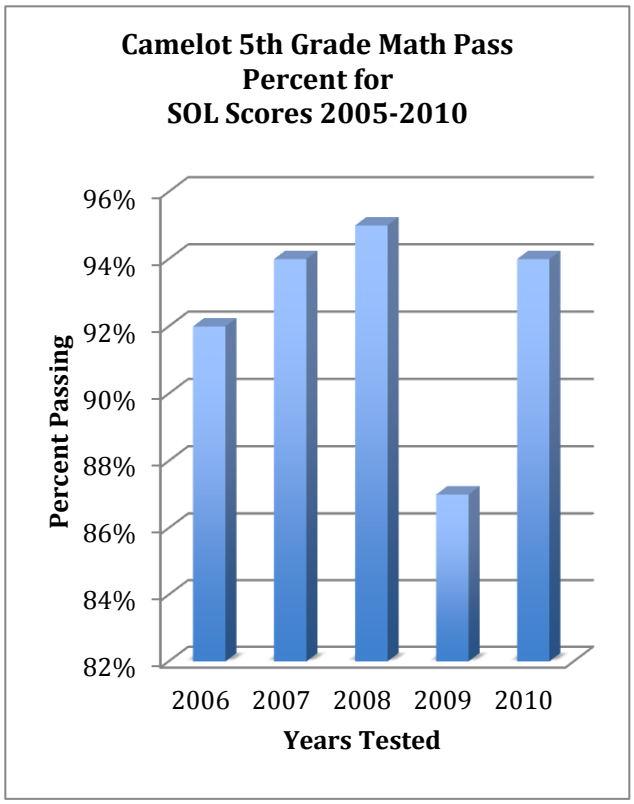




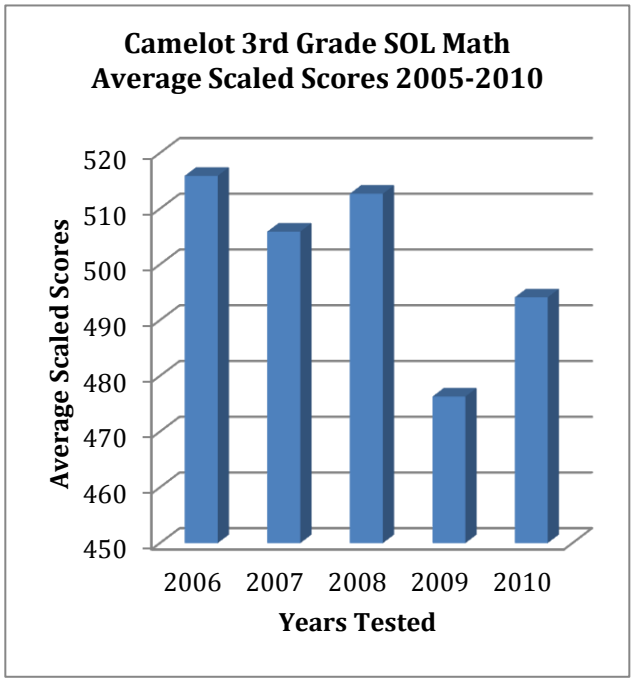
Graphs below represent **pass percentage** for 2005-2010 math SOL scores for grades 3, 4, & 5.



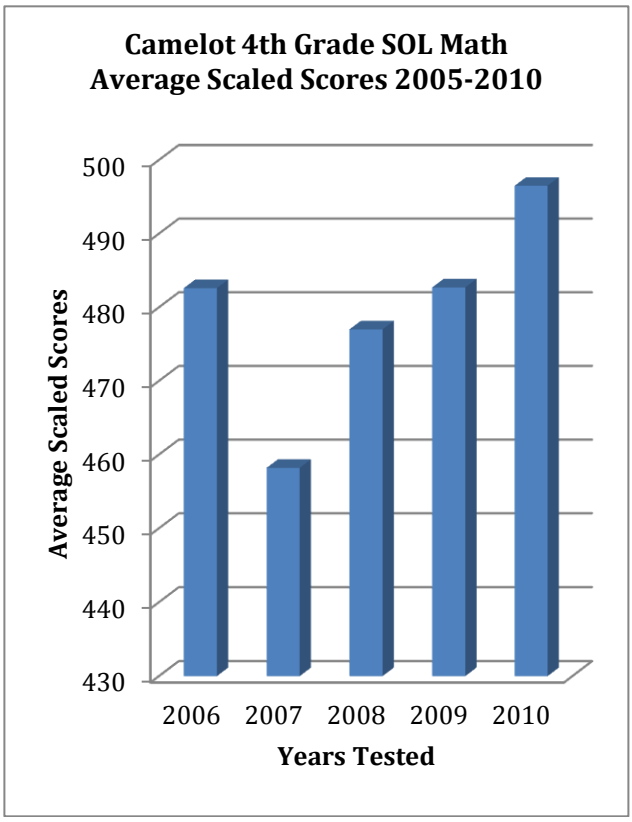


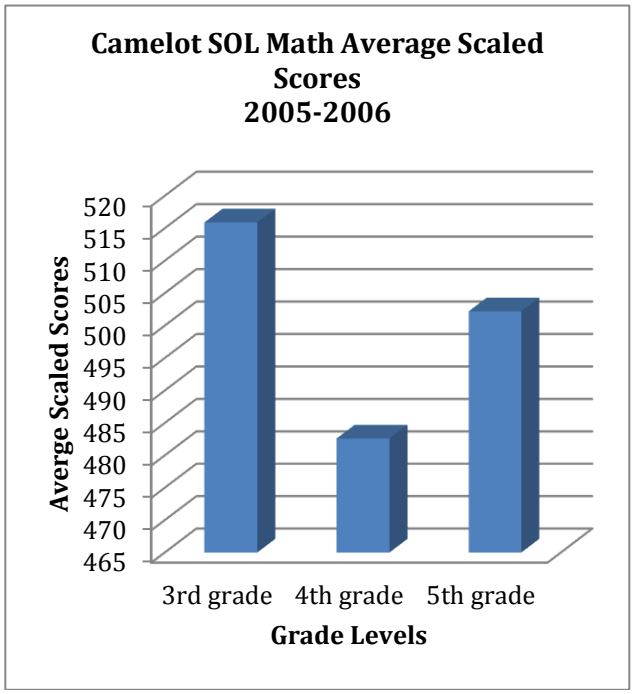


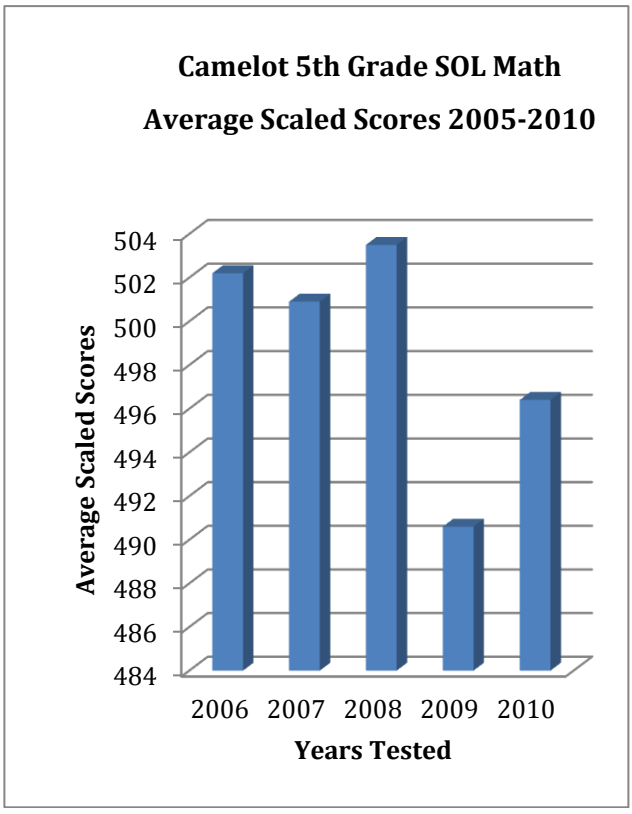
Graphs below represent **average scaled scores** for 2005-2010 math SOL scores for grades 3, 4, & 5.

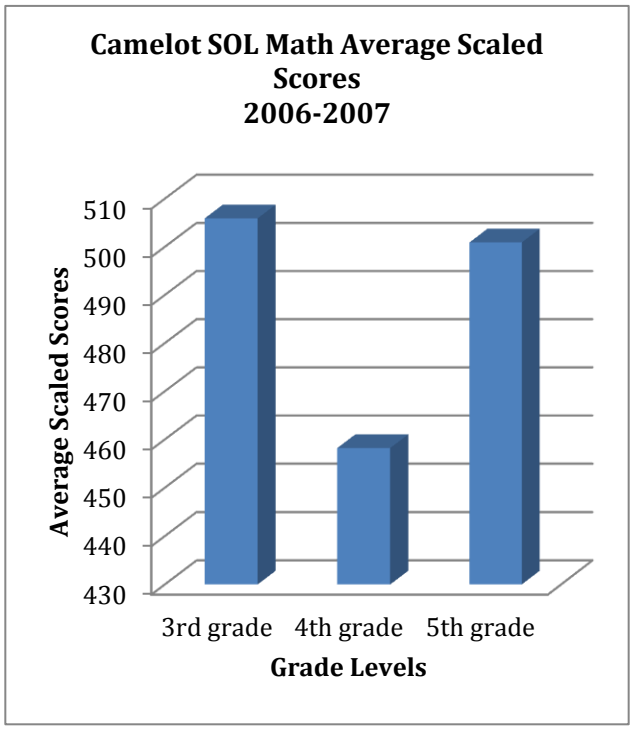


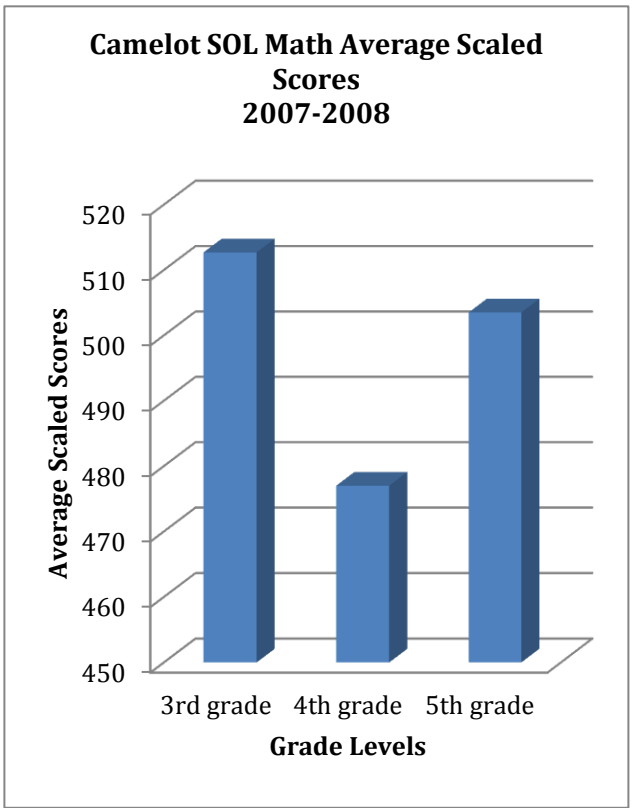
Graphs below represent average scaled scores for grades 3, 4, & 5
for years **2005-2006** through **2009-2010**

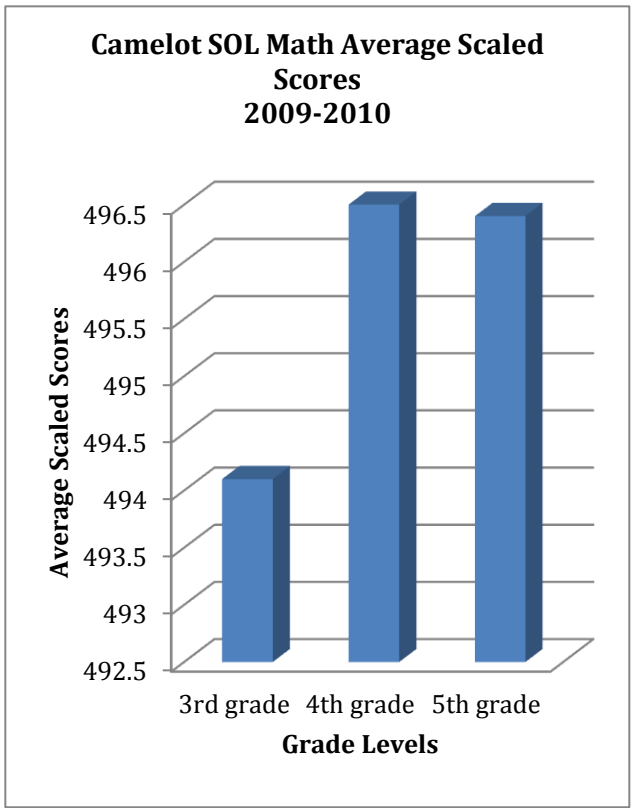


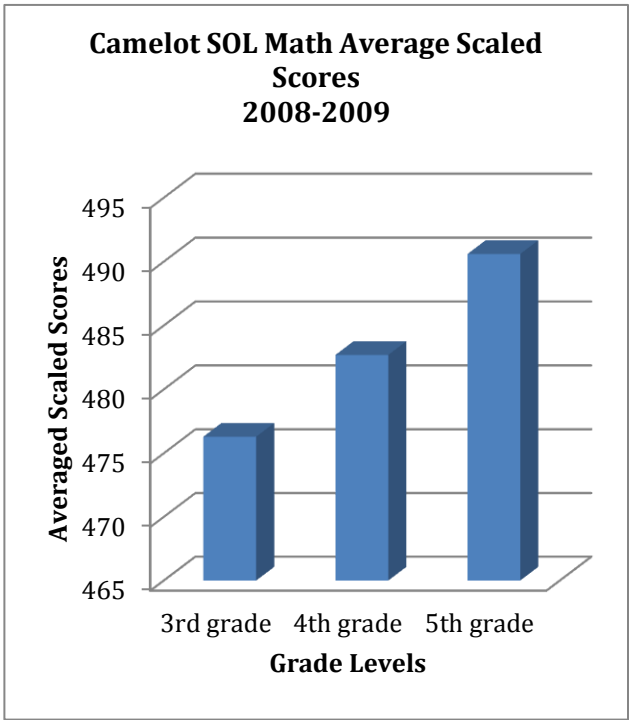












Under the 2001 NCLB Act, the AYP for all schools must be 100% of all students passing English & math by the academic year 2013-2014.

	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010
Eng.	61.0	65.0	69.0	73.0	77.0	81.0	85.0
Math	59.0	63.0	67.0	71.0	75.0	79.0	83.0

Math 3rd Grade SOL Scores 1998-2010

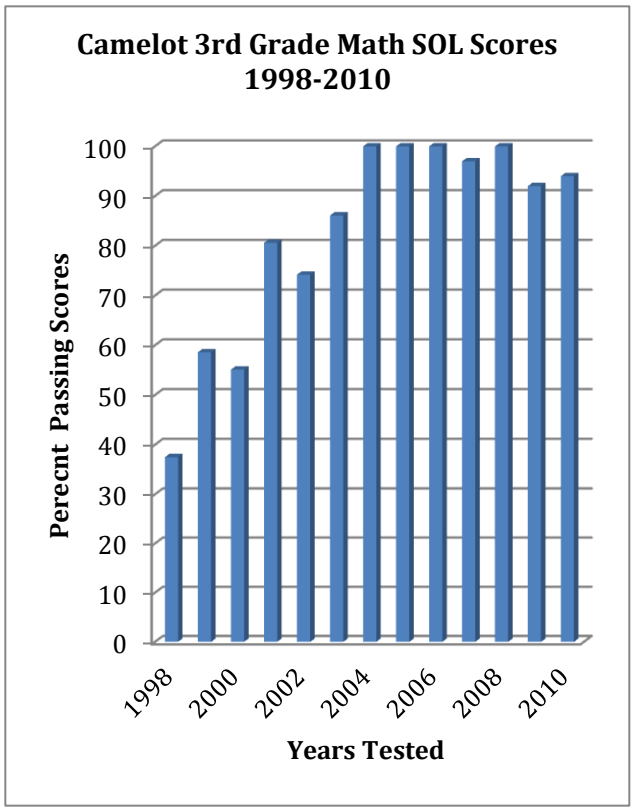
1998	37.5
1999	58.6
2000	55.1
2001	80.6
2002	74.2

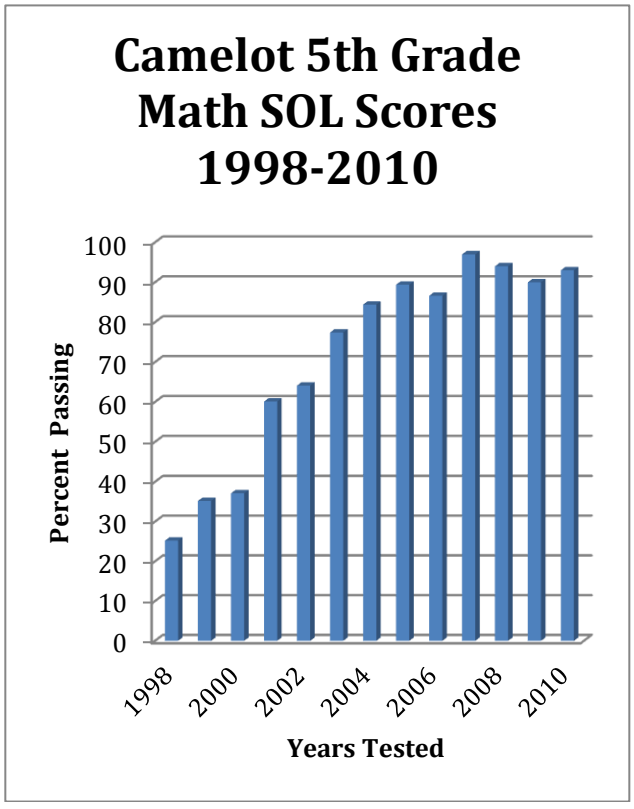
2003	86.1
2004	100
2005	100
2006	100
2007	97
2008	100
2009	92
2010	94

Math 5th Grade SOL Scores 1998-2010

1998	25.2
1999	35.2
2000	37.1
2001	60.1
2002	64.1
2003	77.4
2004	84.4
2005	89.4
2006	86.6
2007	97
2008	94
2009	90
2010	93

3rd & 5th Grade Math SOL Scores from 1998 through 2010





V. CONCLUSION

In conclusion, the analyses of the Math Sprints and SOL scores determined that gains in the benchmark scores resulted from the series of math sprint competitions used as motivators before benchmark assessment and SOL testing increased mean test scores for 3rd, 4th, and 5th grade students during the 2005-2010 school years. Comparison of the 2008 SOL math scores in grades 3 and 5 were shown to be consistent with the SOL scores for grade 4 in testing years 2005-2010. The overall growth in math SOL scores from 1998 – 2010 results in meeting the national and state annual yearly progress and more. The growth in math SOL scores exceeded the target scores as shown in the 2001 NCLB chart.

VI. RECOMMENDATIONS FOR FUTURE RESEARCH

It is recommended that further investigation be done on the relationship of math scores between grades three, four and five for 2005 through 2010 school years. It would also be beneficial to compare the SOL scores of Treakle Elementary and Camelot Elementary School for the same school years, since Treakle Elementary School recently began to use the math sprint strategies. Furthermore, a comparison of Camelot Elementary to the other Title I schools in Chesapeake Virginia would assist in providing the validity of the SOL scores at Camelot Elementary.

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