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Summer Learning Loss for Maine Public School Elementary Students

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EXECUTIVE SUMMARY

The goal of this research was to determine if there are statistically significant differences in learning between different categories of students apart from the influences of school. The foundational assumption is that student academic achievement is a product of both in-school and out-of-school factors. While there are many breaks from schooling during the calendar year, the largest by far is the summer recess. This study examined student achievement data measured at the end of one school year and then again at the beginning of the next school year. The study took advantage of the natural experiment that arose when the State of Maine changed from assessing students' progress toward meeting the standards of the MLR from the spring administered MEA to the fall administered NECAP.

A preliminary analysis revealed that while the MEA and NECAP tests were comparable, they did not yield equivalent test score. Accordingly, a process was used to create equivalent test score calculations. Using these adjusted test scores, MEA and NECAP test scores for Maine elementary students in grades 3-8 were analyzed for both mathematics and reading. The analysis revealed: (1) there was some summer learning loss for both economically advantaged and economically disadvantaged students; (2) summer learning loss was greater for economically disadvantaged students; (3) summer learning loss was less than in other national research; (4) summer learning loss was greater in mathematic than in reading; (5) summer learning loss was greater in mathematics in the earlier grades and in reading in the later elementary grades; and (6) summer learning loss was greatest for students who had demonstrated meeting proficiency by the spring test administration.

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Introduction

The purpose of this study was to determine if Maine public school students experienced any summer learning loss, and if so, did the loss differ by academic discipline or the socio-economic status (SES) of Maine students. For purposes of this study summer learning loss was defined as lost in academic performance over the summer between school years. Student learning loss during the summer recess and its effect on student achievement has been documented in many studies, but the extent to which the findings from these studies are applicable in Maine has not been established.

Until recently it was not possible to document the effects of summer on student academic performance in Maine because Maine lacked a way to compare spring and fall learning. The present study was made possible when the Maine Department of Education, with approval from the Maine Legislature, decided to replace the Maine Educational Assessment (MEA) with the New England Common Assessment Program (NECAP). The MEAs were traditionally administered to all Maine students in grades 3-8 in the spring of each school year. The NECAPs were administered in the fall of each school year, beginning with fall 2009. Thus, this change in test administration by the Maine Department of Education (MDOE) created a natural experiment that allowed for the isolation and measure of student learning for different categories of Maine students during the summer recess of 2009. Maine Education Policy Research Institute (MEPRI) researchers used this opportunity to explore the following research question: *During the summer of 2009 did students in grades 3 through 8 have different summer learning rates in mathematics and reading and were there differences for economically disadvantaged students and economically advantaged students*?

Review of Existing Research

Many researchers have attempted to examine the differential effects of summer recess on student learning (Bruene, 1928; Cook, 1942; Stanovich, 1986; Heyns, 1978, 1987; Cooper et al., 1996; Downey et al., 2004; Alexander et al., 1997, 2001, 2007; Entwisle et al., 1997, 2001; Vales et al., 2013). The Downey, von Hippel and Broh (2004) investigation using The Early Childhood Longitudinal Study, Kindergarten Class of 1998-99 (ECLS-K) data suggested that, "…for students in a typical school, the non-school environment encourages advantaged children to pull ahead…" (p. 623). Cooper, Nye, Charlton, Lindsay, and Greathouse, in their 1996 meta-analysis of 39 studies concluded, "…middle class students appeared to gain on grade-equivalent reading recognition tests over summer, while lower class students lost on them" (p.265).

In their 1997 foundational book *Children Schools and Inequality*, Entwisle, Alexander and Olson hypothesized that resources that are necessary for children to learn are like water pouring out of a faucet. That is, "when school is in session, the faucet is turned on for all children, the resources children need for learning are available to everyone, so all children gain. When school is not in session, children whose families are poor stop gaining because for them the faucet is turned off" (p.37). While this pattern of resource access termed the "faucet theory" does not delve into the "black box" of what resources are disproportionately missing in SES disadvantaged homes and neighborhoods, it nonetheless simplifies the investigation by suggesting the general underpinnings of differential summer learning.

The impact of factors outside of school that influence student achievement begins even before a child enters school. When children enter school at age four or five they have had the equivalent of a four or five year vacation from school in which the school resource "faucet" has been turned off. During this time there are large differences in experiences that lead to large differences in student achievement. In their 2007 book *Annual Growth for All Students, Catch-Up Growth for Those Who are Behind*, Fielding, Kerr, and Rosier assert, "On the first day of kindergarten, the range between students in the bottom and top quartile midpoints is six years in reading skills and four years in math" (p. 226).

Alexander et al., (2007) hypothesized that one of the other key differences between lower and higher SES students is their starting point in first grade; the first data point of

their study. In their study, starting in the fall of their first grade the students in the high SES cohort scored on average 26.48 points higher on the California Achievement Test (CAT-R) test than did their low SES classmates. In the ECLS-K study, Ready (2010) found that children from high SES backgrounds have a sizable advantage in initial development. This difference at the start of kindergarten creates a "head-start" for the high SES cohort that the low SES students continue to lose ground each summer in spite of their gains during the academic year.

In 1978, Heyns' book *Summer Learning and the Effects of Schooling* and subsequent 1987 paper "Schooling and Cognitive Development: Is There a Season for Learning?" Heyns created a framework from which much of the modern research on summer learning over the last thirty years has been based. The importance of Heyns' work was both her investigative approach as well as her conclusions. Citing heavily the Coleman Report (1966), Heyns attempted to determine the effect that out of school influences had on individual student achievement. She reasoned that to isolate the effect that school and out-of-school factors had on a child's education, one had to control for one factor while measuring the other.

Heyns logically reasoned that a student's cognitive growth is a function of both in school and out of school factors. She wrote, "The central premise of this study is that achievement is a continuous process, whereas schooling is intermittent" (1978, p.43). She continued, "As a quasi-experimental control for the effects of education (schooling), the summer months represent a plausible interval in which to contrast patterns of learning" (1978, p.43). She contended that the summer recess is, "a temporal control for the effects of all factors linked to cognitive growth that operate year-round such as family background" (Heyns 1987, p.1156). In effect, by measuring student growth when school was not in session the Heyns study found an useful way to measure Coleman's "external divergent influences" (1966, p.20).

To measure academic achievement Heyns used the Metropolitan Achievement Test (MAT) as her academic measure. Her sample was 1,499 sixth graders and 1,460 seventh graders in the Atlanta public schools from spring of 1971 until the fall of 1972. This gave Heyns two measures of summer learning for both sixth and seventh graders – spring 1971 to fall 1971 and spring 1972 to fall 1972. By comparing student spring scores to their

subsequent fall scores Heyns measured student achievement during the summer months; a time when school factors are controlled for and thus she arrived at a measure of non-school factors. She also measured student achievement during the school year when both non-school and school factors presumably effected student achievement by measuring achievement differences using fall 1971 scores and comparing them to spring 1972 scores.

Not surprisingly her data indicated that for both low-SES children and their high-SES counterpart the most productive learning occurred while school was in session. Heyns comments on this finding, "The data clearly support the contention that schooling makes a substantial contribution to cognitive growth (p.187)." While all students learned more during the school year than during the summer break, Heyns also found that during the school year, the relative growth of students was similar regardless of SES.

Entwisle and Alexander, building on the work of Heyns, authored several studies and reports beginning in 1992 that contend that differences in achievement between high and low SES students can be largely attributed to differences during the summer vacation. In their 1992 study Entwisle and Alexander argued that, "The seasonal pattern of scores emphasizes the point that home disadvantages are compensated for in the winter because, when school is in session, poor children and better-off children perform at almost the same level." They continue, "It is mainly when school is not in session that consistent losses occur for poorer children" (1992, p. 82). For students who come from low SES families, time away from school appears to be the great cognitive divider.

Building on their earlier work Alexander, Entwisle and Olson (2007) quantified the cumulative effects that differences in non-school time have on children. They again used the Beginning School Study (BSS) that began in 1982 and tracked Baltimore elementary school children's progress through their schooling using the reading sub-test of the California Achievement Test (CAT-R) during 11 different testing periods. For the BSS cohort, student progress tracking began in the fall of first grade and continued to grade five. In their study Alexander et al., reviewed the data from 787 students including 397 children categorized as low SES, 204 children classified as middle SES and 186 children classified as high SES.

The results from the study revealed that from grade one through grade five, students of low SES improved over the five winters an average of 191.30 points on the CAT-

R. Their middle SES cohort improved about 19 points more than their low SES classmates (210.19). The high SES cohort improved only 186.11 points or 5.19 points *less* than the low SES cohort. Thus looking at the effect that school had on these children, while middle SES students did much better than both groups, children from low SES families did somewhat *better* than those students from high SES families during the first few years of elementary school.

While the low SES student cohort did slightly better than the high SES student cohort during the first five years of schooling during the school year, they had significantly less growth during the time that school was not in session. During the summer recess, students from the high SES group gained 46.58 points as measured by the CAT-R. This gain occurred over four summers when school was not in session and represents growth greater than the one-year average growth for any group during the study. In contrast, children in the low SES group had a summer regression of 1.90 points. This difference of 48.48 points on the CAT-R is substantial and represents about two thirds of the difference between CAT-R scores for high and low SES groups. Differences between the two groups during the school instructional time were nearly non-existent. According to the BSS data, the majority (two thirds) of achievement differences between high and low SES groups at the end of fifth grade were attributed to differences in summer learning.

Another set of data that provides rich information about children's entry into public education is the Early Childhood Longitudinal Study – Kindergarten (ECLS-K). The data in this study came from children around the country who were educated in public and private schools, attended full and half day kindergarten and were from diverse cultural, ethnic, and socioeconomic backgrounds. Taken from a sample of over 13,000 children across the United States, the advantage of this data over the BSS data is that it represents a greater geographic and socioeconomic cross-section for study.

Information from the ECLS-K data set have been analyzed by several researchers in order to measure the effect of summer on student learning during the early elementary grades. Ready (2010), used the ECLS-K data to quantify student learning both during the school year as well as during the summer. To more accurately measure the effects that school had on a student's learning he adjusted the data to look at groups of students from different SES with comparable absenteeism during the school year. In his study Ready

found that low SES children learn more during their first two years of school than their high SES classmates. He also concluded that while students of average SES stay at about the same cognitive level during the summer recess, children of high SES show gains while children of low SES show literacy skill decreases. This finding supports the premise that achievement differences between low-SES children and high-SES children are not a function of what happens in school.

In summary, the national research literature on summer learning reveals that, in many cases, some student experience greater summer learning loss than other students, and that most often it is economically disadvantaged students who suffer the greatest summer learning loss. Given these national research findings, the question becomes, Are they applicable in Maine? Do Maine students experience summer learning lost, and if so, how much? And does the amount of loss vary depending upon the academic discipline, socio-economic status, gender or other student characteristics? The goal of this study was to answer these questions.

Methodology

The primary research design used in this study was an ex-post facto design. That is to say, achievement scores on two statewide assessments administered in 2009 were analyzed by discipline (mathematics and reading) and selected student characteristics. The study compared a student's MEA score in the spring with that same child's NECAP score in the fall and thus was a within subjects analysis using a repeated measures independent variable analysis. The "treatment" in this study was the summer recess of 2009 that created a situation in which in-school learning factors were controlled for and therefore out of school learning factors were the sole agents acting on student academic achievement.

The sample used in this study included all Maine students who took the end of year MEA assessment in the spring of 2009 and the beginning of year NECAP assessment in the fall of 2009. In accordance with Maine State statute, "Each school administrative unit and each student enrolled in a school covered by this rule shall participate in the Maine Education Assessment (MEA) in grades 4, 8 (Chapter 127 § 4.1)." Table 1 on the next page reports the sub-samples examined in this study. In the spring of 2009 the 70,497 students who were enrolled in grades three through seven were required to take the MEA. In the

following fall 70,622 were enrolled in grades four through eight (Table 1). From this data set, students who did not take either of the two assessments, students who were retained or skipped a grade, students who moved in or out of the state and students who took the alternative Personalized Alternative Assessment Portfolio (PAAP) were excluded from the study sample.

Table 1: Study Samples

School Year	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7
2008-09	13,782	13,822	14,146	14,272	14,475
School Year	**Grade 4**	**Grade 5**	**Grade 6**	**Grade 7**	**Grade 8**
2009-10	13,753	13,891	14,221	14,337	14,420
Difference	(29)	69	75	65	(55)

Two statewide academic assessments were used as measures of student performance. The Maine Educational Assessment (MEA) was administered to all students in grades three through eight from 1985 until 2009. The MEA was created by Measured Progress, an assessment company based in Dover, New Hampshire. Student raw scores are then scaled on an eighty point scale and cut points are made for the various achievement levels.

The second assessment, the New England Common Assessment Program (NECAP), was also created by Measured Progress, the same company that created the MEA. It was created in collaboration among the New England states of New Hampshire, Rhode Island and Vermont and was designed to measure student achievement and meet the annual student assessment requirements of NCLB.

Unlike the MEA the NECAP is administered in the fall. Like the MEA, the NECAP consists of multiple-choice, short answer and constructed response items. And like the MEA, student raw scores on the NECAP are scaled on an eighty-point scale and cut points are made for various levels of achievement.

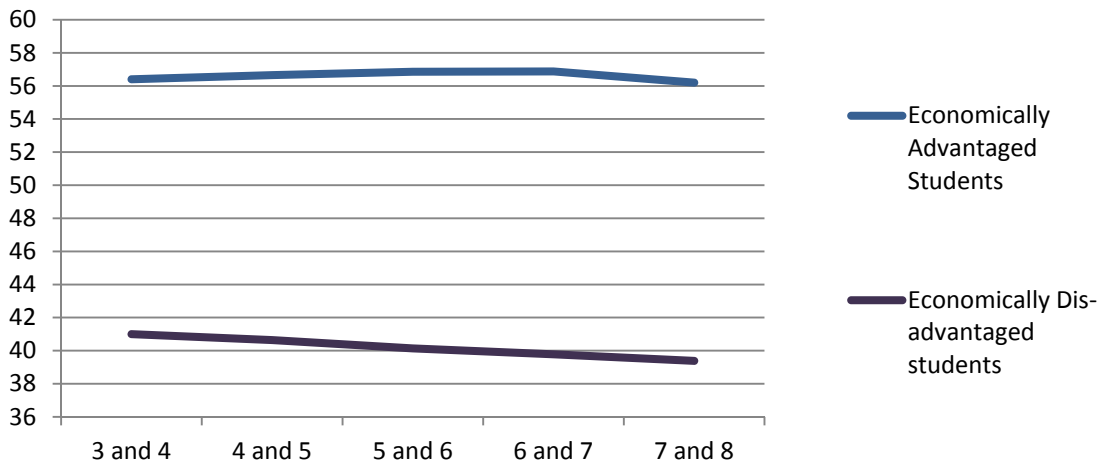
Fundamental to this study was the assumption that both assessments were designed to measure the same learning standards, as reported by the assessment developer, Measured Progress. That is, the spring 3rd grade MEA assessment was constructed to measure 3rd grade learning standards. When those children were promoted

to 4th grade the following year, they were to have taken the 4th grade NECAP assessment. The 4th grade NECAP assessment was constructed to measure the prior year's learning standards: 3rd grade learning. Therefore, during the year that Maine switched from the MEA to the NECAP, in the fall of 2009 the children in grades four through eight were assessed twice on the same learning standards; once in the spring of the prior year (School Year 2009) and then again in the fall of the current year (School Year 2010).

Findings

Descriptive and inferential statistics procedures were used in answering the central research question. Analysis of student performance on the two assessments indicated that there was a degree of summer learning loss for elementary students. Assessment scale scores for economically advantaged and disadvantaged students in reading appear in Table 1 and 2. Similar score patterns were also found for mathematics. Assessment scores are reported as the last two digits of scale scores, and a score of 42 is considered by the state as meeting proficiency.

Table 2: Longitudinal Reading Performance of Grades 3-8 Students



The data reveal several points. First, economically advantaged students score considerable above the state designated proficiency levels in both mathematics and reading, and these students consistently score above proficiency. Economically disadvantaged students, on-

the-other-hand, score consistently below the state defined level of Meets Proficiency. Second, the general pattern for economically advantaged students is that taken as a whole group, there appears to be little summer learning loss, with the amount of summer learning loss being somewhat higher for economically disadvantaged students and slightly more in the upper elementary grades. Third, it appears when examined as a whole group, Maine schools are not experiencing success in narrowing the achievement gap between economically advantaged and economically disadvantaged students. The gap in performance remains fairly unchanged between grades 3 and 8 for Maine students.

Further analysis of the assessment data revealed that a more nuanced picture of the impacts of the summer months on students may be seen by examining students' level of proficiency. Tables 3-6 report the mathematics performance of students in grades 3-7 for each of the four state designated proficiency levels. The performance is reported in terms of percentile changes from spring to fall of 2009. The four proficiency levels are: (1) substantially below proficient; (2) partially proficient; (3) proficient; and (4) proficient with distinction.

The mathematics assessment data reveals an interesting phenomena. For those students below proficiency (Levels 1 and 2), the percentile changes are positive from spring to fall. Students at these levels showed some improvement in performance. And for both Level 1 and level 2, the improvements were greater for economically advantaged students.

However, the reverse was the case for the students that were at or above proficiency. Performance for Level 3 (proficient) and Level 4 (proficient with distinction) students decreased from spring to fall. The percentile changes were all negative (except for one) for both levels and all grades. Performance of students who were proficient in the spring was slightly lower after the summer. In addition, the performance of economically disadvantaged decreased considerably more than the performance of the economically advantaged students.

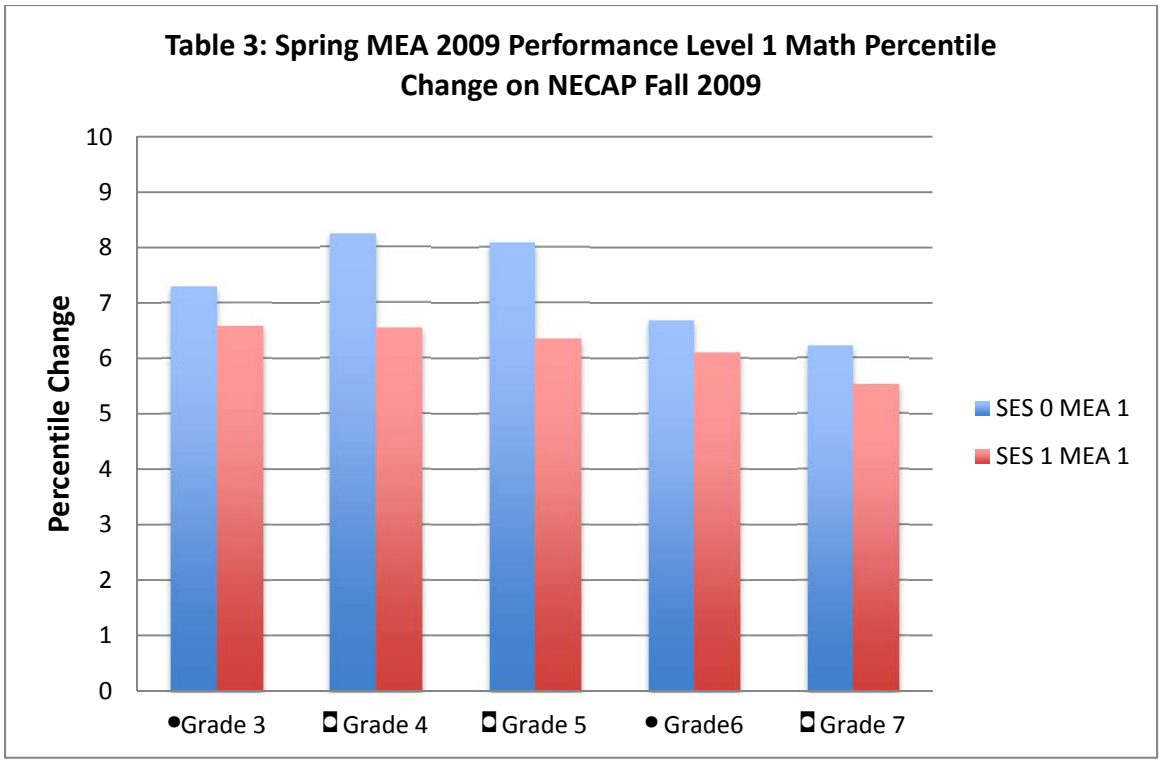


Table 3: Spring MEA 2009 Performance Level 1 Math Percentile Change on NECAP Fall 2009
Percentile Change
10
9
8
7
6
5
4
3
2
1
0
Grade 3
Grade 4
Grade 5
Grade6
Grade 7
SES 0 MEA 1
SES 1 MEA 1

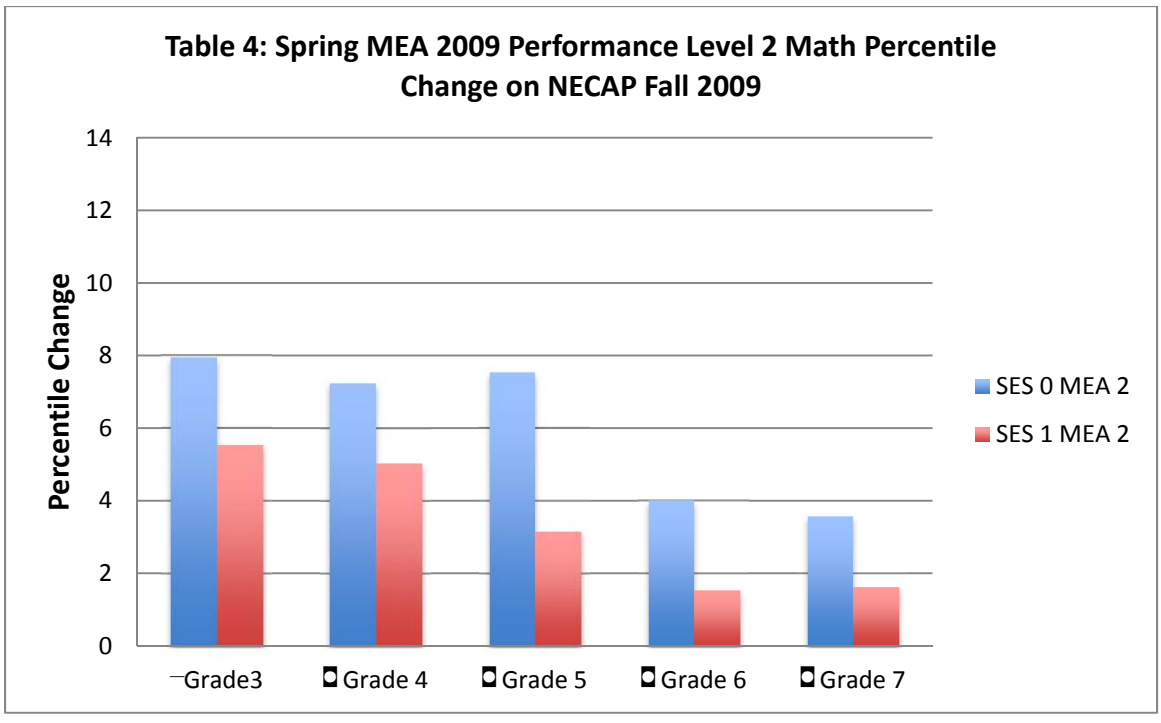
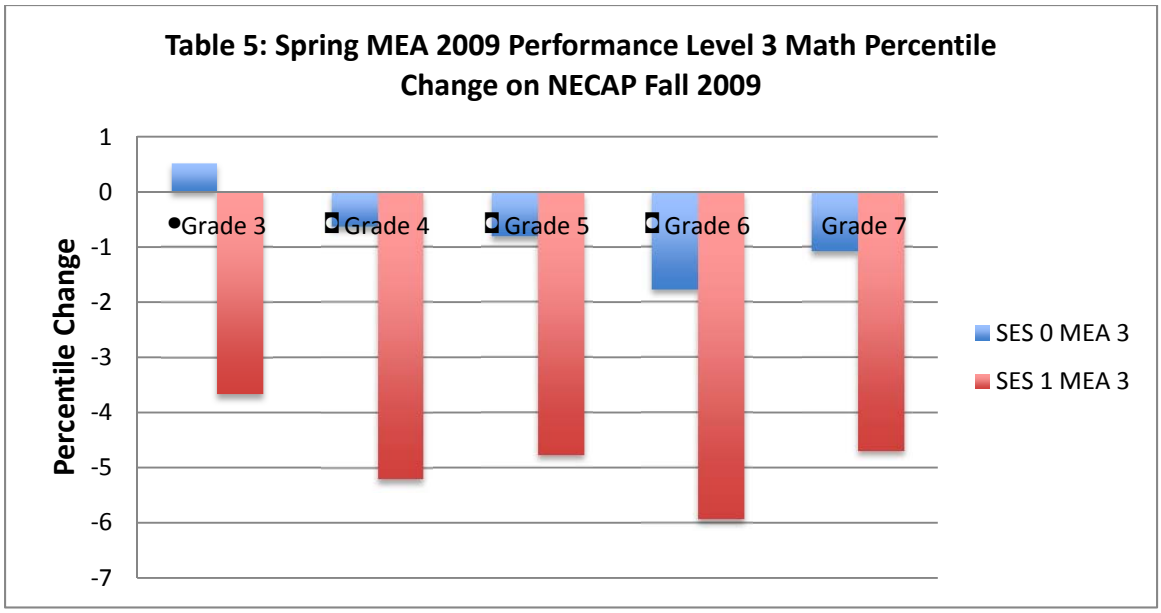
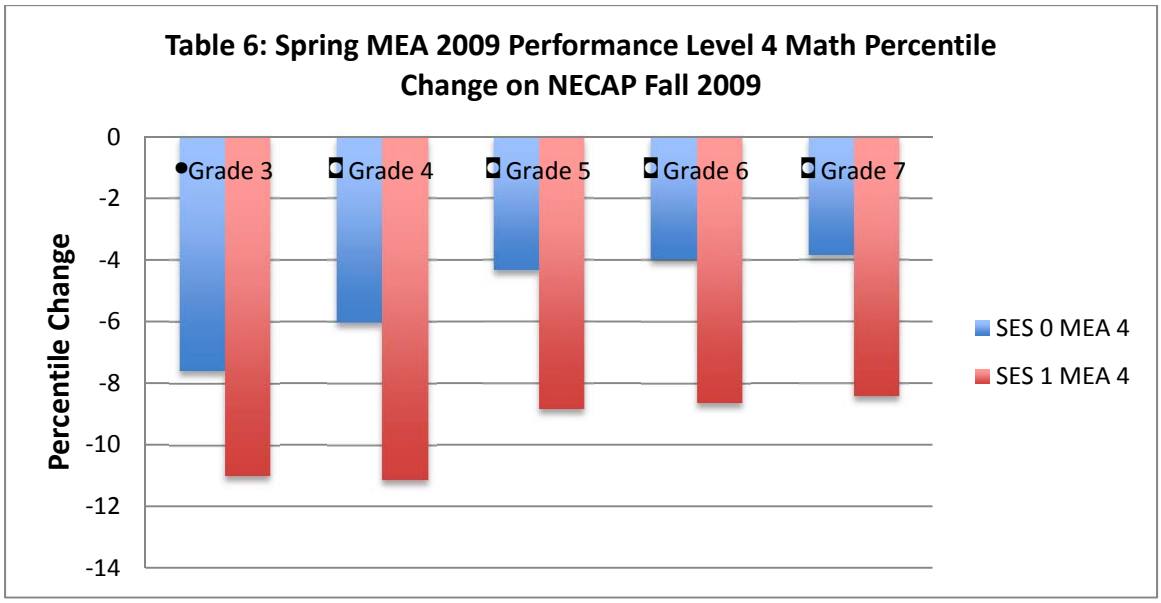


Table 4: Spring MEA 2009 Performance Level 2 Math Percentile Change on NECAP Fall 2009
Percentile Change
14
12
10
8
6
4
2
0
Grade3
Grade 4
Grade 5
Grade 6
Grade 7
SES 0 MEA 2
SES 1 MEA 2





The same pattern of performance was found for Reading. Tables 7-10 report the percentile changes for each of the four levels of proficiency and for grades 3-7.
And the difference in performance of economically advantaged and economically disadvantaged students is even more pronounced than for mathematics. Economically disadvantaged students exhibiting Level 3 and Level 4 proficiency lost the most in terms of learning over the summer months.

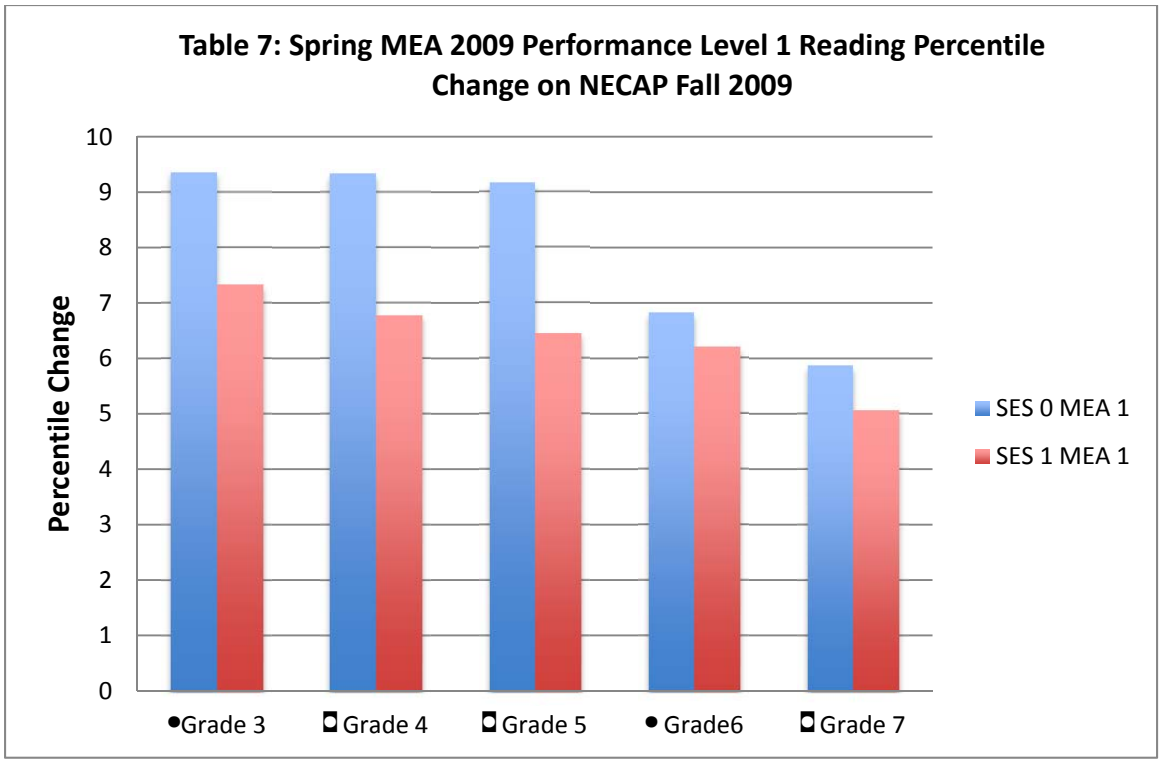


Table 7: Spring MEA 2009 Performance Level 1 Reading Percentile Change on NECAP Fall 2009
Percentile Change
10
9
8
7
6
5
4
3
2
1
0
Grade 3
Grade 4
Grade 5
Grade6
Grade 7
SES 0 MEA 1
SES 1 MEA 1

.

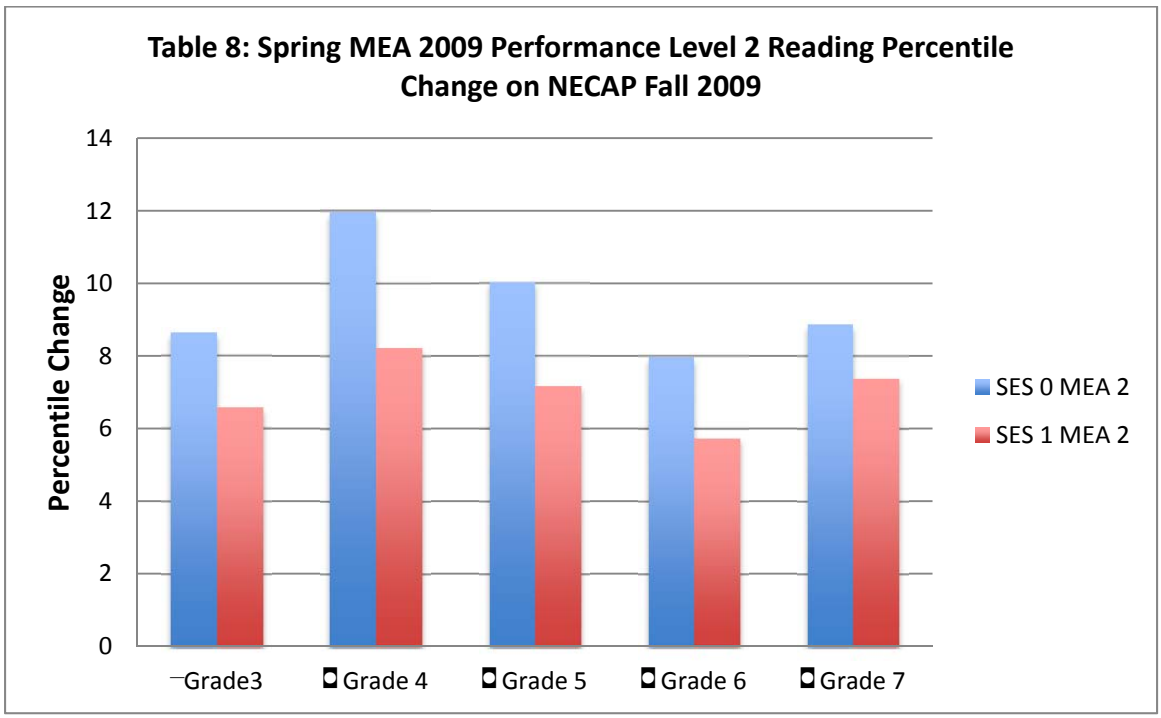
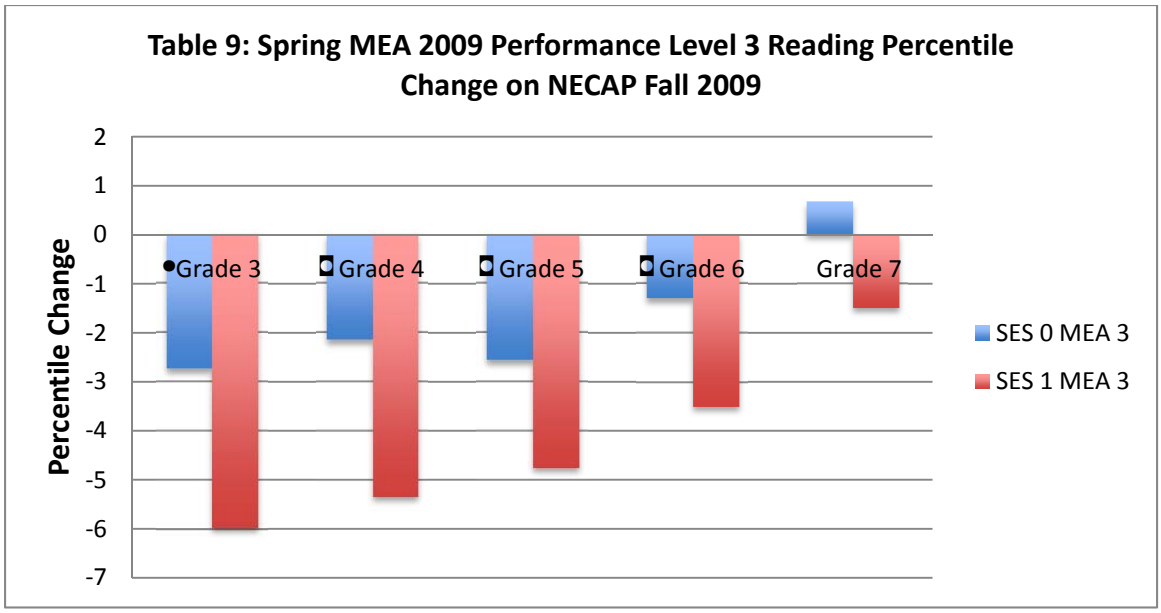
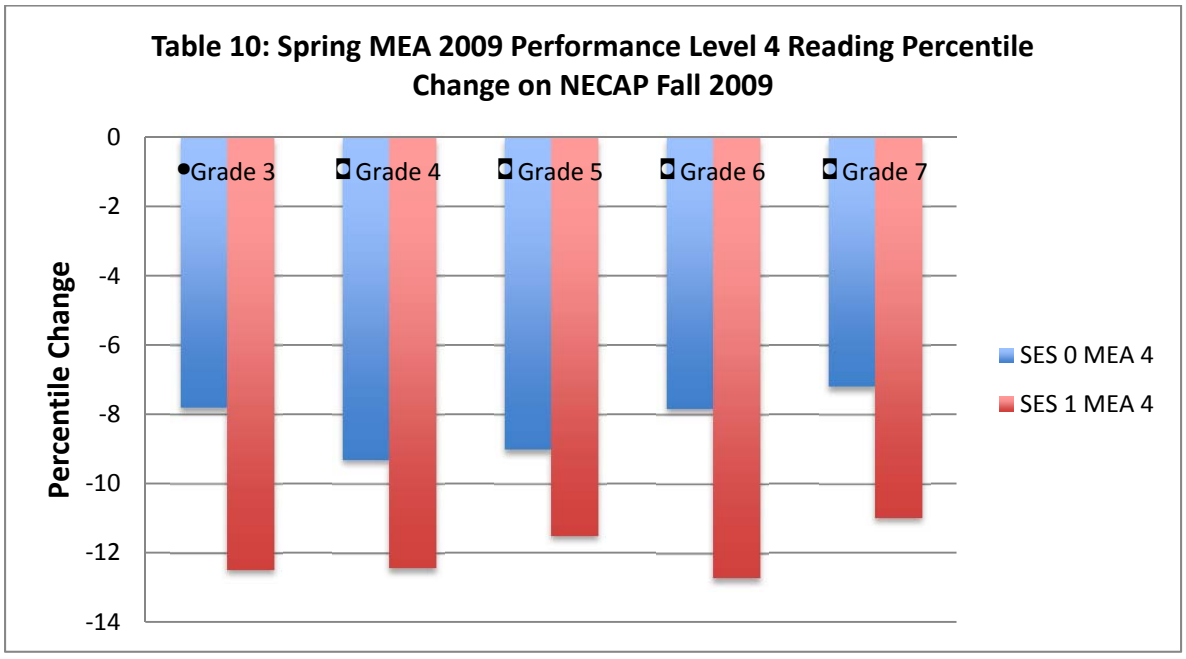


Table 8: Spring MEA 2009 Performance Level 2 Reading Percentile Change on NECAP Fall 2009
Percentile Change
14
12
10
8
6
4
2
0
Grade3
Grade 4
Grade 5
Grade 6
Grade 7
SES 0 MEA 2
SES 1 MEA 2





Discussion

The core research question is study was designed to answer was:

During the summer of 2009 did students in grades 3 through 8 have different summer learning rates in mathematics and reading and were there differences for economically disadvantaged students and economically advantaged students?

The data suggest that the answer to this question is somewhat complex. There was some summer learning loss, but overall, the loss was less than expected given the national

research. This could be the case for several reasons. First, it may in fact be the case that Maine elementary age students experience less summer learning loss than students in more urban settings. Second, the actual learning loss may be greater but that the statewide assessments, designed primarily for accountability purposes, are not precise enough in measuring changes. Third, the two assessments, although designed to be equivalent, may not be equivalent. In fact, in exploring this equivalency we did in fact find than scale scores were not always equivalent on both tests. Thus, the secondary analysis was conducted using percentile scores. These do not require the assessments to be equivalent, but they also carry with them the reality that percentile scores are essentially ranks and ranks do not have equal distance between percentile scores.

An additional finding was that while the degree of summer learning loss does not differ substantially by grade level, it does differ by proficiency levels. Students who were less than proficient in spring 2009 scored higher on the fall assessment. But students who were at or above proficiency in the spring of 2009 slipped in performance by the fall of 2009. Again, part of this phenomenon may be explained by the problems with the assessments, but not all of it. Thus, it is unclear why the performance varies depending upon proficiency levels. Additionally, it is unclear why the proficient level of performance differs depending upon the economic status of the students. Clearly, additional research and analysis is needed in this area.

A final observation from the findings in this study is that the achievement gap between economically advantaged and economically disadvantaged students remains fairly stable over grades 3-8. The gap is stable over the course of the school year and through the summer months. This suggests the need for some major changes within schools over the course of the school year, and further, it suggests the potential importance of the implementation of some effective summer school programming.

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