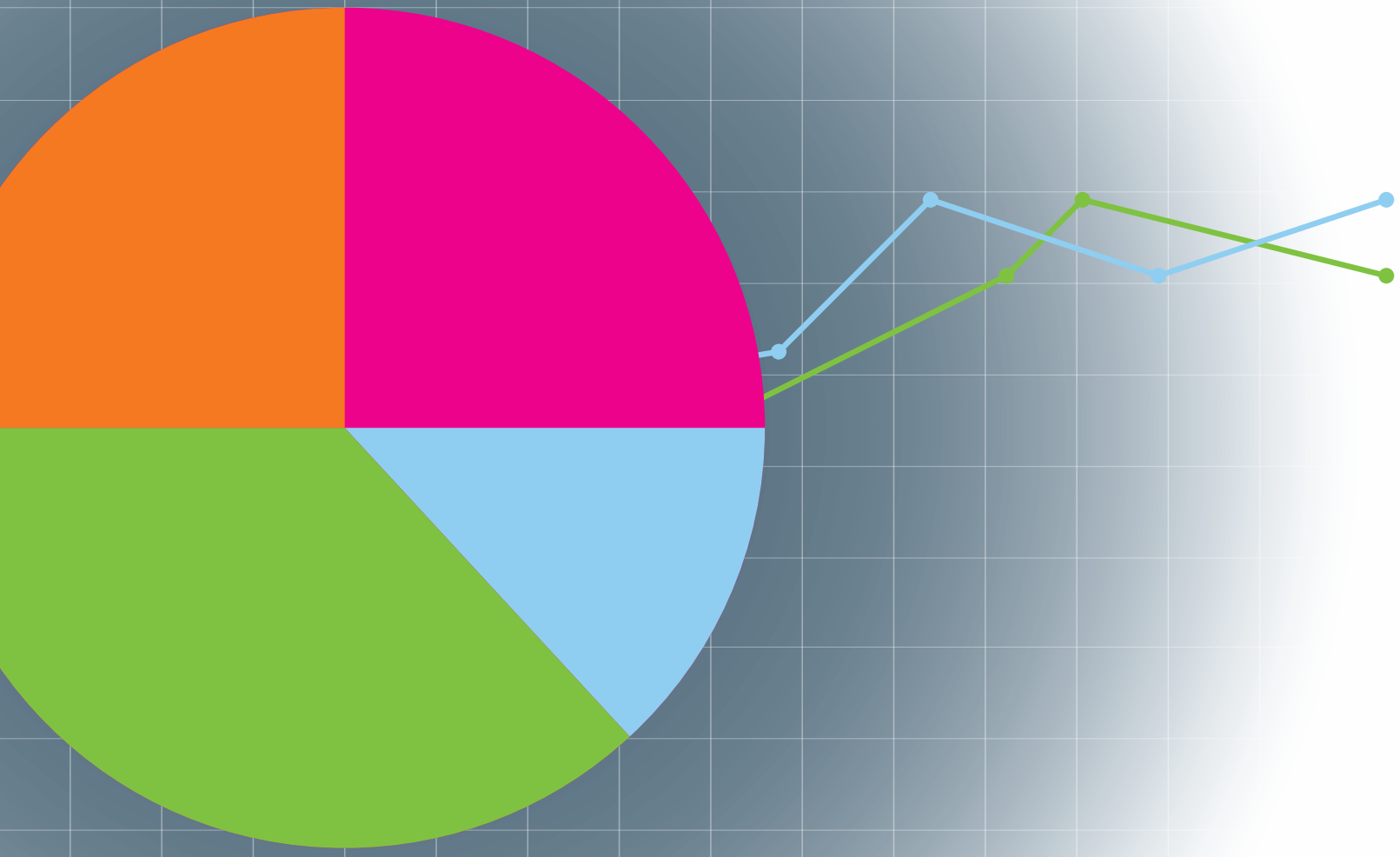
21st Century Community Learning Centers 2014

A Quasi-Experimental Investigation of Program Impacts on Student Achievement in Mathematics and Reading/Language Arts



West Virginia Department of EDUCATION
Office of Research

21st Century Community Learning Centers 2014

A Quasi-Experimental Investigation of Program Impacts on Student Achievement in Mathematics and Reading/Language Arts

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This research study was reviewed and approved by the West Virginia Department of Education Institutional Review Board (IRB-CIS-002). Should you desire additional details about this study's approval status, you may contact the WVDE IRB chairperson, Patricia Cahape Hammer (phammer@k12.wv.us).

Executive Summary

This report summarizes an evaluation study investigating the effects of participation in the 21st Century Community Learning Centers (CCLC) program on student achievement in mathematics and reading/language arts, for the cohort of students who participated during the 2013–2014 school year. The report is a supplement to the Office of Assessment, Accountability, and Research's annual evaluation of the CCLC program.

Methods

We conducted a quasi-experimental examination of within- and between-group differences in student assessment outcomes in both mathematics and reading/language arts. The study addressed 10 research questions (RQs). The treatment group consisted of students who participated in at least 30 days of CCLC during the 2013–2014 school year. A control group consisting of demographically similar students who did not participate in CCLC was selected using propensity score matching (PSM).

Findings

Research Questions 1 and 2 (RQ1 and RQ2)

RQ1 and RQ2 sought to determine if CCLC and non-CCLC students' year-to-year gains in mathematics and reading/language arts were significantly different. These questions were addressed using a series of independent samples *t* tests. The analyses used group membership as the independent variable and mean WESTEST 2 scale score gains from 2012–2013 to 2013–2014 in mathematics and reading/language arts as the outcome variables. Results showed no significant differences between these groups in either mathematics or reading/language arts scale score gains.

Research Questions 3 and 4 (RQ3 and RQ4)

RQ3 and RQ4 sought to determine if CCLC and non-CCLC students' 2013–2014 end-of-year scores in mathematics and reading/language arts were significantly different. These questions were addressed using a series of independent samples *t* tests. The analyses used group membership as the independent variable and mean WESTEST 2 scale score from the 2013–2014 school year in mathematics and reading/language arts as the outcome variables. Results showed no significant differences between these groups in either mathematics or reading/language arts scale scores.

Research Questions 5 and 6 (RQ5 and RQ6)

RQ5 and RQ6 sought to determine if CCLC students experienced statistically significant changes in performance from 2012–2013 to 2013–2014. These questions were addressed using a series of paired *t* tests. The analyses used time as the independent variable and CCLC students' mean 2012–2013 and 2013–2014 WESTEST 2 scale scores in mathematics and reading/language arts as the outcome variables. CCLC students exhibited statistically significant mathematics gains in Grades 4, 5, 6, 7, 9 and 11; the students also exhibited statistically significant gains in reading/language arts in Grades 4, 5, 6, 7, 8, and 10.

Research Questions 7 and 8 (RQ7 and RQ8)

RQ7 and RQ8 sought to determine if non-CCLC students experienced statistically significant changes in performance from 2012–2013 to 2013–2014. These questions were addressed using a series of paired *t* tests. The analyses used time as the independent variable and non-CCLC students' mean 2012–2013 and 2013–2014 WESTEST 2 scale scores in mathematics and reading/language arts as the outcome variables. Similar to CCLC students, non-CCLC students exhibited statistically significant mathematics gains in several grades (i.e., Grades 4, 5, 6, 7, 8, 9 and 11), and reading/language arts gains in Grades 4, 5, 6, and 7.

Research Questions 9 and 10 (RQ9 and RQ10)

RQ9 and RQ10 sought to determine if student achievement over time differed significantly between groups. These questions were addressed using repeated measures analysis of variance (RM ANOVA) tests. The analyses used two predictor variables, group membership and time, as independent variables predicting the outcome of WESTEST 2 performance in mathematics and reading/language arts. We looked for a significant interaction effect to indicate one group scored differently from the other over time. We found significant main effects for time, but there were no statistically significant interaction effects between groups and time. However, in reading/language arts, the interaction effects approached significance in Grades 8 and 10. In both cases, CCLC students outperformed the non-CCLC comparison group.

Conclusions

There were no statistically significant differences between groups. When examining within-group differences, both groups exhibited multiple statistically significant changes in mathematics and reading/language arts performance. However, only in the case of Grades 8 and 10 reading/language arts did the results approach statistical significance in the predicted direction (i.e., with CCLC students outperforming non-CCLC students).

Limitations of study

This study had several important limitations that may limit our ability to draw definitive conclusions about the effectiveness of the CCLC program in producing academic achievement gains. First, this study only encompassed a single year of CCLC intervention. It is likely that academic achievement gains on standardized assessments would not be realized until more time has elapsed. Second, we were able to examine only Grades 4–11 in the study due to a lack of available achievement data for Grades K–3. This is a significant limitation when one considers the fact that approximately 50% of the 2013–2014 CCLC cohort was enrolled in these grades.

Recommendations

To the extent possible, we will attempt to prepare next year's edition of this report at the outset of the 2014–2015 school year, a time when the data are more actionable for CCLC program staff.

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Introduction

This year, like last year, the West Virginia Department of Education Office of Assessment and Research is providing two separate evaluation reports for the 21st Century Community Learning Centers Program (CCLC). The first is a descriptive evaluation of the program's implementation and key performance measures. This report, the second, employs a quasi-experimental design to evaluate the impact of 21st CCLC program participation on student academic achievement, using reliable quantitative academic assessments of participating students who were in the program in 2013.

The explanatory variable for this study was defined as participation in the CCLC program for at least 30 days. Students meeting this criterion were initially identified by program directors. The Office of Research then conducted a survey of teachers attributed to each of the students. The outcome variables used in this study were derived from the West Virginia Educational Standards Test 2 (WESTEST 2). WESTEST 2 was a summative test consisting of four content areas (mathematics, reading/language arts, science, and social studies); all students in Grades 3–11 took the WESTEST 2. Until the 2014–2015 school year, the West Virginia Department of Education administered WESTEST 2 annually.[1] This study examined academic performance at the conclusion of the 2013–2014 school year and academic achievement gains realized from 2012–2013 to 2013–2014 in both mathematics and reading/language arts for Grades 4–11[2]. The treatment group includes students participating in the CCLC program and the control group includes nonparticipating matched students.

To examine the impact of CCLC program participation on 1-year academic gains, the following research questions were posed:

RQ1 Do students participating in the 2013–2014 CCLC program exhibit significantly higher mean scale score gains in WESTEST 2 mathematics in each grade, 4–11, than nonparticipating students in each of these grades from 2013 to 2014?

RQ2 Do students participating in the 2013–2014 CCLC program exhibit significantly higher mean scale score gains in WESTEST 2 reading/language arts in each grade, 4–11, than nonparticipating students in each of these grades from 2013 to 2014?

To examine the impact of CCLC program participation on end-of-year academic achievement, the following research questions were posed.

[1] In the 2014-2015 school year, the WVDE adopted a new general summative assessment based on the Next Generation content standards and objectives.

[2] Grades K-2 are excluded due to the lack of a common outcome metric for these students. Grade 3 is excluded because the evaluation design required controlling for prior academic achievement.

RQ3 Do students participating in the 2013–2014 CCLC program exhibit significantly higher mean scale scores in WESTEST 2 mathematics in 2014 in each grade, 4–11, than nonparticipating students in each of these grades?

RQ4 Do students participating in the 2013–2014 CCLC exhibit significantly higher mean scale scores in WESTEST 2 reading/language arts in 2014 in each grade, 4–11, than nonparticipating students in these grades?

We also examined the year-to-year changes in academic achievement for each group independently. The following research questions were posed.

RQ5 Do students participating in the CCLC program exhibit significant change in mean scale scores in WESTEST 2 mathematics by grade over time?

RQ6 Do students participating in the CCLC program exhibit significant change in mean scale scores in WESTEST 2 reading/language arts by grade over time?

RQ7 Do students not participating in the CCLC program exhibit significant change in mean scale scores in WESTEST 2 mathematics by grade over time?

RQ8 Do students not participating in the CCLC program exhibit significant change in mean scale scores in WESTEST 2 reading/language arts by grade over time?

Finally, we sought to determine if gains experienced by CCLC students were significantly different from those gains experienced by non-CCLC students. The following research questions were posed.

RQ9 Do students participating in CCLC exhibit significantly higher mean scale scores in WESTEST 2 mathematics than the nonparticipating students by grade over time?

RQ10 Do students participating in CCLC exhibit significantly higher mean scale scores in WESTEST 2 reading/language arts than the nonparticipating students by grade over time?

Methods

We conducted a quasi-experimental examination of existing student assessment data in mathematics and reading/language arts for students who participated in CCLC during the 2013–2014 school year. The treatment group consisted of students who participated in at least 30 days of CCLC intervention for whom teacher surveys were received. The comparison group was matched using propensity score matching using a variety of demographic and performance covariates. Analyses were conducted to examine both within- and between-group differences in student achievement.

Population Characteristics

The West Virginia Department of Education provided CCLC students' regular classroom teachers an online survey to be completed about each student who had participated in the program for at least 30 days during the 2013–2014 school year. Among other items, the

teacher survey asked educators to identify students who met minimum criteria for CCLC program participation. To be selected for inclusion in the treatment group for this study, students had to be enrolled in an assessed grade level during this school year and have attended the CCLC program for 30 days or more. A matched comparison group was selected from the population of all non-CCLC students.

Sampling Procedures

The criteria for inclusion in this study included having (a) a valid unique student identifier, (b) grade level assessment scale scores for the last 2 years in both mathematics and reading/language arts, (c) having a complete set of demographic covariate variables to be used during matching, and (d) having attended the program for 30 or more days. From the program directors' reports, we identified 4,577 students who participated in the CCLC program for at least 30 days during the 2013–2014 school year. The Office of Research, instead of using the full list of these students opted to use a list of students for whom teacher survey information had been received including a valid unique student identifier—a smaller group of 2,116 students. After removing students in Grades K–3 we were left with a pool of potential students among whom, only 1,236 had test records for the 2 years needed. After removing the remainder of students who did not receive scale scores for both mathematics and reading/language arts and who were retained from one year to the next, we were left with a final sample of 899 CCLC students. This represents 20% of the initial pool of student records.

We used propensity score matching (PSM) to select a matched comparison group for each grade level. This method uses logistic regression to select a comparison group that closely matches the treatment group on a variety of observed covariates. First, a binary indicator was created to indicate whether or not each student in the state participated in CCLC during the 2013–2014 school year. Group 1 was defined as the treatment group (those students who attended 30 or more days in the CCLC program) and Group 0 was defined as the control group (those students not known to have participated in the CCLC program for 30 or more days during the 2013–2014 school year). We then specified the PSM models, which derived conditional probabilities for each student by regressing the binary group membership variable on the following covariates: (a) prior academic achievement in both mathematics and reading/language arts, (b) gender, (c) race/ethnicity, (d) free/reduced-price lunch eligibility, and (e) special education eligibility. Grade level was held constant by conducting matching independently within each grade. Thus, in this study the propensity score represented the predicted probability that a given student would attend 30 days of CCLC based on this set of preintervention covariates. Finally, we used nearest neighbor matching to select the most appropriate match for each CCLC student. Verification analyses revealed that this matching methodology identified an adequately balanced comparison group for hypothesis testing.[3]

[3] We used chi squared analyses to verify the two groups did not differ on categorical demographic variables. We used independent samples t-tests to verify the two groups did not differ on prior academic achievement in reading/language arts and mathematics.

Measures and Covariates

This study includes an examination of student achievement data. We analyzed individual students' scale scores, and gain scores in both mathematics and reading/language arts. Gain scores were operationalized as the change in student scale scores from 2012–2013 to 2013–2014. This time period was selected because the 2013–2014 school year represented the intervention year for the CCLC program. Thus, it was reasonable to expect that students who participated in CCLC during the 2013–2014 school year would experience differential gains when compared with similar students not known to have participated in CCLC.

Covariates used in this study include students' gender, race/ethnicity, special education eligibility, free/reduced-price lunch eligibility, and prior academic achievement in mathematics and reading/language arts.

Data collection methods

All data for this study were collected from two sources—the CCLC Teacher Survey and the West Virginia Educational Information System (WVEIS). CCLC Teacher Survey data were collected by the researchers as part of the annual descriptive evaluation of the 21st CCLC Program. WVEIS data were extracted from the annual testing record file collected by the West Virginia Department of Education.

Research Design

RQ1 and RQ2 were addressed using a series of independent samples *t* tests. These analyses used group membership as the independent variable and mean WESTEST 2 scale score gains from 2012–2013 to 2013–2014 in mathematics and reading/language arts as the outcome variables. Each grade level and content area combination was tested independently to estimate impact of the CCLC program. In sum, we conducted 16 tests:

1. Eight tests (one per grade for Grades 4–11) examined the impact of group membership on year-to-year WESTEST 2 mathematics gains to determine whether CCLC students (treatment) experienced greater gains than students who did not receive the treatment (control).
2. Eight tests (one per grade for Grades 4–11) examined the impact of group membership on year-to-year WESTEST 2 reading/language arts gains to determine whether CCLC students (treatment) experienced greater gains than students who did not receive the treatment (control).

RQ3 and RQ4 were addressed using a series of independent samples *t* tests. These analyses used group membership as the independent variable and mean 2013–2014 WESTEST 2 outcomes in mathematics and reading/language arts as the outcome variables. Each grade level and content area combination was tested independently to estimate impact of the CCLC program in 2013–2014. In sum, we conducted 16 tests:

3. Eight tests (one per grade for Grades 4–11) examined the impact of group membership on 2013–2014 WESTEST 2 mathematics outcomes to determine whether CCLC students (treatment) scored higher than students who did not receive the treatment (control).
4. Eight tests (one per grade for Grades 4–11) examined the impact of group membership on 2013–2014 WESTEST 2 reading/language arts outcomes to determine whether CCLC students (treatment) scored higher than students who did not receive the treatment (control).

RQ5 and RQ6 were addressed using a series of paired *t* tests. These analyses used time as the independent variable and students' mean 2012–2013 and 2013–2014 WESTEST 2 scale scores in mathematics and reading/language arts as the outcome variables. Each grade level and content area combination was tested independently. In sum, we conducted 16 tests:

5. Eight tests (one per grade for Grades 4–11) examined the impact of time on WESTEST 2 outcomes to determine whether CCLC students exhibited higher achievement in mathematics during the 2013–2014 school year when compared to their own mathematics results for the prior academic year.
6. Eight tests (one per grade for Grades 4–11) examined the impact of time on WESTEST 2 outcomes to determine whether CCLC students exhibited higher achievement in reading/language arts during the 2013–2014 school year when compared to their own reading/language arts results for the prior academic year.

RQ7 and RQ8 were addressed using a series of paired *t* tests. These analyses used time as the independent variable and mean 2012–2013 and 2013–2014 WESTEST 2 scale scores in mathematics and reading/language arts as the outcome variables. Each grade level and content area combination was tested independently. In sum, we conducted 16 tests:

7. Eight tests (one per grade for Grades 4–11) examined the impact of time on WESTEST 2 outcomes to determine whether control group students exhibited higher achievement in mathematics during the 2013–2014 school year when compared to their own mathematics results for the prior academic year.
8. Eight tests (one per grade for Grades 4–11) examined the impact of time on WESTEST 2 outcomes to determine whether control group students exhibited higher achievement in reading/language arts during the 2013–2014 school year when compared to their own reading/language arts results for the prior academic year.

RQ9 and RQ10 were addressed using repeated measures analysis of variance (RM ANOVA) tests. These analyses used two predictor variables, group membership and time, as independent variables predicting the outcome of WESTEST 2 performance in mathematics and reading language arts. In these analyses we looked for a significant interaction effect to indicate one group scored differently from the other over time. In sum we conducted 16 tests:

9. Eight tests (one per grade for Grades 4–11) examined the interaction of group and time on WESTEST 2 mathematics outcomes to determine whether students in the treatment group scored significantly higher than students in the control group over time.

10. Eight tests (one per grade for Grades 4–11) examined the interaction of group and time on WESTEST 2 reading/language arts outcomes to determine whether students in the treatment group scored significantly higher than students in the control group over time.

Results

Results are presented below by research question.

RQ1 and RQ2

Table 1 in Appendix A presents the results of independent *t* tests used to determine the statistical significance of differences in mathematics mean scale score gains between CCLC participants and nonparticipants for Grades 4–11. In no case were the observed differences statistically significant. See Figure 1 for a graphical representation of mathematics gains by group and grade level.

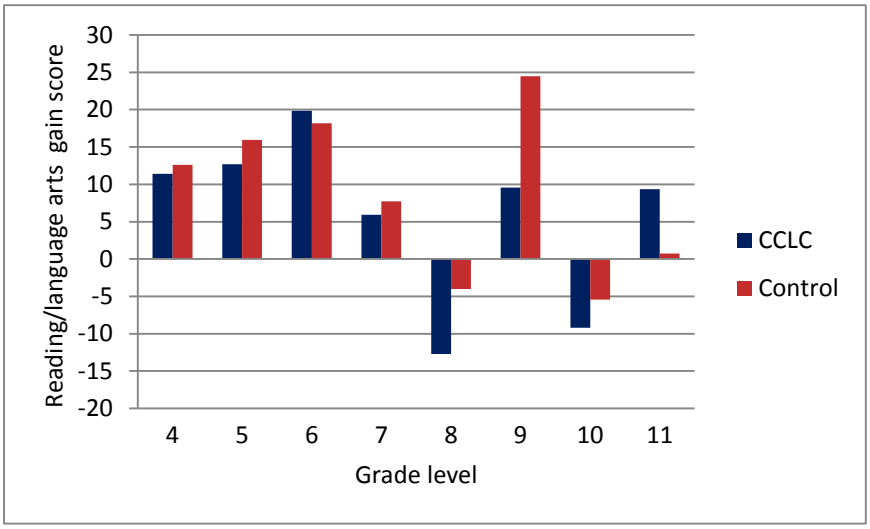

Figure 1. Difference in WESTEST 2 Mathematics Gain Scores by Group and Grade Level

Table 2 in Appendix A presents the results of independent *t* tests used to determine the statistical significance of differences in reading/language arts mean scale score gains between Group 1 (CCLC participants) and Group 0 (nonparticipants) for Grades 4–11. In no case were the observed differences statistically significant. See Figure 2 for a graphical representation of reading/language arts gains by group and grade level.

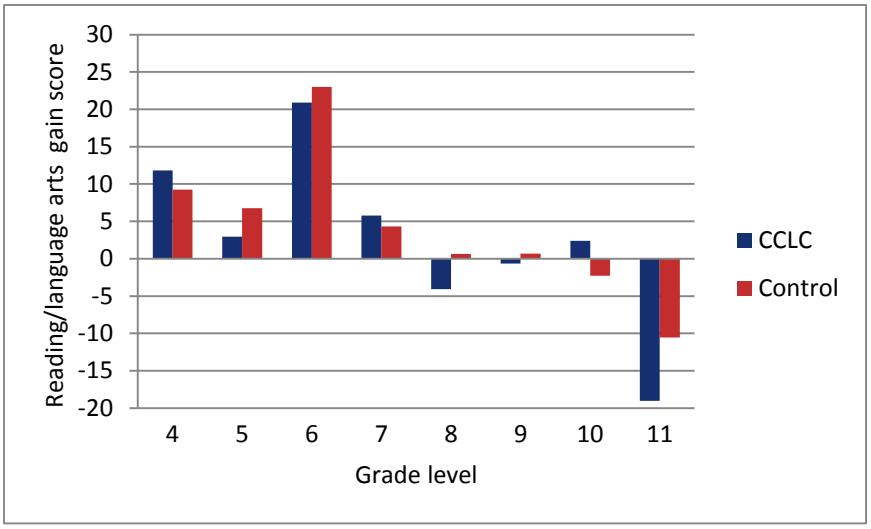

Figure 2. Difference in WESTEST 2 Reading/Language Arts Gain Scores by Group and Grade Level

RQ3 and RQ4

Table 3 in Appendix A presents the results of independent *t* tests used to determine the statistical significance of differences in 2013–2014 mathematics performance between Group 1 (CCLC participants) and Group 0 (nonparticipants) for Grades 4–11. In no case were the observed differences statistically significant. See Figure 3 for a graphical representation of mathematics gains by group and grade level.

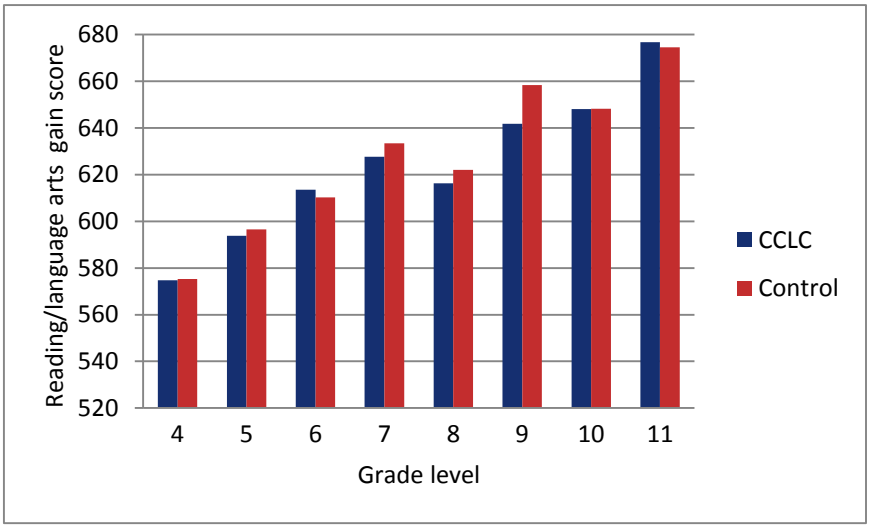

Figure 3. Difference in 2013–2014 Mathematics Performance by Group and Grade Level

Table 4 in Appendix A presents the results of independent samples *t* tests used to determine the statistical significance of differences in 2013–2014 reading/language arts performance between Group 1 (CCLC participants) and Group 0 (nonparticipants) for Grades 4–11.

In no case were the observed differences statistically significant. See Figure 4 for a graphical representation of reading/language arts gains by group and grade level.

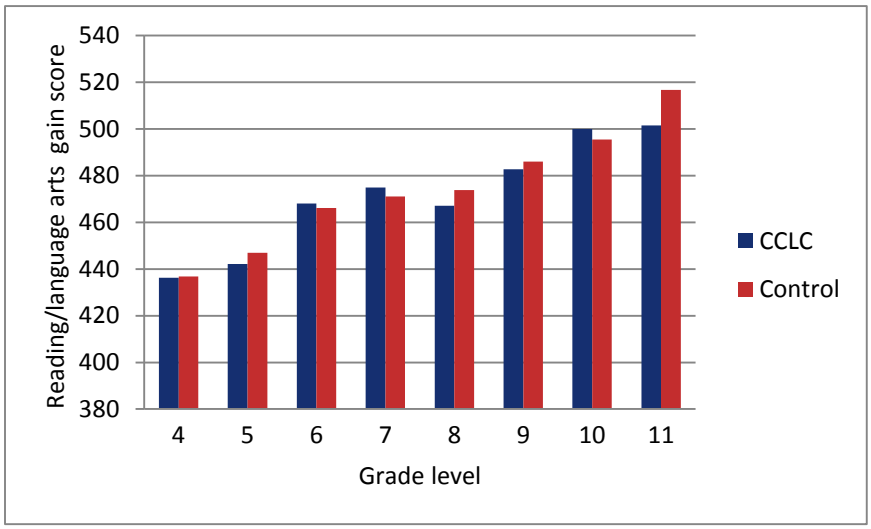

Figure 4. Difference in 2012–2013 Reading/Language Arts Performance by Group and Grade Level

RQ5 and RQ6

Table 5 in Appendix A presents the results of paired *t* tests used to determine the statistical significance of differences in 2012–2013 and 2013–2014 mathematics performance for CCLC participants for Grades 4–11. The results were statistically significant for Grades 4–6 and Grade 8. However, results were not significant for Grade 7 and Grades 9 through 11. Figure 5 provides a graphical representation of mathematics gains for the CCLC group.

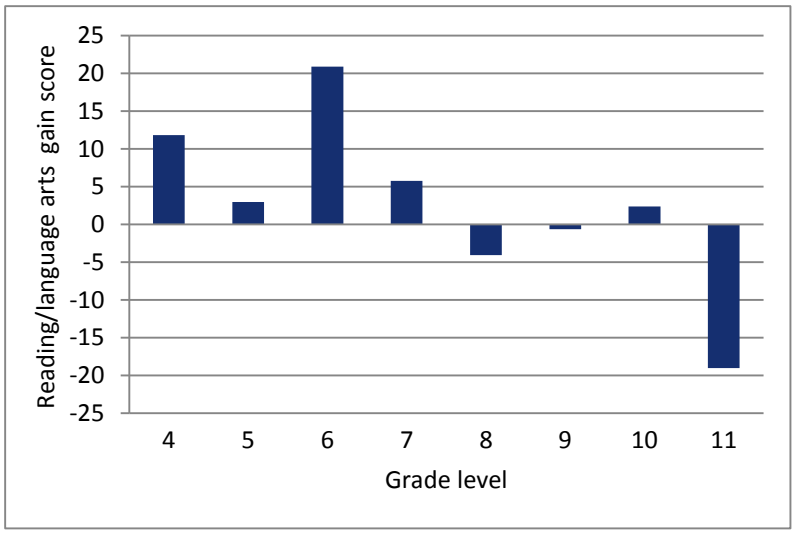

Figure 5. 2012–2013 to 2013–2014 Mathematics Gain Scores for CCLC Students by Grade

Table 6 in Appendix A presents the results of paired *t* tests used to determine the statistical significance of differences in 2012–2013 and 2013–2014 reading/language arts performance for CCLC participants for Grades 4–11. The results were statistically significant for Grades 4, 6, 7, and 11. However, results were not significant for Grades 5, 8, 9 and 10. Figure 6 provides a graphical representation of reading/language arts gains for the CCLC group.

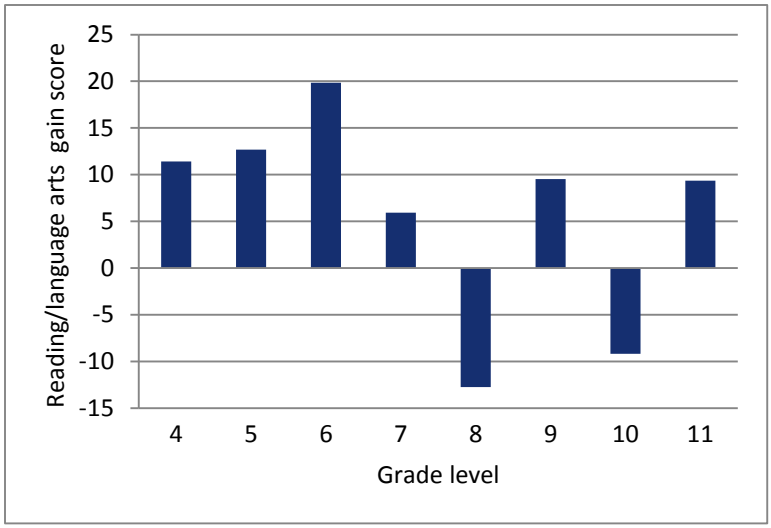

Figure 6. 2012–2013 to 2013–2014 Reading/Language Arts Gain Scores for CCLC Students by Grade

RQ7 and RQ8

Table 7 in Appendix A presents the results of paired *t* tests used to determine the statistical significance of differences in 2012–2013 and 2013–2014 mathematics performance for non-CCLC participants for Grades 4–11. The results were statistically significant for Grades

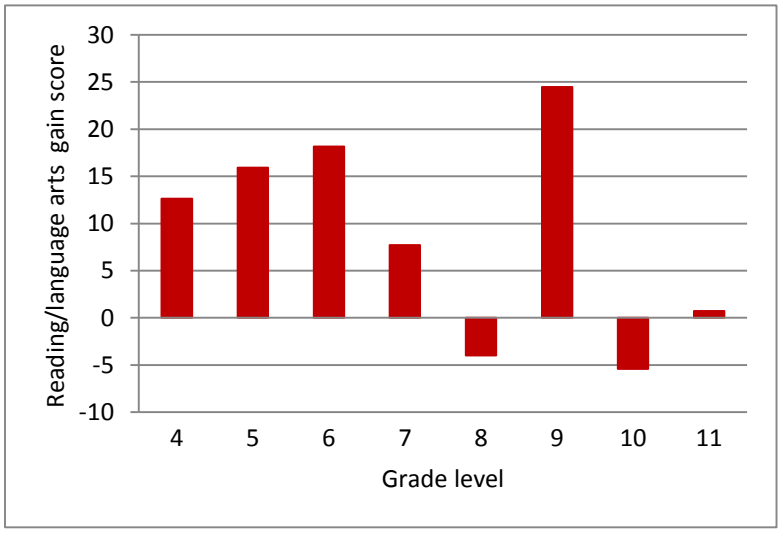

Figure 7. 2012–2013 to 2013–2014 Mathematics Gain Scores for non-CCLC Students by Grade

4–7 and 9. Figure 7 provides a graphical representation of mathematics gains for the CCLC group.

Table 8 in Appendix A presents the results paired *t* test analysis used to determine the statistical significance of differences in 2012–2013 and 2013–2014 reading/language arts performance for non-CCLC participants for Grades 4–11. The results were statistically significant for Grades 4, 5, and 6. Figure 8 provides a graphical representation of reading/language arts gains for the CCLC group.

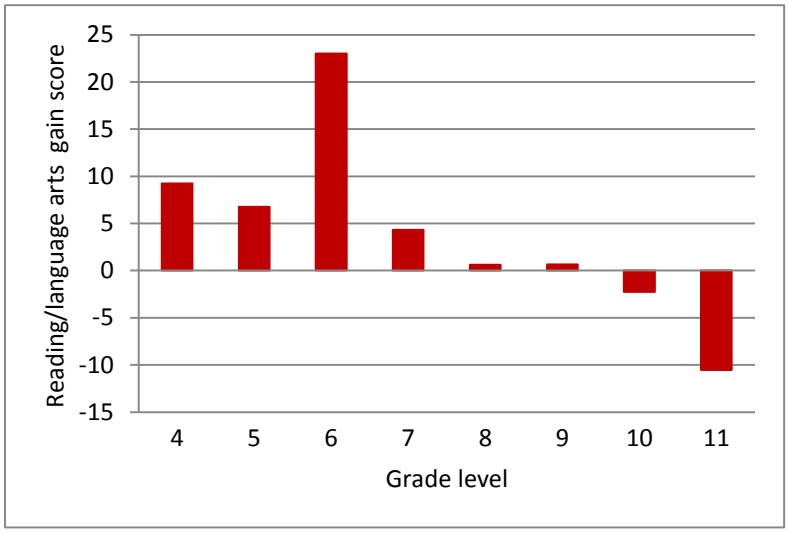

Figure 8. 2012–2013 to 2013–2014 Reading/Language Arts Gain Scores for non-CCLC Students by Grade

RQ9 and RQ10

Table 9 in Appendix A presents the within-subjects effect of time by grade for mathematics analyses. In all grades except Grades 10 and 11, there was a statistically significant main effect for time indicating that, irrespective of group membership, students in Grades 4 through 9 grades experienced statistically significant changes in mathematics performance from one year to the next. However, as indicated in Table 10 in Appendix A, none of the group*time interaction effects were statistically significant leading us to conclude that the two groups' changes in mathematics performance did not differ significantly over time. Figure 9–Figure 15 in Appendix B present group differences in mathematics achievement over time by grade level.

Table 11 in Appendix A presents the within-subjects effect of time by grade for reading/language arts analyses. In Grades 4–7 and 11, there was a statistically significant main effect for time indicating that, irrespective of group membership, students in these grades experienced statistically significant changes in mathematics performance from one year to the next. However, as indicated in Table 12 in Appendix A, none of the group*time interaction effects were statistically significant leading us to conclude that the two groups' changes in reading/language arts performance did not differ significantly over time. Figure 16–Figure 23

in Appendix B present group differences in reading/language arts achievement over time by grade level.

Discussion

Independent sample *t* tests sought to determine if CCLC students experienced higher academic achievement gains in mathematics or reading/language arts than control group students from 2012–2013 to 2013–2014. In addition to testing for differences in scale score gains, we also examined differences between these groups in actual scale score values by grade. Results showed no significant differences between these groups in either mathematics or reading/language arts with respect to actual scale scores or in scale score gains over time.

The paired *t* tests sought to determine if either group of students experienced significant academic achievement gains in mathematics or reading/language arts from 2012–2013 to 2013–2014 when examined independently. CCLC students exhibited statistically significant mathematics gains in Grades 4, 5, 6, and 8; these students also exhibited statistically significant gains in reading/language arts in Grades 4, 6, 7, and 11. Results were similar for control non-CCLC participant students who exhibited statistically significant mathematics gains in Grades 4, 5, 6, 7, and 9, and reading/language arts gains in Grades 4, 5, and 6.

Repeated measures analyses of variance (ANOVA) were used to determine if student achievement in mathematics and reading/language arts varied by group over time. While we found significant main effects for time, meaning improvement over time without respect to whether students were CCLC participants or not, there were no statistically significant interaction effects among groups and time. This indicates the groups did not experience differential gains over time.

Limitations

The study had several important limitations that may limit our ability to draw definitive conclusions about the effectiveness of the CCLC program in producing academic achievement gains. First, the study was limited in that it only encompassed a single year of intervention. While we used baseline academic achievement to control for prior performance, it could be possible that additional time in CCLC is necessary to experience measurable gains. Furthermore, and more problematic, our study was limited by the academic achievement data that were available, which included only Grades 4–11. There is currently no standardized academic achievement measure available for students K-2 and while Grade 3 is a tested grade, prior test scores are not available to determine achievement gains. This is a critical limitation when one considers that 50% of students who participated in CCLC during the 2013–2014 school year were in Grades K-3.

Recommendations

To the extent possible, we will attempt to prepare next year's edition of this report at the outset of the 2014–2015 school year, a time when the data are more actionable for CCLC program staff.

Appendix A

This appendix includes detailed statistical information for all hypotheses tested.

Table 1. H1–H8 Statistical Summary (Mathematics)

Group	Hypotheses	Grade	*N*	Mean	Std. deviation	*t*	*df*	Sig. (2 tail)*
1-CCLC participants	H1	4	289	11.42	40.024	.377	576	.706
0-Nonparticipants		4	289	12.62	36.914			
1-CCLC participants	H2	5	156	12.68	38.818	.752	310	.452
0-Nonparticipants		5	156	15.94	37.619			
1-CCLC participants	H3	6	156	19.85	42.551	-.347	310	.729
0-Nonparticipants		6	156	18.15	43.513			
1-CCLC participants	H4	7	83	5.93	34.684	.346	164	.730
0-Nonparticipants		7	83	7.71	31.628			
1-CCLC participants	H5	8	97	-12.73	40.878	1.463	192	.145
0-Nonparticipants		8	97	-4.01	42.161			
1-CCLC participants	H6	9	33	9.55	41.371	1.523	64	.133
0-Nonparticipants		9	33	24.48	38.251			
1-CCLC participants	H7	10	49	-9.18	43.811	.409	96	.683
0-Nonparticipants		10	49	-5.43	46.985			
1-CCLC participants	H8	11	36	9.36	30.668	-1.152	70	.253
0-Nonparticipants		11	36	0.72	32.940			

*p<.05 for significance

Table 2. H9–H16 Statistical Summary (Reading/Language Arts)

Group	Hypothesis	Grade	*N*	Mean	Std. deviation	*t*	*df*	Sig. (2 tail)*
1-CCLC participants	H9	4	289	11.84	27.859	-1.159	576	.247
0-Nonparticipants		4	289	9.25	25.939			
1-CCLC participants	H10	5	156	2.96	30.494	1.216	310	.225
0-Nonparticipants		5	156	6.78	24.785			
1-CCLC participants	H11	6	156	20.88	28.936	.672	310	.502
0-Nonparticipants		6	156	23.01	27.142			
1-CCLC participants	H12	7	83	5.78	24.491	-.399	164	.690
0-Nonparticipants		7	83	4.31	22.935			
1-CCLC participants	H13	8	97	-4.05	28.416	1.165	192	.245
0-Nonparticipants		8	97	0.64	27.642			
1-CCLC participants	H14	9	33	-0.64	25.946	.197	64	.844
0-Nonparticipants		9	33	0.67	27.659			
1-CCLC participants	H15	10	49	2.39	28.842	-.764	96	.446
0-Nonparticipants		10	49	-2.27	31.361			
1-CCLC participants	H16	11	36	-19.00	43.341	.899	70	.372
0-Nonparticipants		11	36	-10.53	36.357			

*p<.05 for significance

Table 3. H17–H24 Statistical Summary (Mathematics)

Group	Hypothesis	Grade	*N*	Mean	Std. deviation	*t*	*df*	Sig. (2 tail)*
1-CCLC participants	H17	4	289	574.72	50.152	.145	576	.885
0-Nonparticipants		4	289	575.32	48.811			
1-CCLC participants	H18	5	156	593.83	50.451	.480	310	.632
0-Nonparticipants		5	156	596.51	48.175			
1-CCLC participants	H19	6	156	613.53	44.033	-.609	310	.543
0-Nonparticipants		6	156	610.32	48.874			
1-CCLC participants	H20	7	83	627.72	53.020	.734	164	.464
0-Nonparticipants		7	83	633.43	47.010			
1-CCLC participants	H21	8	97	616.26	55.201	.747	192	.456
0-Nonparticipants		8	97	622.03	52.475			
1-CCLC participants	H22	9	33	641.85	54.504	1.233	64	.222
0-Nonparticipants		9	33	658.36	54.274			
1-CCLC participants	H23	10	49	648.08	52.768	.020	96	.984
0-Nonparticipants		10	49	648.29	48.233			
1-CCLC participants	H24	11	36	676.81	39.797	-.218	70	.828
0-Nonparticipants		11	36	674.50	49.471			

*p<.05 for significance

Table 4. H25–H32 Statistical Summary (Reading/Language Arts)

Group	Hypothesis	Grade	*N*	Mean	Std. deviation	*t*	*df*	Sig. (2 tail)*
1-CCLC participants	H25	4	289	436.31	37.187	.134	576	.893
0-Nonparticipants		4	289	436.75	41.391			
1-CCLC participants	H26	5	156	442.10	40.527	1.103	310	.271
0-Nonparticipants		5	156	446.97	37.336			
1-CCLC participants	H27	6	156	468.04	48.163	-.398	310	.691
0-Nonparticipants		6	156	466.09	37.949			
1-CCLC participants	H28	7	83	474.93	32.774	-.565	164	.573
0-Nonparticipants		7	83	471.06	53.077			
1-CCLC participants	H29	8	97	467.06	42.312	1.134	192	.258
0-Nonparticipants		8	97	473.86	41.108			
1-CCLC participants	H30	9	33	482.73	37.112	.337	64	.737
0-Nonparticipants		9	33	486.06	42.969			
1-CCLC participants	H31	10	49	500.02	37.058	-.484	96	.629
0-Nonparticipants		10	49	495.55	52.891			
1-CCLC participants	H32	11	36	501.50	46.328	1.481	70	.143
0-Nonparticipants		11	36	516.75	40.848			

*p<.05 for significance

Table 5. H33–H40 Statistical Summary

CCLC participants	Hypothesis	Grade	*N*	Mean diff	Std. deviation	*t*	*df*	Sig. (2 tail)*
Mathematics	H33	4	289	11.415	40	4.849	288	**.000***
Mathematics	H34	5	156	12.679	39	4.080	155	**.000***
Mathematics	H35	6	156	19.846	43	5.825	155	**.000***
Mathematics	H36	7	83	5.928	35	1.557	82	.123
Mathematics	H37	8	97	-12.732	41	-3.068	96	**.003***
Mathematics	H38	9	33	9.545	41	1.325	32	.194
Mathematics	H39	10	49	-9.184	44	-1.467	48	.149
Mathematics	H40	11	36	9.361	31	1.831	35	.076

*p<.05 for significance

Table 6. H41–H48 Statistical Summary

CCLC participants	Hypothesis	Grade	*N*	Mean diff	Std. deviation	*t*	*df*	Sig. (2 tail)*
Reading/language arts	H41	4	289	11.841	28	7.225	288	**.000***
Reading/language arts	H42	5	156	2.955	30	1.210	155	.228
Reading/language arts	H43	6	156	20.878	29	9.012	155	**.000***
Reading/language arts	H44	7	83	5.783	24	2.151	82	**.034***
Reading/language arts	H45	8	97	-4.052	28	-1.404	96	.163
Reading/language arts	H46	9	33	-0.636	26	-0.141	32	.889
Reading/language arts	H47	10	49	2.388	29	0.580	48	.565
Reading/language arts	H48	11	36	-19.000	43	-2.630	35	**.013***

*p<.05 for significance

Table 7. H49–H56 Statistical Summary

Non-CLC Participants	Hypothesis	Grade	*N*	Mean diff	Std. deviation	*t*	*df*	Sig. (2 tail)*
Mathematics	H49	4	289	12.623	36.914	5.813	288	**.000***
Mathematics	H50	5	156	15.936	37.619	5.291	155	**.000***
Mathematics	H51	6	156	18.154	43.513	5.211	155	**.000***
Mathematics	H52	7	83	7.711	31.628	2.221	82	**.029***
Mathematics	H53	8	97	-4.010	42.161	-0.937	96	.351
Mathematics	H54	9	33	24.485	38.251	3.677	32	**.001***
Mathematics	H55	10	49	-5.429	46.985	-0.809	48	.423
Mathematics	H56	11	36	0.722	32.940	0.132	35	.896

*p<.05 for significance

Table 8. H57–H64 Statistical Summary

Non-CCLC participants	Hypothesis	Grade	*N*	Mean diff	Std. deviation	*t*	*df*	Sig. (2 tail)*
Reading/language arts	H_{57}	4	289	9.246	25.939	6.059	288	**.000***
Reading/language arts	H_{58}	5	156	6.782	24.785	3.418	155	**.001***
Reading/language arts	H_{59}	6	156	23.013	27.142	10.590	155	**.000***
Reading/language arts	H_{60}	7	83	4.313	22.935	1.713	82	.090
Reading/language arts	H_{61}	8	97	0.639	27.642	0.228	96	.820
Reading/language arts	H_{62}	9	33	0.667	27.659	0.138	32	.891
Reading/language arts	H_{63}	10	49	-2.265	31.361	-0.506	48	.615
Reading/language arts	H_{64}	11	36	-10.528	36.357	-1.737	35	.091

*p<.05 for significance

Table 9. Within Subjects Effects for Time (Mathematics Analyses)

Grade	Hypothesis		Source	Type III sum of squares	*df*	Mean square	*F*	Sig.*
4th grade	H_{65}	Time	Huynh-Feldt	41748.105	1.000	41748.105	56.330	**.000***
5th grade	H_{66}	Time	Huynh-Feldt	31934.769	1.000	31934.769	43.716	**.000***
6th grade	H_{67}	Time	Huynh-Feldt	56316.000	1.000	56316.000	60.817	**.000***
7th grade	H_{68}	Time	Huynh-Feldt	3859.711	1.000	3859.711	7.007	**.009***
8th grade	H_{69}	Time	Huynh-Feldt	6797.361	1.000	6797.361	7.884	**.006***
9th grade	H_{70}	Time	Huynh-Feldt	9554.008	1.000	9554.008	12.038	**.001***
10th grade	H_{71}	Time	Huynh-Feldt	2615.592	1.000	2615.592	2.535	.115
11th grade	H_{72}	Time	Huynh-Feldt	915.062	1.000	915.062	1.807	.183

*p<.05 for significance

Table 10. Interaction Effects for Time*Group (Mathematics Analyses)

Grade	Hypothesis	Source	Type III sum of squares	*df*	Mean square	*F*	Sig.*
4th grade	H_{73}	Time*group	105.364	1.000	105.364	.142	.706
5th grade	H_{74}	Time*group	413.564	1.000	413.564	.566	.452
6th grade	H_{75}	Time*group	111.692	1.000	111.692	.121	.729
7th grade	H_{76}	Time*group	65.976	1.000	65.976	.120	.730
8th grade	H_{77}	Time*group	1844.629	1.000	1844.629	2.140	.145
9th grade	H_{78}	Time*group	1841.280	1.000	1841.280	2.320	.133
10th grade	H_{79}	Time*group	172.735	1.000	172.735	.167	.683
11th grade	H_{80}	Time*group	671.674	1.000	671.674	1.326	.253

*p<.05 for significance

Table 11. Within Subjects Effects for Time (Reading/Language Arts Analyses)

Grade	Hypothesis	Source		Type III sum of squares	*df*	Mean square	*F*	Sig.*
4th grade	H_{81}	Time	Huynh-Feldt	32125.291	1.000	32125.291	88.683	**.000***
5th grade	H_{82}	Time	Huynh-Feldt	3697.694	1.000	3697.694	9.578	**.002***
6th grade	H_{83}	Time	Huynh-Feldt	75130.463	1.000	75130.463	190.927	**.000***
7th grade	H_{84}	Time	Huynh-Feldt	2115.193	1.000	2115.193	7.515	**.007***
8th grade	H_{85}	Time	Huynh-Feldt	282.374	1.000	282.374	0.719	.398
9th grade	H_{86}	Time	Huynh-Feldt	0.008	1.000	0.008	0.000	.996
10th grade	H_{87}	Time	Huynh-Feldt	0.184	1.000	0.184	0.000	.984
11th grade	H_{88}	Time	Huynh-Feldt	7847.007	1.000	7847.007	9.808	**.003***

*p<.05 for significance

Table 12. Interaction Effects for Time*Group (Reading/Language Arts Analyses)

Grade	Hypothesis	Source	Type III sum of squares	*df*	Mean square	*F*	Sig.*
4th grade	H_{89}	Time*group	486.592	1.000	486.592	1.343	.247
5th grade	H_{90}	Time*group	571.168	1.000	571.168	1.479	.225
6th grade	H_{91}	Time*group	177.707	1.000	177.707	.452	.502
7th grade	H_{92}	Time*group	44.831	1.000	44.831	.159	.690
8th grade	H_{93}	Time*group	533.570	1.000	533.570	1.358	.245
9th grade	H_{94}	Time*group	14.008	1.000	14.008	.039	.844
10th grade	H_{95}	Time*group	265.224	1.000	265.224	.584	.446
11th grade	H_{96}	Time*group	646.007	1.000	646.007	.807	.372

*p<.05 for significance

Appendix B

This appendix presents graphical representations of the differences observed in student achievement over time by group.

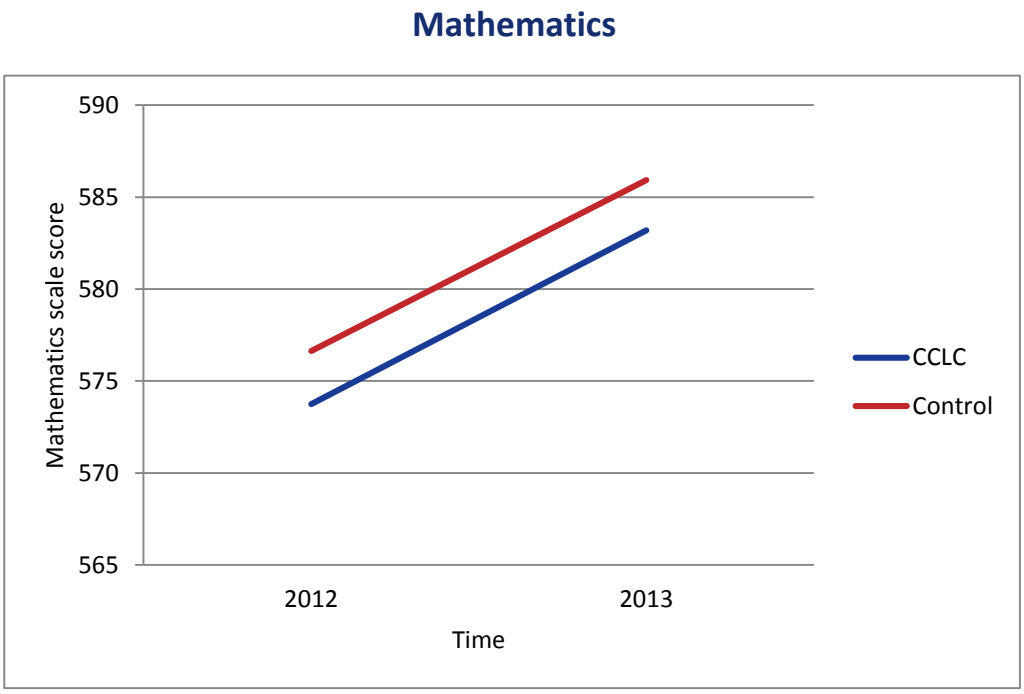

Figure 9. Fourth Grade Year-to-Year Mathematics Achievement by Group

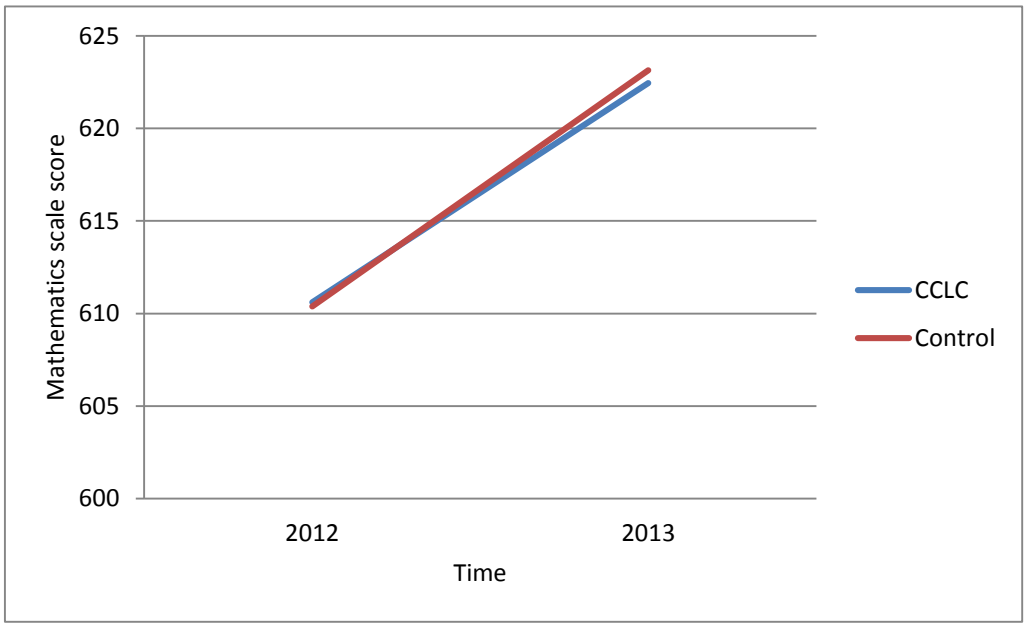

Figure 10. Sixth Grade Year-to-Year Mathematics Achievement by Group

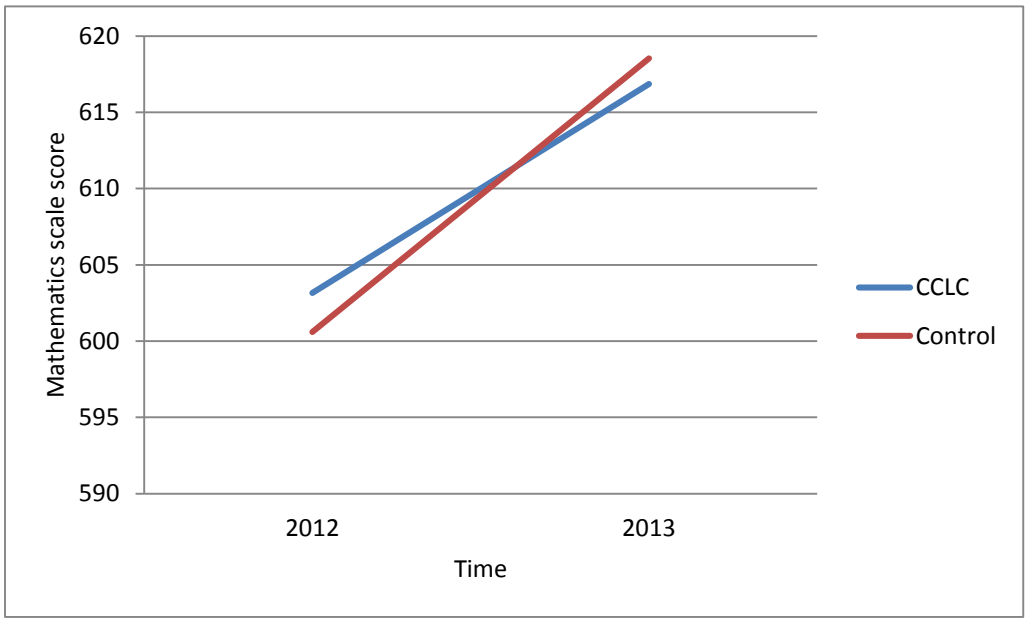

Figure 11. Seventh Grade Year-to-Year Mathematics Achievement by Group

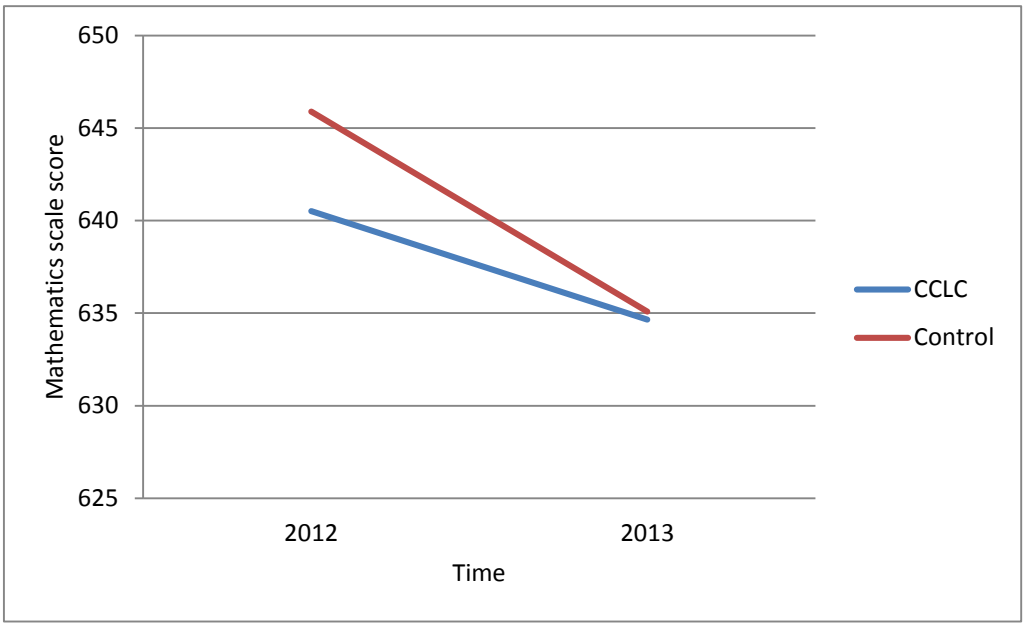

Figure 12. Eighth Grade Year-to-Year Mathematics Achievement by Group

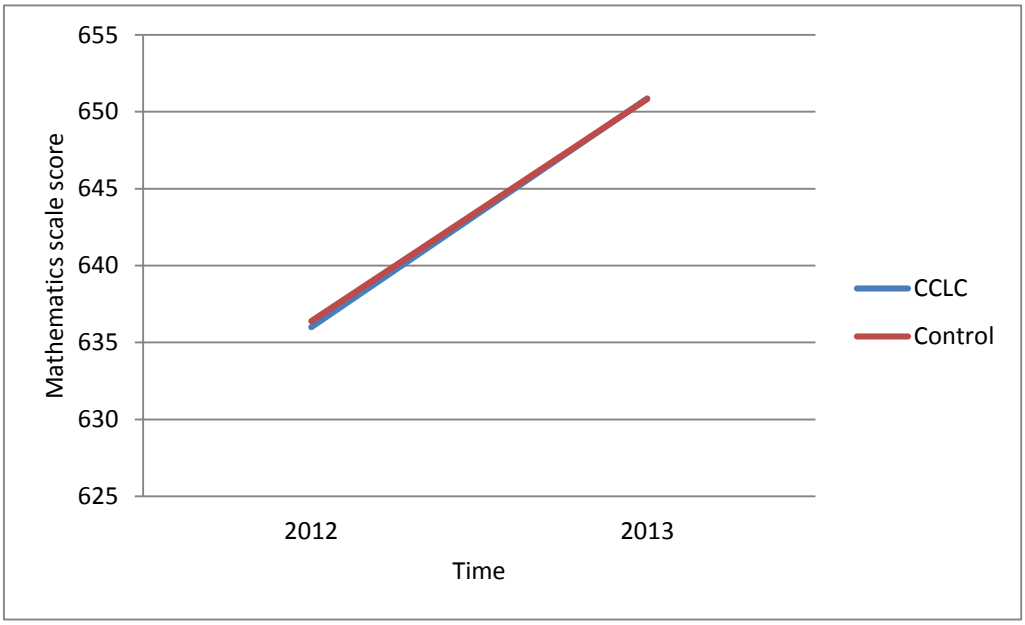

Figure 13. Ninth Grade Year-to-Year Mathematics Achievement by Group

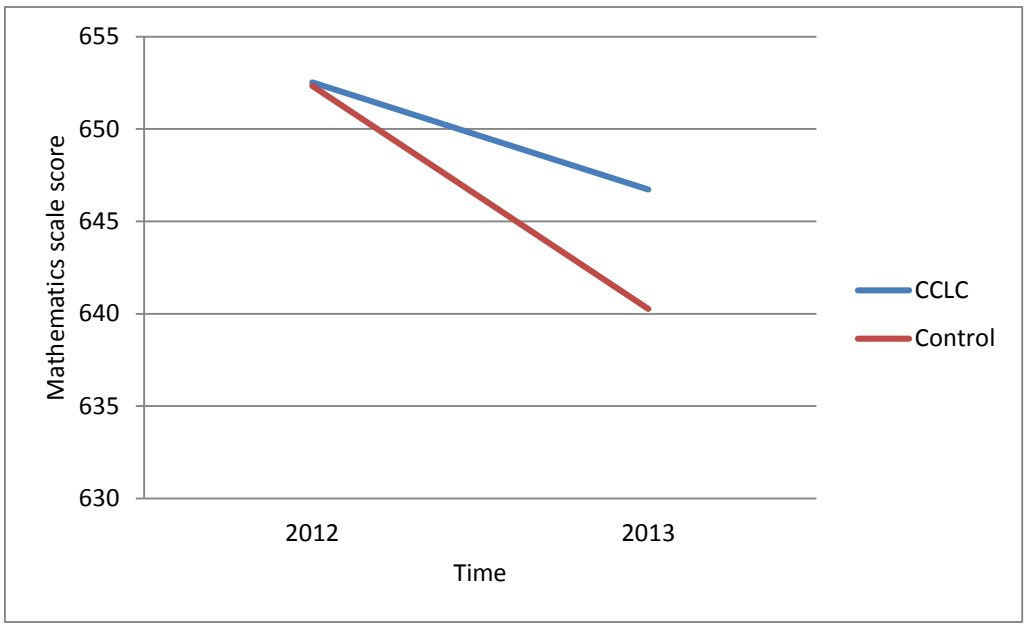

Figure 14. Tenth Grade Year-to-Year Mathematics Achievement by Group

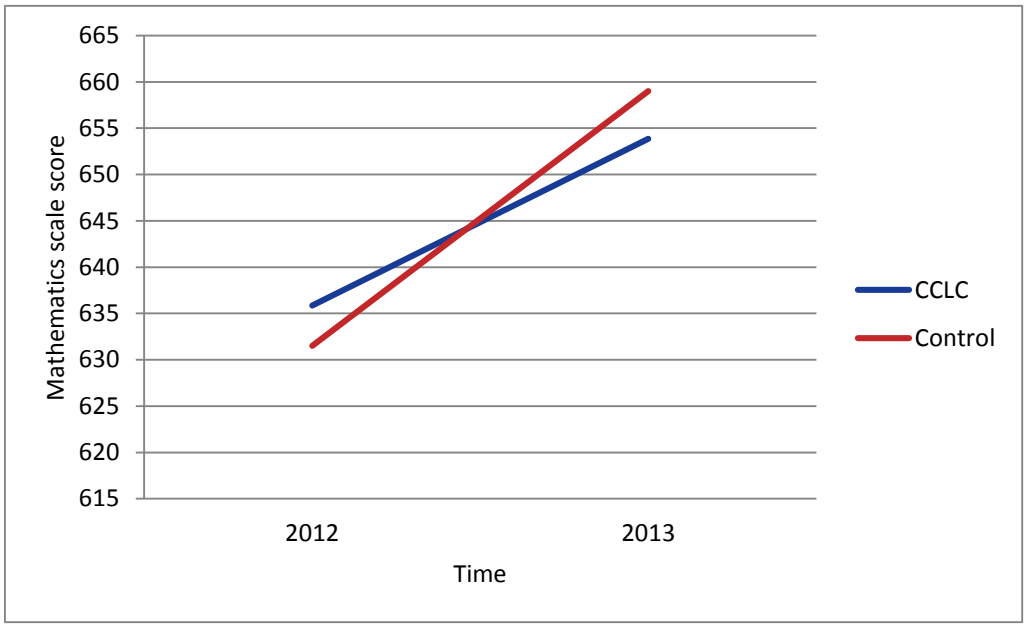

Figure 15. Eleventh Grade Year-to-Year Mathematics Achievement by Group

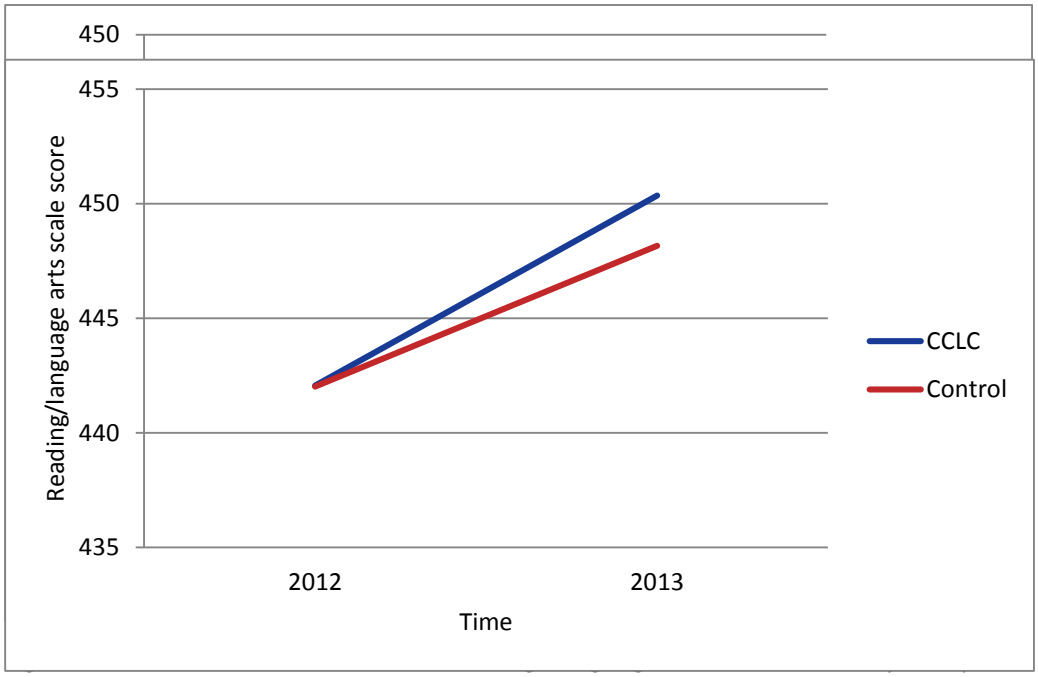

Figure 17. Fifth Grade Year-to-Year Reading/Language Arts Achievement by Group

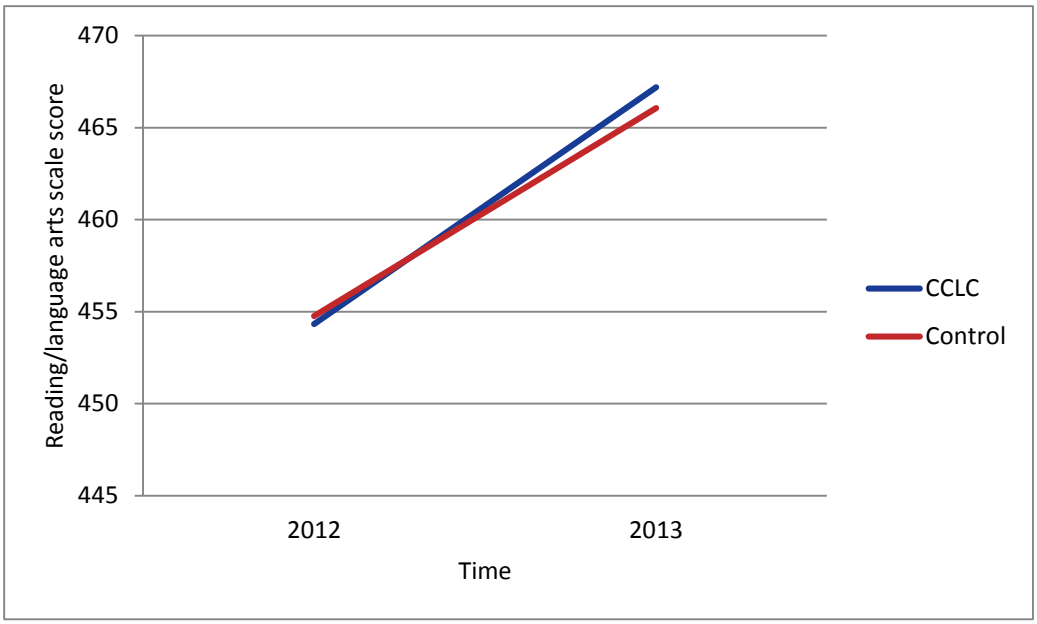

Figure 18. Sixth Grade Year-to-Year Reading/Language Arts Achievement by Group

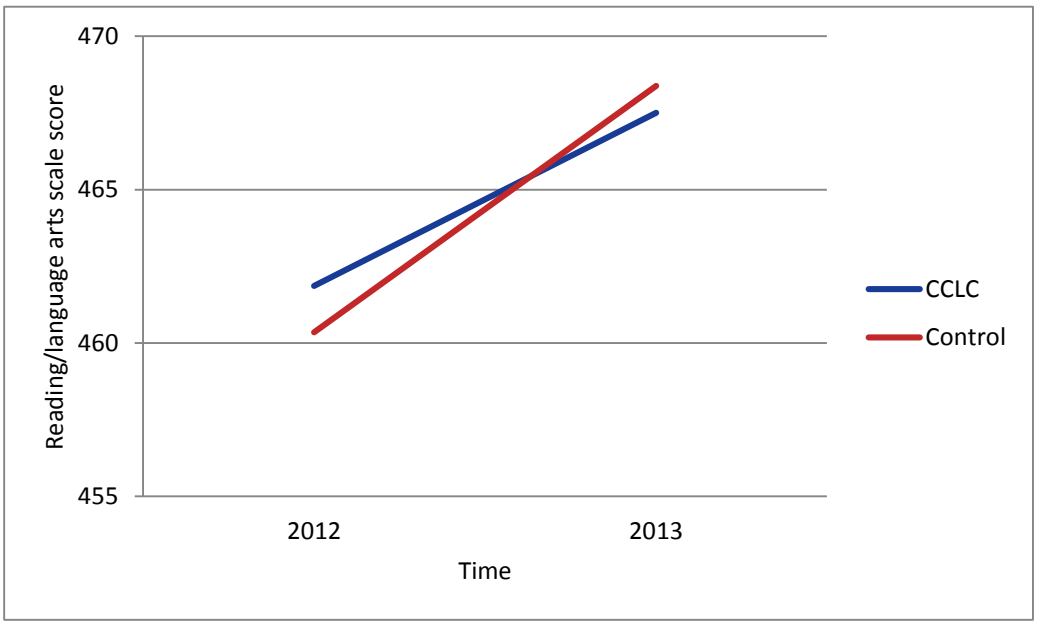

Figure 19. Seventh Grade Year-to-Year Reading/Language Arts Achievement by Group

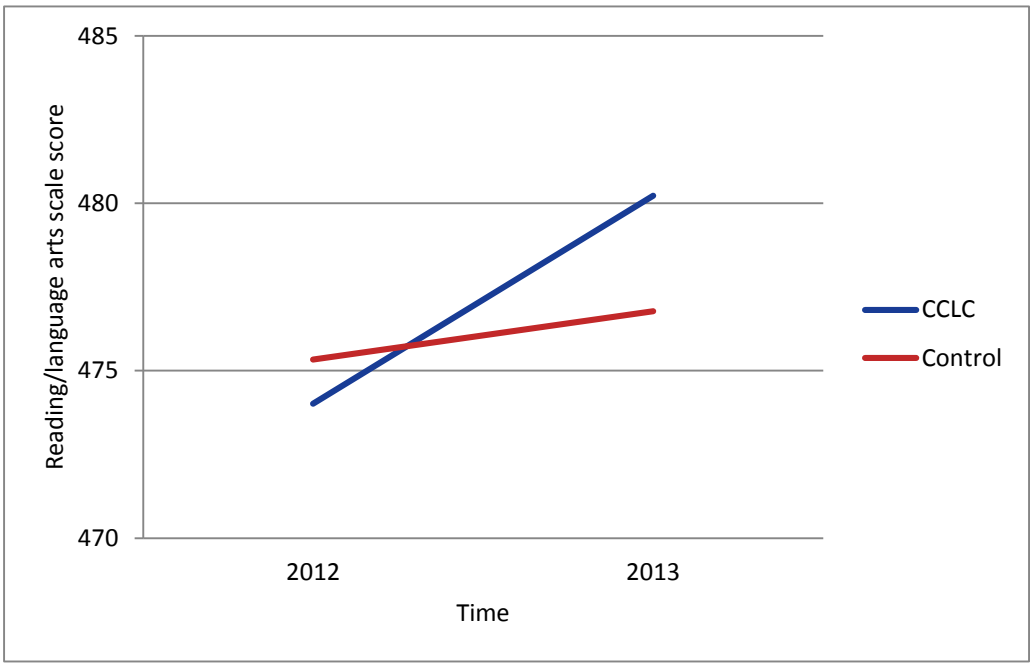

Figure 20. Eighth Grade Year-to-Year Reading/Language Arts Achievement by Group

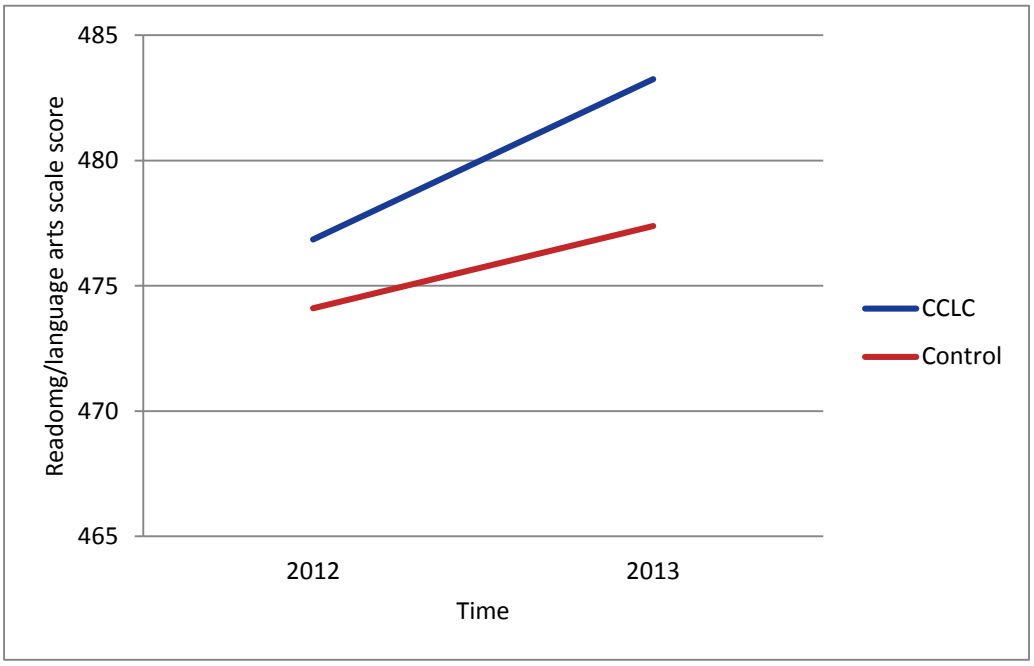

Figure 21. Ninth Grade Year-to-Year Reading/Language Arts Achievement by Group

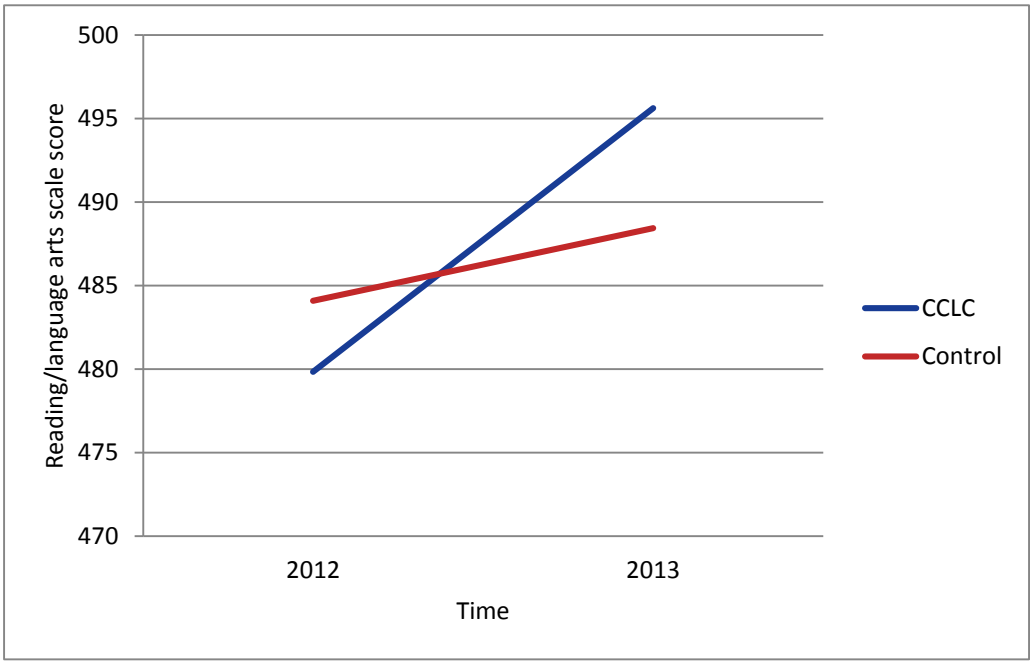

Figure 22. Tenth Grade Year-to-Year Reading/Language Arts Achievement by Group

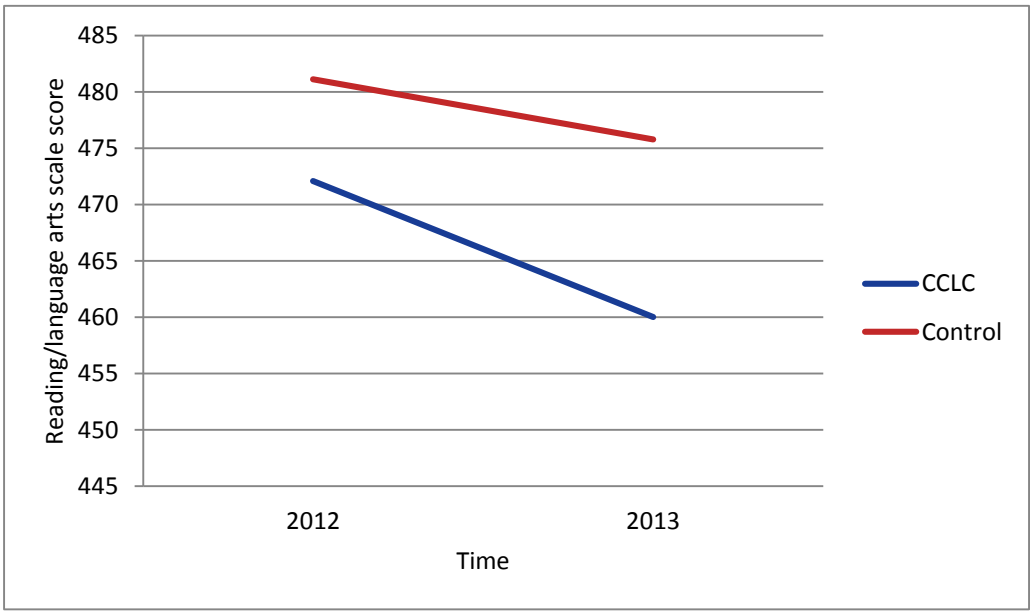

Figure 23. Eleventh Grade Year-to-Year Reading/Language Arts Achievement by Group

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State Superintendent of Schools